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The Effect of Capital on Profitability in Nordic Banks

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Abstract

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This thesis explores the relationship between capital and profitability in Nordic banks. Bank capital can have either profitable or adverse effects and the Nordic countries have recently straightened their capital requirement, so therefore it's important to see what relationship there is between their bank capital and profitability. We use four different profitability variables in order to see what measurement is appropriate for the Nordic countries. Using data from five Nordic countries and 113 banks between the years 2011-2016, we estimate our model applying the system Generalized Methods of Moments (GMM) approach in our study. We find that by increasing capital with 1 unit, the profitability measurement ROA, in the Nordic banks, will increase by 6.4 units. We further find that our profitability variables show significantly positive persistence of profit and that Commercial banks are playing a dominant role in the Nordic banking system. Further, by adding regulation and institutional factors into our model, the main result does not change, meaning, there is still the same significantly positive relationship between capital and profitability, and persistence of profit.

Keywords: *Profitability, Bank Capital, Capital Requirements, Nordic Countries, System Generalized Method of Moments*

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1. Introduction

According to Lee and Hsieh (2013), bank capital can have either profitable or adverse effects. Therefore, the relationship between bank capital and profitability has been a crucial debate in financial studies. Corporate finance theories such as the “tradeoff theory” state that, when a bank is in equilibrium, the trade-off between costs and benefits will give an ideal level of capital and there will be a zero relationship at the margin. Regulators of capital requirement, on the other hand, suggest that banks should hold a higher capital ratio than the ideal one, which will impose costs (Miller, 1995; Buser et al., 1981). Festic et al. (2011) mention that the Basel Committee on Banking Supervision (BCBS) has renewed capital requirement and regulations in banks in order to respond to the recent financial crisis. European banks implement the new Basel accord and the aim is to strengthen the regulation, supervision and risk management of banks. An increase of holding a certain percentage of capital in banks and an increase in the quality of the capital are new rules that have been implemented to the new Basel accord (Bank for International Settlement, 2012; 2016).

For the Nordic countries, (Sweden, Norway, Denmark, Finland, and Iceland) the banking industry is indicated with around 400-500 banks and most of these banks are small to medium-sized banks (Lanebank, 2014-2017). It is shown and notable that in Sweden the major banks have had a stable return on equity of around 12% during the last years. After the financial crisis in 2008, the harmonized supervision within the European Union has increased due to that banks in Sweden also operate in Europe. FI (2017) argues that because Swedish banks follow the high capital buffer requirements and have a lot of low-risk assets, they are well-capitalized and the banks capital levels are over the average for the European banks.

Norway has also strengthened the capital requirement during the last five years with an increase in equity, but the risk-weighted asset has decreased and total asset increased so the capital ratio has therefore increased (Winje & Turtveit, 2014; Norge bank, 2016). Denmark’s Nationalbank (2016) mentions that overall, the Danish banks are well-capitalized and an increase in the capital ratio is made. Also in 2015, the profitability of banks achieved the highest since the financial crisis. In Finland, the strictness of capital requirement has increased the capital buffer in banks (Finance Finland, 2016) and in Iceland, the banks are still recovering from the financial crises and facing tighter capital requirements (Reuters, 2016). Overall, the Nordic countries have straightened their capital requirement and therefore

it is interesting to see if and how this has affected the profitability of the banks. Has it increased their profitability or does it have negative effect on the banks to operate with a strengthened capital base?

Few examples of earlier research, conducted by Lee & Hsieh (2013), Goddard et al. (2004), Jacques & Nigro (1997), Iannotta et al. (2007) and Bougatef & Mgdmi (2016), find that the relationship between capital and profitability is positive which means that more capital will only make the banks more profitable. However, there are studies that find an opposite result, which shows a negative relationship between capital and profitability, such as Goddard et al. (2010).

