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THE EFFECT OF REVENUE DIVERSIFICATION ON BANK PROFITABILITY AND RISK DURING COVID-19: EVIDENCE FROM THE NORDIC COUNTRIES

Bachelor's thesis

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I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
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has not been previously presented for grading.

The document length is 9264 words from the introduction to the end of the conclusion.

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ABSTRACT

This paper aims to study the profit diversification decision by bank entities in the Nordic countries, and the impact of the Covid-19 pandemic on bank performance and risk. In total 1325 observations were collected from 227 banks from Finland, Sweden, Norway, and Denmark. The data was collected from the database BankFocus between the period of 2013-2021, with the years 2020-2021 being affected by Covid.

After a thorough litterature search, the following were selected as dependent variables; return on average assets, return on average equity, risk-adjusted return on average assets, and risk-adjusted return on average equity were selected as dependent variables, while bank size, equity, deposits, loan loss provisions, share of non-interest income, and share of fees and commissions were selected as independent variables. From these variables, fixed-effect regression models were created.

The main results of the paper indicate the Covid-19 pandemic affecting the performance of Nordic banks negatively, decreasing profitability and risk-adjusted revenue. An increase in risk can be argued through the models and theoretical literature. Revenue diversification appears to increase profitability and risk-adjusted revenue, within the Nordic region, while the ratio of fees and commissions had a negative impact on both profitability and risk-adjusted returns. The evidence showed bank size to not be a determining factor of profitability and risk-adjusted return. The theoretical literature suggests concentration within the market and high cooperation levels between banks demean the importance of bank size.

Keywords: Revenue diversification, Non-interest income, Covid-19, Nordic banking.

INTRODUCTION

The topic of the thesis is to investigate the impact of banking profit diversification on the performance and risk during the Covid-19 pandemic. Banks are financial institutions that take part immensely in a country's economic development and growth. The banking industry's efficiency and quality of providing services have a large effect on the country's economic growth but also act greatly on the daily lives of individuals, as found by Wang et al (2014). Thus, finding ways to improve the risk/return trade-off and enhance bank profitability is of great interest to bank executives, bank regulators, and supervisors Stiroh (2004a). In addition, by reducing the volatility of the bank's profits and lowering the bank's risk, some of the capital requirements could be justly lowered (Stiroh (2004a)).

In the banking industry, revenue diversification refers to the proportions of interest and non-interest revenue. Interest revenue represents the amount of interest earned and gathered from multiple financial assets. Bank's revenue diversification is stipulated into three different dimensions by Mercieca et al. (2007):(I) over financial services and products, (II) through geographical expansion, and (III) a combination of geographical and business line diversification. In this study, the effect of diversification between non-interest income and net interest income will be studied. The effect of revenue diversification in the banking sector and its impact on risk during the Covid-19 pandemic has had several studies conducted on the country and continent level, but studies including all Nordic countries (Finland, Sweden, Norway, Denmark, and Iceland) are limited.

The sample studied is that of Nordic bank entities, that take part as intermediaries between savers and borrowers, allocating credit for productive activities, financial services, etc. Furthermore, financial institutions shares offer great investment opportunities and additional information on banks' performances would be significant information in the investment decision-making process. Additionally, financial development has a significant bidirectional causality with economic growth in high-income countries (Bangake et al. (2011)). This connection makes decisions on risk reduction and profit diversification more crucial.

This paper aims to study the profit diversification decision by bank entities in the Nordic countries, and the impact of the Covid-19 pandemic on bank performance and risk. More specifically, the study seeks to find how and if variables set in previous literature, direct the choice for the selected banks of revenue diversification, how it affects risk, and has Covid impacted this relation. The findings of this paper would then be compared with similar previous studies conducted earlier, searching for parallel findings or disagreements between the studies.

The thesis seeks to answer the following research questions:
- Do Nordic banks benefit from revenue diversification?
- Has Covid affected bank profitability or risk negatively?

Additionally, four hypotheses were created based on the theoretical literature to provide a clear direction within the study. H1: Covid has a negative impact on the profitability of banks, H2: Covid has a negative impact on the risk-adjusted returns, H3: Non-interest revenue has a negative association with profitability, and H4: Non-interest revenue has a negative association with risk-adjusted returns.

To achieve an answer to these questions a regression analysis will be conducted with 227 banks' financial information. The data collected for this study will be secondary, containing variables and ratios gathered from selected firms' balance sheets and income statements. The data will be gathered in 9 year period between the years 2013-2021 where years 2020-2021 will be Covid-affected data. The data was gathered from the database BankFocus.

The structure of this thesis has been divided into three different sections. The first section will include a review of the preceding literature, the most relevant empirical studies with similar research topics, and their findings. The banking-related topics covered include the effects of profit diversification, the financial performance of Nordic banks, and the broad impact of Covid-19 on the banking sector. The thesis's second section will be committed to presenting the collected data and study methodology. In this section, the used variables will be defined, and selected methods for this study will be discussed. This part will also include descriptive statistics of the sampled data. Finally, the third chapter will include the results of the regression analysis and these results will be discussed, before culminating the paper with a conclusion on the research question.

1. THEORETICAL BACKGROUND

This chapter has been divided into two sections. The first lays out a review of the existing literature, theoretical and empirical, on banking performance, Covid-19 impact on banking, and profit diversification from which the hypothesis for this research will be concluded. The literature review's main task is to define and justify the selected variables for this study, and some additional hypotheses will be concluded. The hypotheses created are H1: Covid-19 had a negative impact on bank profitability, H2: Covid-19 had a negative impact on risk-adjusted returns, and H3: Revenue diversification has a negative association with bank profitability, and H4: Non-interest revenue has a negative association with risk-adjusted returns.

1.1. Banking Performance

Generally speaking, a bank can diversify its profits into two categories: Interest income and non-interest income. Specifically, interest income account for compensation received from another person or an entity for providing them with funds, commonly through lending activities while noninterest revenue encompasses various fees, such as service fees, late payment fees, and credit card fees, among others. Broadly, interest income refers to income from principal activities for banks.

1.1.1. Banking profit diversification and risk

There has been a trend to switch toward non-interest income in the banking sector for the past decades (Stiroh (2004a), Chiorazzo (2008)). Banks seem to be eager to go after functional diversification with activities such as insurance, real estate, and investment banking, among others Ochenge R (2022). Stiroh (2004a) found, in the USA banking market, between the years 1984 and 2001, the rate of non-interest income grew from 25% to 43% of total net operating revenue. During this period, at the aggregate level, the volatility of bank revenue growth decreased, mainly due to the lower volatility in interest income in the 1990s. The changes in noninterest income on the other hand are more volatile, due to the unpredictable revenue from trading (Stiroh (2004a)).

Similarly, to the USA market European markets have been shifting toward diversifying their profits in hopes of maximizing their revenue, due to increased competitiveness in the banking sector, when deregulations, credit availability enhanced, and the Euro was introduced (Elsas et al (2010), Baele et al (2007), Mercieca et al (2007)). In their study, Mercieca et al (2007) considered the diversification efforts of banks, which may involve various strategies, including shifting between non-interest income and interest income-generating activities, diversifying within either of these two types of income-generating activities or adopting a combination of both strategies simultaneously. Banks may choose to diversify by offering non-interest income products or services that complement an existing interest income-generating activity. Alternatively, banks may additionally diversify within either non-interest income or interest income activities (Mercieca et al (2007)).

Additionally, Mercieca et al. (2007) divided profit diversification in the banking sector into three categories: financial services and products where additional fees can be added, with the supply of services being increased. Second, through geographical expansion where assets such as real estate can be purchased from outside the operating regions. Third, a combination of geographical and business line diversification, which includes additional services offered to markets outside of the main operating region (Mercieca et al. (2007)). Typically, Commercial banks increased their diversification by increasing fee-based business, while banks with strong fee-based profits broadened their activities in the trading sector. Other banks, on the other hand, diversified their revenue streams by underwriting insurance contracts (Elsas et al. (2010)).

Elsas et al. (2010), additionally found that diversifying banks' profit creates value for bank shareholders. This value created might come from two wide-ranging sources. One way for a bank to create value is to use customer information to provide them with customized products and services. Furthermore, banks with high operational leverage may gain a competitive advantage by diversifying into related business areas and leveraging existing infrastructure and expertise to save money. For example, selling life insurance through a bank's retail branch network may result in scope economies, allowing the bank to offer more cost-effective products than specialized insurance providers (Elsas et al (2010).

The main goal of profit diversification, in addition to increasing revenue, is risk reduction. The different types of bank risk listed by Mohamed (2016), are credit, Interest rate, market, liquidity, foreign exchange, and strategic risk. Describing them shortly, credit risk refers to a situation when

bank-provided credit payments may be delayed or remain unpaid. Mohammed (2016) argues that in banks' balance sheets, 70% or more is connected to credit risk. Credit risk is the principal cause of losses and bank failures.

Interest rate risk refers to the possible impact of interest rate changes on a bank's earnings and the value of its assets and liabilities. Some of the risk management methods include financial futures and interest rate swaps (Mohamed (2016)). Market risks are commonly defined as changes in the market, altering the value of a portfolio either being an investment or trading nature, on a decreasing scale. In the banking sector, the following three risk factors are most commonly affecting the market environment. Liquidity of the assets, interest rate, and foreign exchange rate (Mohamed (2016)).

Liquidity risk described by Jenkinson (2008), is the danger of a bank not being able to meet its commitments if depositors attempt to withdraw funds before the bank's ability to reimburse them. Liquidity is crucial in the banking sector since it helps banks counter unexpected fluctuations in the balance sheets and meet required funds for future growth (Mohamed (2016)). Foreign exchange risk can be described as the increased variability experienced by an entity due to currency fluctuations (Jacque (2013)). Finally, strategic risk is described by Slywotzky and Drzik (2018) as several external events and trends that can ruin a company's growth course. The compatibility of an organization's strategic goals, the business strategies established to attain the goals, the resources deployed against these goals, and the quality of the execution process are all considered factors in strategic risk (Mohamed (2016)).

1.1.2. Covid-19 Impact on the banking sector

The outbreak of Covid-19 also known as SARS-CoV-2 was declared a pandemic on 11 March 2020 by World Health Organization (WHO). To limit the spread of the virus, countries commenced closing borders, curfews, physical distancing, government stimuli, etc. The Covid-19 pandemic exerted an effect on every sector, with varying impacts.

At the start of 2020, the pandemic was thought to cause a global crisis, comparable to or even worse than the banking crisis of 2007-2009. Aldasoro et al (2020) conducted a study of the Covid effect on banking in the early stages of the crisis. The results revealed that the decline in the banking sector shares was on par or over the decline witnessed in the crash of Lehman Brothers

2008. Additionally, the same condition was true for credit default swap (CDS) spreads especially in emerging markets. Aldasoro et al (2020) furthermore pointed out the trend of EU banks' performing ratios, such as ROA operating at a lower level than that of banks from other jurisdictions, which showed to further decrease after the start of the pandemic. In late April, a general price recovery occurred due to forceful policy measures, which favored banks with stronger profitability. The demand for CDS spreads continued growing for less profitable and capitalized banks regardless of the policy. Notably, the share prices of well-capitalized banks tended to recover more firmly compared to the poorly capitalized ones (Aldasoro et al (2020)).

Similar research carried out in the early stages of the pandemic by Rizwan et al (2020) studied the Covid impact on the systematic risks in the banking sector. The study concluded an intense rise in country-level systematic risk during the Covid period, which flattened by the end of April possibly attributed to policy responses. Along with many other studies also suggest the Covid crisis caused tightened credit standards and reduced demand for loans (Rizwan et al (2020), Resti (2021), Elnahass et al (2021), Li X et al (2021) to name few).

As found by Resti (2021) in a study of a later stage of Covid, the post-pandemic world strengthened issues and trends existing before the Covid pandemic. The increase in teleworking led to an increase in e-commerce, which enhanced the demand for timely and affordable alternative payment methods for cash. Resti (2021) also estimated an increase in the demand for personalized services provided on a digital platform. As the studies during the early stages of Covid found, the number of non-performing loans (NPL) increased also according to Resti (2021) in the EU region. Other significant changes include a fall in the price of the commercial real estate pledged as collaterals.

From these statements, we draw a hypothesis:
H1: Covid had a negative impact on the profitability of banks.
And due to increased credit risk:
H2: Covid had a negative impact on the risk-adjusted returns

1.1.3. Banking state in the Nordic region

Sweden, Norway, and Finland went through a banking crisis in 1990, caused by the expected inflation and inflation leading to tightened monetary policies. This pushed the Nordic countries to the verge of collapsing (Gjedrem (2000)). The reaction to the crisis varied in countries, but the

actions and measures taken to overcome this crisis are internationally valued as one of the most successful in history (Honkapohja (2009), Quadt & Nguyen (2016), Gjedrem (2000)). This crisis revealed the need for improvements within the Nordic banking sector, which have taken effect based on the evidence presented by Berglund and Mäkinen (2019). The evidence showed that due to the improvements, the Nordic banks were able to recover faster, compared to other European banks during the 2008 financial crisis. Additionally, Nordic banks have been shown to be more cost-effective and more profitable compared to other European banks (Pedersen et al (2006)).

The Nordic banks have additionally largened their operations outside of the Nordic region. The 5 largest banking groups in Nordics, which classify Nordics as their home markets, have established branches, cooperations, mergers, or obtained organizations from other Nordic countries. Some have even expanded to Eastern-Europe such as Poland, the Baltics, and Germany (Gjedrem (2000)).

Financial and trade openness has shown the Nordic region to be susceptible to global and regional shocks (Agarwal et al. (2013a)). Another risk factor in the Nordic bank market is the large size of assets in the banking field. Pedersen et al. (2006) showcased the ratio of banks' assets to GDP, to be a value of over 1 in all Nordic countries. Additionally, a small group of Nordic banks commands the market which could furthermore give incentives for a "too big to fail" attitude, contributing banks to make riskier investment and credit decisions (Wilmarth (2010)). Furthermore, Berglund & Mäkinen (2019) found Nordic banks bear higher banks loans to deposits ratio compared to other European banks. This indicates that Nordic banks are more reliant on wholesale funding. In addition, Nordic markets have a high consumer debt rate, which may increase the banking sector's vulnerability. While real estate and pension fund holdings are the primary assets of households, they are subject to illiquidity and asset valuation fluctuations, which can cause a negative loop in the banking industry in case of a decrease in real estate prices (Berglund & Mäkinen (2019), Agarwal et al. (2013a). Savolainen, et al (2017) found that the amount of non-performing loans (NPL), and loan losses have been small, within the Nordic countries compared to other European banks. This evidence does not guarantee the high supply of loans and credits does not have risks but showcases evidence of the sustainability of high debt and credit rates with the Nordic consumers.

1.2.Review of empirical studies

Multiple studies test the effect of revenue diversification on banking risk and profitability, using data from different continents, countries with different development stages of economy, utilizing different variables, etc. The results have been dichotomous and not a clear consensus has been achieved in literature. In this section some of these results will be presented, starting with more well-known papers studying profit diversification, and ending with more similar studies researching the impact of Covid on profit diversification.