Previous studies mainly focus on the relationship between capital and profitability in Europe or in the United States, and the results do not show the same relationships between capital and profitability due to different internal and external factors. We could not find any studies that only focus on Nordic countries, therefore it is most interesting to see how banks in Nordic countries have been affected by the capital level. All of the Nordic banks should fulfil the Basel commitment requirement of minimum 8% of the capital adequacy ratio, total capital to risk weighted assets. However, some banks might decide to hold a higher percentage of capital and since all Nordic banks are also categorized as high-level income banking groups, we would like to see if holding more or less capital has any effects on bank profitability. Therefore, the purpose of this paper is to find out what is the relationship between the capital in Nordic banks and their profitability level. We contribute to existing literature in ways of doing a research that only focus on Nordic countries, which no other study has done before and finding a relationship between capital and profitability in their banks. We also contribute by using four different profitability measurements to see what measurements is most suitable for the Nordic countries.

The study that influences our thesis the most is conducted by Lee and Hsieh's (2013), which applies a Generalized Method of Moments technique in order to investigate the relationship between capital and risk, and also capital and profitability, in Asian banks. Our research, however, covers a panel data of 113 Nordic banks, from the years 2011 to 2016 in five Nordic countries. In order to find how profitable the banks are, we use four different measures – ROA (the return on assets), ROE (the return on equity), NIM (the net interest margin), and NR (the net interest revenue against the average asset). For the level of capital

in banks, we use the equity to total asset ratio, i.e. the solidity. By having data on four different measures similar to Lee and Hsieh (2013), this study will find what proxy is suitable for Nordic banks. In order to analyze the panel data, two-step dynamic panel techniques, as well as Generalized Method of Moments (GMM) approach, is applied to compensate potential endogeneity, heteroscedasticity and autocorrelation problems in the data.

As part of our study, we hypothesize that (i) capital and profitability will have a positive relationship within Nordic banks and (ii) regulation/institutional factors will not disturb the results between capital and profitability within Nordic banks. Through our estimations, we find a significantly positive relationship between capital and the profitability variable ROA. By increasing capital with one unit, the profitability increases by 6.4 units. This result is in line with Lee and Hsieh (2013), but also the arguments that capital will decrease the probability of bank failure, necessary in negative circumstances, efficiently change allocation of downside risk between taxpayers and stockholders and protect high leverage banks according to Admati & Hellwig (2014) and Olalekan (2013). We also find in our second estimation that Commercial banks are most similar to our main model. In our third estimation, we add regulation and institutional factors for all of the Nordic countries, and the result shows that there is still a positive relationship between capital and profitability, and significantly positive persistence of profit exists between the profitability variables ROA, ROE and NIM, the same way as in the first estimation. We, therefore, state that these new variables do not disturb our first estimation. Our results suggests important policy implications, that authorities should consider using more than one profitability measurement, due to different results, and using only one single profitability variable can give wrong policy.

The rest of this study is divided as follows: Section 2 describes the theory behind our topic and the main previous studies that have been researched. Section 3 presents the collected data and the econometric models used. Section 4 presents the results and a brief discussion of the findings. Lastly, Section 5 concludes.

2. Theory & Literature Review

2.1 What is bank profitability?

It is important to know how a bank is performing and how efficient it is, and therefore an important indicator for that is bank profitability. In order to measure the bank profitability, there are profitability ratios that define the bank's bottom line and the return that goes to the bank's investors. According to Mehta & Bhavani (2016) and Peavler (2017), there are usually two different categories of the profitability ratios. The first category is “margins” which tells how well the banks can get profit from sales. The second category of profitability ratio is the “return” and this ratio measures the efficiency in banks in forms of return.

In order to measure the profitability or performance in banks, there are “accounting value” and “market value” based approaches. According to Osborne et al. (2013) the total market value of banks debt and equity, is the ideal one but the problem is that not all banks have data on the market value approach. The reason is that it is not as easy to measure the bank’s asset, as it is with the accounting measures; therefore researchers usually use the accounting measures that take the book values of equity and asset into consideration, which reflects the historical of it (Osborne et al., 2013).