Stiroh (2004a) measured the beneficial effect of profit diversification in the U.S. banking market, with quarterly data between the years 1984 and 2001. In his study, independent variables used in the regression model included, size, capitalization, size growth, the ratio of non-interest revenue out of net operating revenue, control variables of non-interest income, and a dummy variable for banks belonging to a multibank holding company (Stiroh (2004a)). The studies found that on an aggregate level, non-interest income tends to be more volatile than net interest income. Especially trading income shows high levels of volatility compared to interest income. The study additionally showed that the correlation between non-interest and interest income has increased since the 1990s. Furthermore, the study's results indicated that risk and return had a clear negative association with non-interest revenue and profits per unit of risk. Additionally, further expansion may eventually reduce risk-adjusted returns, whereas fiduciary income is associated with higher profit per risk and more stable net income growth (Stiroh (2004a)).
Following these results, the following hypothesis is drawn:

H3: Non-interest revenue has a negative association with profitability.
H4: Non-interest revenue has a negative association with risk-adjusted returns.

Stiroh and Rumble (2006) conducted a study measuring the effect of potential benefits of diversification, and whether the shift toward revenue diversification has improved profitability. In their study, they collected financial information from US banks and financial holding companies between the years 1997-2002. They focused on the variables, profit diversification, share of non-interest income, and a set of control variables. The main finding of their study is the benefit of diversification might be outweighed by the increased share of non-interest income, which is shown to be considerably more volatile with financial holding companies. Additionally, the increase in profit diversification does not increase profitability (Stiroh and Rumble (2006)).

Demsetz & Strahan (1997) conducted a study analyzing the effect of diversification on bank holding companies. The study was conducted using the following variables; return on most stocks, yield, change in the spread of treasury rates, the spread of change between corporate and treasury bonds, size, and capitalization. The results indicated a strong connection between firm size and profit diversification at publicly traded bank holding companies. Additionally, the study did not find evidence supporting the modern portfolio theory of profit diversification reducing risk. Furthermore, the evidence shows that a 10% increase in assets reduces risk from 2% to up to 2.6% (Demsetz and Strahan (1997)).

Mercieca et al (2007) studied the benefits of diversification for small European Banks. In their study, they collected data from 755 small banks between the years 1997-2003. They studied diversification with variables such as shares of non-interest, interest income, net operating revenue, ratios of captured commission revenue, trading income, and other operating income as a share of non-interest income. Also, risk-adjusted profit was studied. The result suggests a negative connection between non-interest income and risk-adjusted performance. Furthermore, small banks in Europe gained no direct benefit from diversifying from their primary business activities but should increase their performance, by adding more resources to their current activities (Mercieca et al (2007)). Additionally, the study showed a negative connection between risk-adjusted revenue and active restrictions and a positive correlation between insolvency risk and banking freedom.

Elsas et al. (2010) conducted panel data research between the period of 1996-2008, studying the effect of revenue diversification on bank valuation. Diversification was studied using the adjusted Herfindahl–Hirshman index, which includes ratios of diversification. In the selected regression model independent variables include vertical integration, size, systematic risk, the ratio of non-interest revenue over interest revenue, and the interaction term (Elsas et al. (2010)). The result indicated that revenue diversification increases bank profitability, consistent with the foot-in-the-door explanation. The benefits of diversification additionally hold during the 2008 financial crisis, even when the majority of the diversification was done by commercial banks expanding to investment banking, which endured the highest losses during the crisis (Elsas et al. (2010)). The findings of the study disagree with other studies presented so far, highlighting the lack of consensus on the impact of profit diversification.

Chiorazzo et al. (2007) studied the effect of profit diversification on Italian bank profitability, by gathering annual data between the years 1993 to 2003. In their study, the selected dependent variables include risk-adjusted ROA and ROE. The selected independent variables are similar to the ones presented earlier in the review. The evidence showed the connection between risk-adjusted return and non-interest income to be stronger with larger banks. The findings conflict with studies presented earlier by Stiroh and Rumble (2006). Furthermore, profit diversification has a positive relationship with risk-adjusted revenue. Additionally, small banks with a small share of non-interest income gain from increasing their share of non-interest income (Chiorazzo et al. (2007). This statement contradicts the results given by Mercieca et al (2007) and Stiroh (2004a), stating that small banks had no gain on profit diversification. The difference in results could be explained by the size of the region studied. Mercieca et al. (2007) and Stiroh (2004a) chose a continent-wide area to be studied, while Chiorazzo et al. (2007) studied only banks from Italy.

Similarly to this current research paper, Li et al (2021) studied the effect of revenue diversification on bank profitability and risk during the Covid-19 pandemic. The data used a sample of 216 U.S. commercial banks during the Covid period. The study used univariate analysis by comparing the financial performances of banks based on the ratio of net non-interest income divided by net interest income. Another regression model was estimated measuring banks' risk, with the standard deviation of ROA and ROE being dependent variables while using lagged variables of ROA and ROE in addition to previously presented control variables (Li X et al (2021)). Finally, a t-test was performed on differences in means between the top quintile and bottom quintile. The study concluded that non-interest income was positively connected with performance but was inversely connected with risk during the Covid period. Lagged variables of ROE and ROA indicated that well-performing banks continued performing strongly throughout the pandemic. Additionally, the evidence showed, riskier banks turned increasingly riskier during the pandemic. Finally, the growth of assets is indicated to be positively connected with profitability and inversely connected with risk (Li et al (2021)).

Ochenge (2022) similarly to previous research, studied the effect of revenue diversification on risk and profitability during the Covid-19 pandemic. In their study, they use dynamic panel regression to study revenue diversification and bank performance during Covid-19, in Kenya. The study collected data from 30 Kenyan banks between the years 2010-2020. The regression model used similar dependent and independent variables as presented earlier. The study revealed non-interest income to be positively connected to profitability and inversely connected with risk. The

relationship did hold during the Covid-19 crisis yet the connection appears weak (Ochenge (2022)).

Overall, a clear consensus cannot be drawn from the review. The reviewed studies from the U.S. banking market provided a clearer conclusion of non-interest revenue not having the sought benefits, but quite oppositely, might only make banks riskier. Studies done in the EU were more dispersed in research results. Generally, studies done on a larger scale including the entirety of the EU tended to offer results similar to the U.S. market, while more specified on a region or bank size showed evidence of gains of profit diversification. Additionally, there seems to be a gap in the literature measuring the effect of revenue diversification during the Covid-19 pandemic from the EU area, and studies missing on the diversification effect on the Nordic area. The literature has given insight into what variables would be suitable for the regression model. The following section will present the selected variables with additional details.

2. DATA AND METHODOLOGY

In this section, an overview of data collection, variables selected for the regression model, possible issues with the data, and countermeasures taken to avoid and minimize these issues are presented. Additionally, various tests measuring selected data's characteristics are presented. With these findings, a suitable model for regression is selected.

2.1 Sample and data collection

The selected data for the model is secondary and consists of financial figures from financial statements of sample banks, downloaded from the BankFocus database. The data was downloaded between the years 2013-2021 where the years 2020-2021 were Covid affected and the years 2013-2019 were not. The data was collected to calculate the required ratios and determinants for the regression analysis. The sample consists of banks operating as commercial, savings, and cooperative banks, in the Nordic region (Finland, Sweden, Norway, or Denmark). The original data set consisted of 755 banks and 3748 observations. The quality of the data in the primary state is poor and some data cleaning was conducted. Assets were required for most of the selected ratios, so bank-specific yearly information missing data on assets were removed. Additionally, observations with negative values for net interest income and non-interest income were removed following the same approach followed by Chiorazzo et al. (2008). Regression models are sensitive to outliers, and that's why the data was cleaned using the 1.5IQR method. IQR stands for inner quartile range, and the method considers values 1.5 inner quartile range below of first quarter or 1.5 inner quartile range above the third quarter as outliers. Additionally, banks that were notably missing in values or years were removed from the data set. The final sample consisted of 227 banks and 1325 observations. The original plan was to include Iceland, but after the data set was cleaned, the number of bank-specific data was too low to draw accurate conclusions, concluding in removing Iceland from the data set.