There are four different key accounting based profitability ratios that take assets and equity into consideration as important profit factors in banks. These major profitability ratios are return on assets (ROA), return on equity (ROE), net interest margins (NIM) and net interest revenue against average assets (NR) according to Olalekan & Adeyinka (2013) and Lee and Hsieh, (2013).

To measure the profitability from the shareholders point of view, the ROE is the best measure, where it shows how much net benefit they get from investing capital in the banks. Looking instead at the bank’s managements profitability point of view, the ROA is the best measure, due to that it represents the managerial efficiency and profit can be generated from assets by the bank’s management, i.e. they can control it better (Singh, 2010). Stakeholders and shareholders play an important role in banks. As stakeholders have important contributions in asset and equity, and shareholders specifically in equity, bank profitability should satisfy them. Otherwise, they will transfer their wealth somewhere more profitable.

Managers, therefore, struggle to maximize long-term return to them (Simpson & Kohers, 2002; Karr, 2005).

According to Saunders and Cornett (2012), ROE and ROA measure profitability of the financial institutions generated by per dollar of equity and asset, respectively. ROA and ROE ratios are presented in equation (1) and (2), respectively.

$$ROA = \frac{Net\ income}{Total\ asset} \quad (1)$$

$$ROE = \frac{Net\ income}{Total\ equity\ capital} \quad (2)$$

ROE can also be shown as equation (3) below:

$$ROE = \frac{Net\ income}{Total\ equity\ capital} = \frac{Net\ income}{Asset} \times \frac{Asset}{Total\ equity\ capital} = ROA \times EM \quad (3)$$

As it can be seen, ROE can also be calculated by ROA multiple EM or equity multiplier, which measures how much assets are funded with equity compare to debt. As stockholders would like a high ROE, the bank can increase ROA or EM. Although ROE will increase by increasing bank's leverage, solvency risk in the bank will also increase, which will have a negative effect on profitability. As you can see in equation (4) below, ROA is made of profit margin (PM) or asset utilization (AU) where an increase in either of them will lead to an increase in ROA and consequently ROE (Saunders and Cornett, 2012).

$$ROA = \frac{Net\ income}{Total\ operating\ income} \times \frac{Total\ operating\ income}{Total\ asset} = PM \times AU \quad (4)$$

Based on Saunders and Cornett (2012), PM states how a bank can control the expenses and AU refers to how a bank can earn from its asset. When banks are profitable, they can manage their expenses or make money from their assets. However, any of these components can have different sources which could result in diverse effects on profitability. For example, increasing PM through decreasing salaries will lead to lower quality of labors.

NIM, another interesting profitability ratio, measures the net interest income generated by earning asset (Investment securities + Net loans and leases) which is presented in equation (5) and NR measures Net interest revenue against average assets in equation (6) below:

$$NIM = \frac{\text{Net interest income}}{\text{Earning asset}} \quad (5)$$

$$NR = \frac{\text{Net interest revenue}}{\text{Average asset}} \quad (6)$$

As seen, all these accounting measures are linked, meaning that changes that happen in bank might affect all these measures (Saunders and Cornett, 2012; Lee and Hsieh, 2013).

Comparing these ratios with each other will give different outcomes. For example, comparing ROA with ROE, the return of ROE will usually be higher than the return of ROA due to the leverage that ROE takes into consideration, as long as ROA is positive (Mehta & Bhavani, 2016; Peavler, 2017). Also, Athanasoglou et al. (2008) suggest that when using ROA as a measurement, the equity to asset measure for the capital variable, is the most suitable.