Accounting method differences may result in some misrepresentations or biases. Because this dataset contains both time and cross-sectional observations from different companies over

different time periods, the final sample can be considered a panel dataset; however, the removal of several bank years during the data cleaning process resulted in an unbalanced dataset.

The distribution of banks and bank types is presented in Table 1. The highest number of banks came from Norway with 77 banks while Denmark had the smallest number 28. Notably, a clear majority of Cooperative banks came from Finland, while Sweden and Norway didn't have any in this data set. The mode bank type is a savings bank (144), with the majority coming from Sweden and Norway.

Table 1. Number and types of banks by country

Country	Finland	Sweden	Norway	Denmark	Total
Savings	4	45	75	20	144
Cooperative	56	0	0	4	60
Commercial	10	7	2	4	23
Total	70	52	77	28	227

Source: Calculations compiled by the author based on the data from BankFocus

Bank performance has been measured differently, within the literature depending on the goal of the research. Most commonly return on assets (ROA) and return on equity (ROE) have been used to measure profitability but return on average assets (ROAA) and return on average equity (ROAE) are also frequent selections. Lee et al. (2014), Petria et al. (2015), Li et al. (2021), and Ochenge (2022) to name a few. The empirical literature has additionally shown that risk-adjusted return on average assets (RAROAA) and risk-adjusted return on average equity (RAROAE) are common ratios to measure banks' risk. Mercieca et al. (2007), Nepali (2018), Stiroh (2004) to name a few. Therefore 4 dependent variables will be used.

$$\text{Return on average assets (RO}AA) = \frac{Net\ \text{Income}}{Average\ asset} \tag{1}$$

$$\text{Return on average equity (ROAE)} = \frac{Net\ \text{Income}}{Average\ Equity} \tag{2}$$

$$\text{Risk adjusted} - \text{return on average asset (RAROAA)} = \frac{ROAA}{Standard\ deviation\ of\ ROA} \tag{3}$$

$$\text{Risk adjusted} - \text{return on average equity (RAROAE)} = \frac{ROAE}{Standard\ deviation\ of\ ROE} \tag{4}$$

The independent variables chosen for this research are size, equity, fees and commissions, deposits, loan loss provisions, and noninterest revenue. ROAA and ROAE will additionally have risk measurements. The selection of the variables was based on the variables used in previous studies and data availability. Table 2 assembled below will indicate the formula and abbreviations for selected independent variables.

Table 2. Chosen Determinants for Banking Performance and Risk

Determinant	Variable	Symbol	Proxy
Rate of profitability	Return on average assets	ROAA	NI/AA
	Return on average equity	ROAE	NI/AE
Risk	Risk-adjusted return on average assets	RAROAA	NI/AA/SDROA
	Risk-adjusted return on average equity	ROAE	NI/AE/SDROE
Bank size	Natural logarithm of Total assets	SIZE	LN(TA)
Diversification measure	Share of fees and commissions	FEECOM	F&C/TOI
	Share of Non-interest income	NONI	NII/TOI
Control variables	Bank capitalization	EQUITY	E/TA
	Deposits to assets	DEPOSITS	D/TA
	Share of Loan Loss Provisions	LLP	LLP/TL
	COVID-19 crisis	COVID	1 during the years 2020-2021, otherwise 0

Source: Compiled by the author

Explanations: NI: Net income, AA: Average assets, AE: Average Equity, SDROA: Standard deviation of ROA, SDROE: Standard deviation of ROE, LN: Natural logarithm, TA: Total Assets, F&C: Net fees and Commisions, TOI: Total Operating Income, NII, Non-Interest Income, E: Equity, D: Deposits, LLP: Loan Loss provisions

Notes: The standard deviation on ROA and ROE was calculated for each individual over a full sample period, based on the data collected from the database BankFocus.

There have been different ratios used in previous studies to measure these variables, but the selected ones seem to be the most common. Quite a large variety of ratios have been used to measure the risk associated with banking, on top of risk-adjusted returns, such as the z-score. Additionally, size has been additionally measured as the natural logarithm of total operating revenue, market capitalization, or book value of equity Schildbach (2017).

2.2 Descriptive Statistics

To gain a better understanding of the variables of the sample dataset, descriptive statistics are assembled in Table 3. The data was collected in millions of euros, and a majority of the variables are calculated as ratios.

Table 3. Descriptive statistics of all the variables

Variable	Mean	Median	SD	Min	Max	Coefficient of variaton	N
ROAA	0.00766	0.00753	0.00358	-0.0036	0.0185	0.4673	1325
ROAE	0.0621	0.0619	0.0282	-0.0326	0.159	0.4541	1325
RAROAA	4.33	4.14	2.48	-1.02	13.9	0.5727	1325
RAROAE	4.54	4.30	2.69	-1.12	16.7	0.5925	1325
COVID	0.209	0.000	0.406	0.000	1.00	1.9426	1325
EQUITY	0.128	0.119	0.0420	0.0381	0.415	0.3281	1325
SIZE	5.539	5.660	0.8217	2.417	7.027	0.1483	1325
FEECOM	0.209	0.185	0.0961	-0.0489	0.622	0.4598	1325
DEPOSITS	0.795	0.805	0.0742	0.0286	0.939	0.0933	1325
LLP	0.00143	0.000944	0.00431	-0.0755	0.0356	3.0140	1325
NONI	0.343	0.342	0.107	0.0403	0.695	0.3120	1325

Source: Compiled by the author based on the data collected from database BankFocus

As Table 3 shows, the mean for the share of non-interest revenue is 34%. This shows that on average Nordic banks make 66% of their revenue in more traditional net interest revenue. The largest values came from a commercial bank operating in Denmark, with a ratio of 70% of operating income coming from non-interest revenue. The smallest value present in the data set was

4.03%. The mean value for FEECOM of 21% shows that on average, 21% out of 34% is generated from fees and commissions. This also shows that on average 13% of total operating revenue is generated through trading and other non-interest income.

The smallest values for ROAA and ROAE -0.4% and -0.3% respectively are from the same bank from Finland in the year 2021. The mean for ROAA 0.76% and ROAE 6.2% is slightly above European averages (European banking federation), which is in line with findings presented by Pedersen et al. (2006) previously in the text.

The standard deviation with bank size is 0.82 which tells that the banks are generally similar in size. Furthermore, the coefficients of variation presented in Table 3 are relatively small with all variables, indicating that the banks in the dataset are kindred to each other. This supports the findings of Pesola (2007), claiming that collecting data from the Nordic region would guarantee relatively high quality of homogeneous data. The mean value for COVID was 0.21, indicating that the data set has more observations between the years 2013-2019. The total number of observations during the Covid period was 276.

Multicollinearity refers to a situation where two or more independent variables have a high correlation. This correlation could produce biased or inaccurate results, by inflating the standard error of coefficients in regression and additionally by increasing the variance of the regression model coefficient (Akinwande et al. (2015)). In the case of multicollinearity, the independent variable should be removed from the model. A correlation coefficient matrix is presented below in Table 4. Multicollinearity does not raise concerns within the model. The strongest correlation coefficient between variables FEECOM and NONI ratios (0.59).

Table 4. Correlation matrix of independent variables

	NONI	LLP	DEPOSITS	FEECOM	SIZE	EQUITY	COVID
NONI	1	-0.0487	0.1015	0.5905	0.1131	0.3704	0.0496
LLP	-0.0487	1	0.0235	-0.0765	-0.061	0.0071	-0.0215
DEPOSITS	0.1015	0.0235	1	0.1091	-0.3334	-0.1825	-0.0243
FEECOM	0.5905	-0.0765	0.1091	1	0.0685	0.1635	-0.0128
SIZE	0.1131	-0.0615	-0.3334	0.0685	1	-0.0450	0.0052
EQUITY	0.3704	0.0071	-0.1825	0.1635	-0.0450	1	0.0238
COVID	0.0496	-0.0215	-0.0243	-0.0128	0.0052	0.0238	1

Source: Compiled by the author based on the data collected from database BankFocus

A variance influence test (VIF) will be conducted to ensure the results of the correlation coefficients. The VIF test considers the correlation of one variable with all other variables selected for the test, indicating more clearly which variable is not suitable for the model. The results of the VIF test are presented in the table below. Generally, variables gaining VIF test results of 5 and above are considered weak for the model and should be removed (Akinwande et al. (2015)). As we can see from Table 5 below, all VIF scores are below 2 indicating to not raise concerns regarding multicollinearity within the selected model.

Table 5. VIF test results

Variable	VIF
COVID	1.038
EQUITY	1.247
SIZE	1.255
FEECOM	1.617
DEPOSITS	1.260
LLP	1.015
NONI	1.784

Source: Author's calculations based on the data collected from the database BankFocus

Additionally, to get an idea of the general trend of profit diversification in the Nordic banks, the below graph was gathered, showing the average yearly ratios of non-interest and interest income. The percentages are shown in decimals and the ratios are based on the data collected for the period 2013-2021 from the database BankFocus.
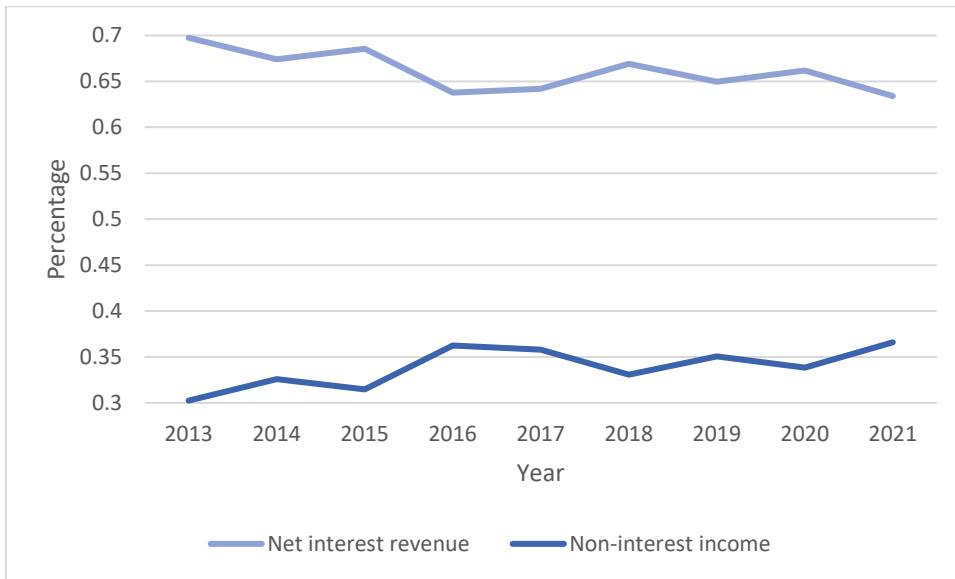
Figure1. Average ratios of non-interest and interest income for the period (2019-2022)

Source: Author's calculations based on the data collected from the database BankFocus

Even though there is volatility, a general trend of an increase in non-interest and a decrease in net interest income is noticeable. The year 2016, seems to start a decrease in the ratio of non-interest revenue, which continues decreasing until the period 2020. The highest average value of 37% occurred during 2021, leaving a clear increasing trendline. The smallest average of 30% was calculated for the year 2013. The increase in non-interest revenue has also been observed in individual countries and at the EU and U.S. levels (Stiroh (2004), Chiorazzo et al. (2008), Mercieca et al. (2007), Elsas et al. (2010), to name a few).

2.3 Methodology

To reiterate, the collected data for the regression analysis consist of 229 banks with 1333 observations. The data is unbalanced panel data for a 9-year period between the years 2013 and 2022. Based on the previous literature, the selected regression model is fixed effect regression (Mercieca et al. (2007), Ciorazzo (2008), and Elsas et al. (2010), to name a few). Other regression models such as ordinary least squares were also frequently selected, but the fixed effect seems more frequently selected. The fixed effect model has two data requirements: The dependent variable must be measured for each individual on at least two occasions, and the measured results must be comparable with the parallel results of each individual (Allison (2009)).

The equation for the fixed effect model can be described by the equation:

$$Y_{it} = \alpha_i + \beta_1 COVID_{it} + \beta_2 EQUITY_{it} + \beta_3 SIZE_{it} + \beta_4 FEECOM_{it} + \beta_5 DEPOSITS_{it} +$$

$$\beta_6 LLP_{it} + \beta_7 NONI_{it} + \varepsilon_{it} \hspace{4cm} (5)$$

Where

Y	dependent variable,
α_i	intercept for each individual,
i	individual index 1< i <229,
t	time index 1<t<9
ε_{it}	error term,
β_i	estimated coefficient

In the selected model, the dependent variable Y are ROAA, ROAE, RAROAA, and RAROAE.

So far in the text, there have been indications that the data could be homogeneous, by comments from Peltola (2007), and the low values of coefficient of variation. Both can be an indication of homogeneous data but do not guarantee homogeneity. Hence to test the data for heteroscedasticity a distribution-free Wald test was conducted. Heteroscedasticity occurs when the variance of errors in a regression model does not remain constant across different values of the independent variables. This might lead to biases in the estimated standard errors, which could lead to false interpretations Breusch and Pagan (1979). The results of the Wald test are presented in Table 5 below.

Table 5. Wald test for heteroskedasticity

Variable	P-value
ROAA	3.87643e+031
ROAE	1.76903e+030
RAROAA	3.05677e+032
RAROAE	1.8075e+029

Source: Compiled by the author based on the data collected from database BankFocus

With a significance level of 5%, we cannot reject the null hypothesis, and heteroscedasticity is presumed to be present within the used data set. Since the data is proven to be heteroscedastic, robust (HAC) standard errors were used in the regression models. The robust standard error adjusts the data for heteroscedasticity by estimating standard errors with a more robust estimator that is less sensitive to the presence of heteroscedasticity Vogelsang (2012).

As mentioned before the presence of outliers was eliminated, by using the 1.5IQR method. An additional issue arising from the data is endogeneity. Endogeneity is one of the most pervasive issues in empirical finance studies Roberts and Whited (2013). It can be defined as a correlation between the explanatory variables and the error term in a regression. The main sources for endogeneity, come from omitted variables, simultaneity, and measurement errors (Roberts and Whited (2013)). Endogeneity causes biased and inconsistent parameter estimates, making reliable inference impractical. The first countermeasures against endogeneity are derived from using panel data, with firm and time-fixed variables. Furthermore, since the fixed effects model does not require independence between the regressors and individual error terms, one potential source of endogeneity is eliminated, while simultaneously adjusting for unobserved heterogeneity in both time-invariant, firm-specific characteristics and time-varying, firm-invariant characteristics (Elsas et al (2010)). As the results of the VIF-test and Correlation matrix indicated there is no significant multicollinearity, leading to the decision of not removing any of the independent variables in the model.