Both ROA and ROE as profitability measures, are linked to the “net income” item from the income statement. ROA and ROE are the mostly used profitability measurement in studies. ROA is a preferred measurement by many regulators, and they state that it is the best measure of bank efficiency. The reason is that ROA lean on the bank’s policy decisions, but also economy and government regulations factors that are not controllable (Hassan and Bashir, 2003). Singh (2010) argue that because ROE weakens all of the risks that are linked to high leverage, ROA is the best measure. Rahman et al. (2015), in this direction, state that a higher ROA and lower ROE will be shown if banks have a high level of equity. Therefore, they use ROA in their study as the main dependent variable, but they also take ROE and NIM into consideration.

Other researchers such as Goddard et al. (2004) and Goddard et al. (2010) prefer ROE on the other hand, due to that cost of capital varies between different countries and between banks in each country. Also that it takes focus on the shareholders, and that shareholders are an important factor for profitability in banks. One negative thing about ROA stated by Bougatef and Mgdmi (2016), is that assets can have a higher risk than others and ROA treat them the same.

Rahman et al. (2015) use NIM because it indicates profit earnings on interest activities which is important. According to Demirgüç-Kunt and Huizinga (2000) and Iannotta et al. (2007), the NIM and NR can be pointers of the efficiency of banking’s system. The interest rate that the savers get on deposit, and the lenders paying the interest on the loans, will drive a wedge

between them. Therefore, NIM and NR are seen to be important variables in both of their studies.

Erina & Lace (2013) and Staikouras & Wood (2004), further, consider two kinds of internal and external factors in order to define the profitability. Internal factors such as accounting based bank size, capital and credit risk which bank has control over them. The external indicators, on the other hand, include macroeconomic factors, which are not controllable such as inflation and Gross Domestic Product (GDP).

In Table 1 below, the profitability ratios are defined separately, and it illustrates different authors that have used these measurements in their research paper, associated with banking capital. The profitability ratio that is used the most is ROA.

Table 1. Literature on profitability measures

Profitability	Measurement	Definition	Authors
Return on Asset	ROA	Measures how profitable the bank is in relation to their total assets.	Altunbas et al. (2007) Anbar and Alper (2011) Athanasoglou et al. (2008) Bougatef and Mgadmi(2016) Ebenezer (2017) Flamini et al. (2009) Hassan and Bashir (2003) Jacques and Nigro (1997) Lee and Hsieh (2013) Petria et al. (2015) Rahman et al. (2015) Rime (2001) Shim (2010) Singh (2010) Sufian (2011) Sulehri and Numair (2015)
Return on equity	ROE	Measures the profitability of a bank in relation to the book value of shareholder equity	Anbar and Alper (2011) Athanasoglou et al. (2008) Berger (1995) Ebenezer (2017) Goddard et al. (2004) Goddard et al. (2010) Hassan and Bashir (2003) Lee and Hsieh (2013) Petria et al. (2015) Rahman et al. (2015) Sufian (2011)
Net interest margin	NIM	Measures how well-off the bank's investment decisions are in relation to its debt situation.	Demirgüç-Kunt and Huizinga (2000) Hassan and Bashir (2003) Lee and Hsieh (2013) Rahman et al. (2015) Sufian (2011)
Net interest revenue	NR	The difference between revenues generated from a bank's assets and the expenses that deals with liabilities payouts.	Iannotta et al. (2007) Lee and Hsieh (2013)

2.2 Capital structure theory

In order to understand bank capital, the start of it is to understand the capital structure decisions in firms and banks. The firm's leverage ratio that is based on accounting values is one way of thinking about the capital structure and this ratio divides the value of the firm's debt by its total asset values. The capital ratio is also another way in order to investigate in the capital structure, and this ratio divides the firm's equity by its assets (Berlin, 2011; Saunders and Cornett, 2012).

There are different kinds of capital structure theories. The first one is the “Modigliani-Miller theorem” and it discusses how the capital structure affects the company’s performance. Proposition I in the “Irrelevance theorem” claims that there is a perfect capital market but only if there are no taxes, no transactions, no bankruptcy cost and that the trading between companies is under the same circumstances. If these assumptions are satisfied, the market value of the firm will have no effect on the capital structure. The proposition II states that the capital structure will be irrelevant for the weighted average cost of capital, which has to remain constant. This theorem, therefore, argues that the capital requirement of increasing the capital ratio would have no effect on the value of the firm and its profitability. Modigliani and Miller later published and modified their assumptions. Many papers have argued against this theorem regarding the capital structure of banks (Modigliani & Miller, 1958).

The theory that was mostly discussed after the theorem of Modigliani-Miller is the “Tradeoff theory”. This theory indicates that through balancing the advantages of the corporate tax of the debt with the cost of bad financing, an optimal debt ratio will occur. High target ratios are efficient for highly profitable companies, with safe and tangible assets, and companies that have low profitability or no profitability at all, with intangible assets, should finance equity instead. This theory has been questioned due to major successful firms with little debt, but the tradeoff theory is still one of the most mentioned theories (Brealey & Myers, 2000).

The biggest competition of the “Tradeoff theory” is the “Pecking order theory”. This theory states that for financing new investments, the core source that companies select is retained earnings, which are referred to as internal financing. If this does not work, the next source is to issue debt and lastly to issue equity. Profitable companies that have more access to internal financing will automatically have less leverage and this is not because of a lower target debt ratio. If the second source is approached, the reason for that is the lack of satisfied internal fund for capital investment programs and this would lead to a less profitable situation. Due to that retained earnings are depend associated with profitability, this theory state that profitability has a negative link to leverage (Myers & Majluf, 1984).

The “Free cash flow theory” or “Agency theory” is also a well-known theory, which argues that, in order to control agency conflict that can occur between the managers and the shareholders, the debt ratio should be high in higher profitability firms. The problem here is the free cash flow, which the managers will be received, and this could be reduced by increasing the leverage levels. This will therefore control the managers from being part of

activities that decrease the firm value. In the case of bankruptcy risk, there might also occur some agency conflict between the shareholders and the debtholders (Jensen, 1986). This free cash flow issue is related to the “Free cash flow theory” which suggest that takeovers or value decreasing investment are more likely to initiate when there is a high free cash flow level in firms. Debt is also important in the free cash flow theory in order to reduce the agency costs. According to Jensen (1976), in firms with high growth opportunities, the shareholders and debtholders have more agency problem, which makes them custom less debt. On the other hand if the firms have less opportunity growth and high free cash flow, the debt will also be high, and in this case, reduce the conflict cost between the manger and the shareholders. The only way debtholders have a saying is when the debt needs to be renewed or when the contract is not completed.

2.3 What is capital in banks and what does it do?

Saunders and Cornett (2012) define bank capital as an item in the balance sheet, containing preferred and common stock, surplus or additional paid-in capital, and retained earnings. This item is supposed to be a cushion to compensate losses. Admati & Hellwig (2014) claims that capital item not only decreases the probability of bank failure, but generally helps the economy to perform better. Olalekan (2013), in this direction, argues that capital plays an important role to protect both bank and customers when it comes to a negative circumstance.

Admati & Hellwig (2014) suggest that banks can generate benefit by holding more capital. Banks not only could decrease the probability of distress and default, but efficiently change the allocation of downside risk between taxpayers and stockholders. In addition, deleveraging multiples would be decreased and banks will respond to the losses better, from an accounting perspective and asset sale will get less effect. Subsidies due to bank size which lead inefficiencies also decreased. Furthermore, problems engaged investment decisions due to high leverage and intensity of inefficient leverage ratchets would be reduced which help bank to behave better in investment.

According to Berlin (2011), there are remarkably few banking theories that regard the decisions of the bank’s capital structure. During the last 20 years, the capital level has been high and therefore it is more important to find the optimal capital decisions that are determined by market pressures, through the modern theory of banking. One thing that makes a bank special is the high leverage. Also in banks, their assets are risky and they must

monitor the loans in order to be sure that returns will be able to pay the creditors and the banks depositors.