Finally, to ensure the reliability and validity of the used regression model, a series of robustness tests are conducted. The robustness is a measure of the ability to remain unphased by minor but deliberate changes in method parameters. Additionally, it provides indications of reliability during regular usage (Vander Heyden et al. (2001)). The robustness test will be conducted by adding and removing variables from the model. Generally, the regression models produced comparable results, but some changes were observable. For example, SIZE produced a different level of statistical significance based on the variables in the model. The robustness test was conducted, following the same principle followed by Mercieca et al. (2007). The regression models were run without the country of Finland and a mode bank type of cooperative bank. Additionally, annual macroeconomic variables, inflation, and the real GDP were added to the models. The variables were collected from the TheWorldBank database. The models tend to behave similarly regardless of the variables used in the model, providing additional support for the results. A more detailed view of the regression results is presented in the appendices.

3. ANALYSIS AND DISCUSSION

In this section, an overview of the regression model results is conducted. The result of covariates and statistical significance is presented and analyzed. After this, a discussion of the results of previous studies, empirical and theoretical, is presented. The hypotheses were drawn previously, in the first part of the thesis.

3.1. Regression model results

In this paper, the dependent variables, profitability, and risk are split into two target variables ROAA, ROAE, RAROAA, and RAROAE respectively, were placed against the independent variables. A pooled dataset was analyzed by fitting a basic pooling model through fixed effect regression analysis. The results of the regression models are seen below in Table 6.

The regression model results suggest that all the independent variables are significant except for size and deposits. Deposits were statistically significant only in the RAROAE with a p-value of 0.0633, while having a negative coefficient in all models. COVID was statistically significant with a negative coefficient in all the models, implying that the Covid-19 pandemic negatively affected returns and risk-adjusted returns. Equity was statistically significant in all the models, having a positive coefficient in models (1) and (3) while having negative coefficients in models (2), and (4). Li et al. (2021) presented similar behavior with equity variable, with equity having a positive coefficient in a model with ROA and standard deviation of ROA while having a negative coefficient, in a model with ROE and standard deviation of ROE. On the opposite Stiroh (2004b) presents regression model results, where equity has a positive connection with risk-adjusted ROA and ROE. With the differing results, it's hard to tell if the changes in the coefficients are a sign of a weak model or if the variable's behavior is normal. Overall, the independent variables behave similarly in all the models, staying statistically significant and having similar numeric characteristics, with exceptions of size, equity, and deposits due to previously mentioned reasons.

Table 6. Results of the regression models

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	0.00263954	0.101***	0.811	6.396***
	(0.00379)	(0.0322)	(1.951)	(1.855)
Covid	−0.000906***	−0.00880***	−0.564***	−0.705***
	(0.000185)	(0.00166)	(0.0905)	(0,0932)
EQUITY	0.0251***	−0.208***	14.936***	−7.688***
	(0.00539)	0.0470	2.460	(2.478)
SIZE	0.000135	−0.00308	0.3308	0.00887
	(0.000486)	(0.00413)	(0.2478)	(0.2380)
FEECOM	−0.0176***	−0.133***	−6.5711***	−6.3746***
	(0.00262)	(0.0230)	(1.0016)	1.045
DEPOSITS	−0.00145	−0.0182	−1.108	−2.160*
	(0.00214)	(0.0204)	(1.142)	(1.158)
LLP	−0.105***	−0.753***	−44.30***	−37.590***
	(0.0208)	(0.207)	(7.807)	(10.890)
NONI	0.0183***	0.146***	6.519***	6.880***
	(0.00195)	(0.0150)	(0.6409)	(0.6869)
R^2	0.326	0.266	0.273	0.2505
Observations	1325	1325	1325	1325

Notes: *** p<0.1; ** p<0.5; * p<0.1

   Robust standard errors are within the parentheses.

Source: Compiled by author using Gretl

The constant in models (1) and (3) is not statistically significant, indicating that a change in the independent variables does not proceed to changes in the dependent variables. Gelman Stern (2006) argues the dividing of research studies based on statistically significant and nonsignificant can lead to the dismissal of interesting findings. In Appendix 5, the less commonly used natural logarithm of total operating revenue is used to measure size, with all the coefficients being statistically significant, with 5% significance while the highest p-value is 0.0437, additionally indicating support for the results.

The regression models (2) and (3) were statistically significant, with a significance level of 1%. Models (1), and (3) were statistically not significant, with the highest p-value approximating 0.68.

R2, commonly known as the coefficient of determination, is a statistical metric used to assess a regression model's quality of fit. It expresses how effectively the independent variables in a regression model explain variation in the dependent variable. The highest R2 value was for model (2) with 0.326, while the lowest value can be found in model (4) (0.2505). It is not uncommon to get low R2 values for panel datasets due to the commonly high heteroscedasticity, but the moderate values could indicate that the model was missing external variables explaining the changes in bank profitability and bank risk-adjusted profitability.

3.2. Discussion

This section will discuss the hypothesis and results in more detail. The discussion will start with gaining a conclusion on the hypothesis and then generally discussing the results, based on empirical and theoretical literature on the field.

H1: Covid-19 pandemic has a negative impact on profitability.
H2: Covid-19 pandemic has a negative impact on risk-adjusted return.

These hypotheses were based on the Covid-enfeebled banking market where demand for loans decreased, and the number of non-performing loans (NPLs) increased. From the created regression models above, we can see COVID having a negative coefficient in all the models, indicating that Covid had a statistically significant negative impact on bank returns and risk-adjusted returns. The coefficients for COVID in models (1) and (2) indicate that the pandemic caused a negative impact on ROAA and ROAE of -0.09% and -0.9% respectively. This decrease would be over 10% of the mean ROAA and ROAE within the data. The coefficients in models (3) and (4) have similar results. The coefficients are negative and statistically significant in both models. The coefficients for COVID in models (3) and (4) indicate a decrease for RAROAA and RAROAE of -0.564 and -0.71 respectively.

When analyzing the risk-adjusted returns, it is hard to draw a direct conclusion about the change in the values. Theoretically, the negative change could be caused by the change in profitability or the change in the standard deviation of ROA and ROE. The literature presented earlier mentions that the number of non-performing loans has increased during the pandemic, in the EU region while the demand for loans decreased (Resti (2021)). This will increase the consumer credit risk,

especially since the consumer balance sheets were weaker than European averages (Agarwal et al. (2013)). Additionally, consumer-owned assets such as real estate, lost value during the pandemic (Resti (2021)), increasing market risk and raising more concern over the increased losses for the banks, in the event of consumer assets being liquidated by means of foreclosure. This could trigger a rollover problem, and banks highly concentrated on mortgage exposure might experience a sharper rise in funding costs (Agarwal et al. (2013b)).

A definitive conclusion cannot be drawn on whether risk-adjusted returns decreased during the Covid-19 pandemic due to a higher risk level or lower profitability, even when the theoretical literature indicates an increase in credit and market risk during the pandemic. Nevertheless, the conclusion: Covid-19 affected bank profitability and risk-adjusted returns negatively, can be concluded.
Therefore, H1 and H2 are accepted.

H3: Revenue diversification is negatively associated with profitability.
H4: Revenue diversification is negatively associated with risk-adjusted revenue.

These hypotheses were formed regardless of contradictory findings in the literature. The study results had not reached a consensus and had research results supporting and against the benefits of revenue diversification. In models (1), (2), (3), and (4) the relationship between variable NONI is positive and highly statistically significant. This provides evidence of Nordic banks increasing profitability and risk-adjusted profitability from diversification.

The results in Models (3) and (4) are in line with the results of Li et al. (2021) in the U.S. banking sector with non-interest income lowering risk and increasing profitability. Chiorazzo et al. (2008), evidence showed that the share of non-interest income had a statistically significant and positive coefficient with risk-adjusted income in Italian banks. In their study, Chiorazzo et al. (2008) argue that larger banks are better positioned to manage the operating leverage associated with fee-based transactions due to economies of scale and the ability to invest more heavily in ICT. Elsas et al. (2010) found that larger banks are hardly facing any restrictions in the diversification levels providing incentives to expand their supply of services or diversify with other means. The Nordic banking sector is highly concentrated and only a few banks dominate the market (Agarwal et al. (2013b)), which is perceivable since the majority of the banks in the data set are branches of larger banking entities. Furthermore, Chiorazzo et al. (2008) argue the use of technologies such as online

services enables the selling of additional services and products with low marginal costs. In their report, Pedersen et al. (2006) point out that the implementation of online services in the Nordic banking sector is successful, providing support for the possible explanation of why revenue diversification is beneficial in Nordic countries.

Stiroh (2004b) found contrasting results from the U.S. banking sector between the ratio of non-interest income and risk-adjusted returns, with the coefficient being negative in both models, but statistically significant in only risk-adjusted return on assets. The evidence additionally indicates that non-interest revenue increased risk and reduced profitability. Furthermore, Mercieca et al. (2007) found evidence that shifting from interest income to non-interest income results in lower average profitability. In their models of profitability and risk-adjusted returns, the coefficients for non-interest income were all negative and statistically significant.

Different theories and possibilities for differing results have been made. Li et al. (2021) point out that the improvements in financial innovation over the past decades, including digital and online technology, have improved banks' ability to reach larger customers and market segments producing more fee income. Stiroh (2004a) strengthens this theory by stating the period of 1970-2001 could be a transition period. The banking sector had not optimized the ways to reap benefits from profit diversification at an optimal level during the study period. Chiorazzo et al (2008) emphasize the structural and regulatory differences explaining the difference between European and American differing results. Nevertheless, the regression model results clearly indicate that the share of non-interest revenue is statistically significant and positively connected with profitability and risk-adjusted returns.

Hence, we did not find enough evidence to confirm H3 and H4.

Despite positive results with the non-interest income, FEECOM is statistically significant in models (1), (2), (3), and (4), while having a negative coefficient within the models. These results indicate that diversifying into fee-based sources of income would reduce profitability. No direct conclusion can be drawn on risk. Similar results were achieved by Stiroh (2004b) where evidence indicated fee and other non-interest income to be negative and statistically significant with risk-adjusted returns. Ciorazzo et al. (2008) stated that large benefits from large banks would be the accessibility of leverage for fee-based transactions. This statement contrasts with our findings indicating that highly concentrated banking markets would not gain from diversification towards fees and commissions. These results encourage further studies, with more specific diversification

sub-groups such as trading income, and other non-interest revenue in addition to fees and commissions.

The loan loss provisions coefficient was negative and statistically significant in all the models with over 99% significance level. The regression model estimates an increase in the loan loss provision rate to cause a 10.5% decrease in ROAA and 75.3% in ROEE. Similar results were gained by Ochenge (2022) with similar size negative coefficients, being statistically significant in all the models. An increase in loan loss provisions would additionally increase the credit risk increasing the riskiness of banks, with credit risk being the most common cause of bank failures and losses (Mohammed (2016)).

Size was not statistically significant in any of the models and was negatively connected in the model (2) while having a positive connection in models (1), (3), and (4). The low significance is exceptional with contradicting results in studies by Mercieca et al. (2007), and Stiroh (2004b), to name a few. Some of the theoretical reasons have already been discussed, such as the concentrated bank market, and the large number of branches in the data set. One additional theory is presented by Gjedrem (2000), arguing smaller players can offer a wider service and product range by cooperating with larger players. This strategy has been utilized especially among Norwegian saving banks according to Gjedrem (2000). Additionally, larger entities would benefit from offering their products through other smaller institutions. This would furthermore diminish the importance of bank size as an exploratory factor in banking profitability and risk-adjusted profitability.

CONCLUSION

This research paper aimed to study the effect of revenue diversification on profitability and risk during and before the Covid-19 pandemic within the Nordic region. More specifically in Finland, Sweden, Norway, and Denmark.

To reach an answer, a panel data set was collected from the database BankFocus, consisting of 227 banks with 1325 observations. In detail, 70 banks were from Finland, 77 from Norway, 28 from Denmark, and 52 from Sweden. Types of banks were Cooperative, Commercial, and Savings banks. The data was collected between the years 2013-2021 where years 2020 and 2021 were affected by Covid.

The selected independent variables for the thesis were size, equity, ratios of diversification, deposits, and loan loss provisions. The dependent variables were return on average assets, return on average equity, risk-adjusted return on average assets, and risk-adjusted returns on average equity. The selection of variables was based on previous literature, the accessibility of required information for the ratios, and pooling model estimations. From these variables, 4 fixed-effect regression models were created.

In the models we found variables Covid, equity, fees and commissions, non-interest income, and loan loss provisions to be statistically significant. All these variables were negatively connected except for non-interest revenue, which was positively connected. Additionally, deposits and equity were both positively and negatively connected. All variables were statistically significant in all of the models, except size and deposits.

To reiterate the main results, Covid-pandemic had a negative impact on banking profitability and risk-adjusted profitability. A definite conclusion of the Covid-pandemics effect on risk was not gained from this model notwithstanding the fact that theoretical literature indicates increased credit and market risk. Non-interest revenue was positively connected with profitability and risk-adjusted profits. Interestingly fees and commissions had a negative relationship indicating the need for a more thorough study of different diversification groups' impacts on profitability and risk-adjusted profitability. Size was not statistically significant in any of the models giving support to theoretical literature, indicating high cooperation between large and small banks in the Nordic region.

Additionally, the large number of branches in the dataset collected from the highly concentrated banking sector within the Nordic region furthermore demeans the importance of bank size.

Additionally, some limitations of the study will be presented, and general recommendations for future studies on the topic of revenue diversification during the Covid-19 pandemic. Firstly, the pandemic could be measured with more detailed variables. Using data on new infections or Google searches of Covid-related terms could provide more accurate estimations of the pandemic's impact. Additionally, adding the annual data for the year 2022 could increase the accuracy of estimated Covid-19 effects. Furthermore, the data set is not evenly or proportionally divided between the countries or the bank types. This might have resulted in biased results within the study. The collected data set had data from 144 savings banks while including only 23 commercial banks. Furthermore, Denmark had only 28 banks, while Finland and Norway had 70 and 77 respectively. Due to the uneven proportions, a comparison between bank types, or countries was not possible.

Future studies could attempt to enable country or bank type comparisons, by selecting an improved data set consisting of a more proportionate number of bank types or number of banks in each country. Additionally including a data set of banks with homogeneous large bank sizes, could produce more reliable results as argued by Elsas (2010). Furthermore, diversification methods could be studied in more detail, by adding other diversification ratios in addition to fees and commissions. This could provide a more detailed explanation of diversification methods that enhance profitability and reduce risk.

Finally, by increasing the time period of the study, some additional factors could be studied. For example, over a decade-long period of control rates staying around 0% ended, and the effect of profit diversification could be studied during higher interest risk. Weak consumer balance sheets in the Nordics (Agarwal 2013a) and raised interest rates provide alternative conditions to study diversification's effect on risk. By including data from the year 2022 the abnormal inflation rates could be further studied while gaining additional data and information on the effects of the COVID-19 pandemic in the banking sector. Additionally, the current insecure state in the U.S. banking sector could reflect in the EU bank market. Increasing the data set to the year 2023, diversification could be measured during increased risk and weakened consumer trust in the banking sector.

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APPENDICES

Appendix 1. Robustness check: Results without Finland and Cooperative banks

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	0.00167	0.0937***	−0.1913	6.089***
	(0.00436)	(0.0370)	(2.237)	(2.195)
Covid	−0.00126***	−0.0111***	−0.651***	−0.763***
	(0.000249)	(0.00221)	(0.124)	(0.1268)
EQUITY	0.0276***	−0.198***	15.67***	−8.471***
	(0.00625)	(0.0539)	(2.859)	(2.872)
SIZE	0.00036	−0.00109	0.5385*	0.144
	(0.000550)	(0.00476)	(0.2867)	(0.283)
FEECOM	−0.0192***	−0.135***	−7.365***	−7.139***
	(0.0030)	(0.0235)	(1.1939)	(1.236)
DEPOSITS	−0.00130	−0.0150	−0.807	−2.032*
	0.00227	(0.0212)	(1.1942)	(1.209)
LLP	−0.1135***	−0.784***	−48.343***	−40.107***
	(0.0225)	(0.230)	(9.0955)	(12.434)
NONI	0.0211***	0.1574***	6.998***	7.363***
	(0.001846)	(0.0146)	(0.6259)	(0.664)
R^2	0.325	0.254	0.251	0.230
Observations	996	996	996	996

Notes: *** $p<0.1$; ** $p<0.5$; * $p<0.1$

     Robust standard errors are within the parentheses.

Source: Compiled by author using Gretl

Appendix 2. Robustness check: Results without the variable DEPOSITS

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	0.000919	0.0796***	−0.506	3.828***
	(0.00292)	(0.0254)	(1.447)	(1.447)
Covid	−0.00092***	−0.00866***	−0.575***	−0.726***
	(0.000184)	(0.00166)	(0.0891)	(0.0931)
EQUITY	0.0262***	−0.194***	15.755***	−6.091**
	(0.00525)	(0.0459)	(2.394)	(2.405)
SIZE	0.000211	−0.00213	0.389	0.122
	(0.000483)	(0.00423)	(0.246)	(0.246)
FEECOM	−0.0175***	−0.133***	−6.55***	−6.33***
	(0.00261)	(0.0209)	(0.994)	(1.034)
DEPOSITS	−0.105***	−0.757***	−44.58***	−38.13***
	(0.0209)	(0.208)	(7.85)	(10.98)
LLP	0.0183***	0.1459***	6.536***	6.914***
	(0.00195)	(0.01497)	(0.64)	(0.687)
NONI	0.000919***	0.0796***	−0.506***	3.828***
	(0.00292)	(0.0254)	(1.447)	(1.447)
R^2	0.326	0.265	0.272	0.247
Observations	1325	1325	1325	1325

Notes: *** $p<0.1$; ** $p<0.5$; * $p<0.1$

      Robust standard errors are within the parentheses.

Source: Compiled by author using Gretl

Appendix 3. Robustness check: Results without the variable LLP

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	−0.000455	0.0791**	−0.495	5.287***
	(0.00387)	(0.0321)	(1.986)	(1.84)
Covid	−0.00109***	−0.00982***	−0.643***	−0.772***
	(0.000188)	(0.00162)	(0.0894)	(0.0916)
EQUITY	0.02604***	−0.201***	15.33***	−7.35***
	(0.00560=	(0.0462)	(2.55)	(2.353)
SIZE	0.000565	−2.60e-06	0.512**	0.163
	(0.000504)	(0.00415)	(0.254)	(0.237)
FEECOM	−0.0130***	−0.1010***	−4.660***	−4.75***
	(0.00236)	(0.0185)	(0.958)	(0.910)
DEPOSITS	−0.00190	−0.0215	−1.301	−2.324**
	(0.00221)	(0.0208)	(1.168)	(1.174)
NONI	0.01795***	0.143***	6.390***	6.771***
	(0.00189)	(0.0151)	(0.649)	(0.695)
R^2	0.294	0.242	0.246	0.232
Observations	1325	1325	1325	1325

Notes: *** $p<0.1$; ** $p<0.5$; * $p<0.1$

      Robust standard errors are within the parentheses.

Source: Compiled by author using Gretl

Appendix 4. Robustness check: Results with macroeconomic variables

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	0.0027	0.101***	1.129	6.587***
	(0.0040)	(0.0340)	(2.063)	(1.94)
Covid	−0.00086***	−0.00827***	−0.534***	−0.685***
	(0.000197)	(0.00177)	(0.0972)	(0.101)
EQUITY	0.0243***	−0.2109***	14.69***	−7.851***
	(0.00545)	(0.0477)	(2.491)	(2.53)
SIZE	0.000163	−0.00295	0.295	−0.012
	(0.000520)	(0.00447)	(0.265)	(0.253)
FEECOM	−0.0178***	−0.1345***	−6.70***	−6.46***
	(0.00264)	(0.0211)	(1.01)	(1.047)
DEPOSITS	−0.00152	−0.0185	−1.212	−2.22*
	(0.00216)	(0.0205)	(1.160)	(1.168)
LLP	−0.10335***	−0.746***	−43.24***	−36.92***
	(0.0202)	(0.2054)	(7.43)	(10.67)
NONI	0.01808***	0.1449***	6.39***	6.801***
	(0.001984)	(0.0150)	(0.645)	(0.695)
INFLATION	−0.00340	−0.01514	1.156	0.6104
	(0.00805)	(0.0688)	(3.918)	(4.029)
REALGDP	0.00533	0.0222	2.246	1.467
	(0.00334)	(0.0289)	(1.579)	(1.74)
R^2	0.328	0.266	0.275	0.251
Observations	1325	1325	1325	1325

Notes: *** $p<0.1$; ** $p<0.5$; * $p<0.1$

Robust standard errors are within the parentheses.

Source: Compiled by author using Gretl

Appendix 5. Robustness check: Results using Total operating income to measure size

	ROAA	ROAE	RAROAA	RAROAE
	(1)	(2)	(3)	(4)
Constant	0,00458**	0,0911***	3,56***	6,90***
	(0,00226)	(0,02171)	(1,12)	(1,20)
Covid	−0,00087***	−0,0093***	−0,482***	−0,704***
	(0,000132)	(0,001197)	(0,0667)	(0,0662)
EQUITY	0,0241***	−0,206***	13,718***	−7,977***
	(0,00528)	(0,0465)	(2,3755)	(2,374)
SIZE	−0,00047***	−0,00442	−0,260	−0,198
	(0,000432)	(0,00388)	(0,205)	(0,201)
FEECOM	−0,0176***	−0,134***	−6,61***	−6,409***
	(0,00265)	(0,0210)	(1,013)	(1,046)
DEPOSITS	−0,00170	−0,0158	−1,534	−2,212*
	(0,00211)	(0,0205)	(1,126)	(1,158)
LLP	−0,1014***	−0,697***	−43,62***	−35,84***
	(0,0197)	(0,1888)	(7,667)	(10,44)
NONI	0,0183***	0,1441***	6,679***	6,88***
	(0,00194)	(0,0148)	(0,629)	(0,669)
R^2	0,328	0.267	0.273	0.251
Observations	1325	1325	1325	1325

Notes: *** $p<0.1$; ** $p<0.5$; * $p<0.1$

  Robust standard errors are within the parentheses.

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