Allen et al. (2011) and Hamid et al. (2011) argue that banks should hold higher accounting based capital than the required level by the regulations in order to have interest in the bank's shareholders. This idea is used in different models and the main purpose is that positive profits (the debt payment of banks is covered by the repayment of loans), is the only way shareholders gain. Increasing equity investment, the probability of successful loans through monitoring will increase. The authors also state that there is a negative side of equity which is the cost of it.

Allen et al. (2011) suggest that banks hold more capital when the market has high competition and when the competition is low they hold less capital but it does not decline the promise of monitoring. The authors also find that holding more equity capital will make the banks extra valuable. Bank capital is like a buffer when the revenues in loan decreases, and bank capital makes the investor get some shares of the bank profits.

The problem is therefore to find a sufficient amount. Very small or big amount of capital will lead to default risk or low return on equity for the shareholder, respectively (Saita, 2010).

2.4 The Basel Committee on Banking Supervision

The Basel Committee on Banking Supervision was formed 1974 by a group of international banking authorities in order to strengthen banks regulation and supervision, and also to improve the financial stability all over the world. The first Basel accord, Basel I was issued in 1988 and required to have a minimum of around 8 percent capital based on risk-weighted assets to keep banks solvent. This accord came to power due to the early 1980's banking crisis. Problems such as external risk, interest rate changes and macroeconomic difficulties were not taken into consideration, so therefore capital measurement and standards were a few years later divided into three different pillars so each state could structure its own system. In 2004, the Basel II accord was published and based on the three main pillars, minimum capital requirements, regulatory supervision and market discipline (Bank for International Settlement, 2016).

The biggest difference between Basel I and Basel II is that Basel II introduces supervisory responsibilities and focuses on strengthening the first pillar. This is by dividing the regulatory capital of a bank into three tiers. After the financial crisis in 2008-2009, Basel III was implemented in 2014, as a response from the miscalculations of risk that could have contributed to the crisis. By funding equity instead of debt in banks (decrease bank leverage), banks holding a higher percentage of an asset in liquid form (increase bank liquidity) and a new percentage of 10.5 (addition of capital conservation buffer) of total capital on RWA are examples of Basel III intent to strengthen bank capital requirements (Bank for International Settlement, 2016).

2.5 Risk associated with banks

In order to maximize profitability or/and maximize the shareholders values, banks have to find an optimal trade-off between profitability and risk. Banks are exposed to different kinds of risks and these risks are the reason why regulations in banks are implemented. One major bank risk is credit risk which is defined by the Basel Committee on Banking Supervision as “the potential that a bank borrower, or counterparty, will fail to meet its payment obligations regarding the terms agreed with the bank”. The Basel I requirement suggest that at least 8% of the bank's credit risk, which also is defined as the risk-weighted asset, should be represented by the total capital in banks (Bank for International Settlement, 2016).

Another major risk is the liquidity risk and in banks, the risk is to fail to meet short-term financial demands. The Basel III accord suggests a measurement called Liquidity Coverage Ratio which requires a bank to hold a certain level of the high-quality liquid asset (Bank for International Settlement, 2016). There have been several empirical studies that have focused on the relationship between regulatory capital and the risk level in banks. Altunbas et al. (2007) find that there was a negative relationship between liquidity and risk-level and that more loans are related to more capitalization which was the liquidity and capital relationship. Jokipii & Milne (2011) argue that they had found a positive two-way relationship where banks increase their capital in a reaction to an increase in risk, and that the risk-taking will increase if there is a higher capitalization level.

Large organizations such as banks are highly leveraged firms and it is important for them to take the systematic risk into consideration when they decide how much capital the banks should have. According to Berlin (2011), banks should have a higher capital due to that banks

does not take the cost of other institutions and taxpayers into considerations. Marco and Fernández (2004) found that commercial banks tend to take on more risk than savings banks and the reason is its ownership structure in commercial banks. A significantly higher ratio of loans to deposit is also found by (Köhler, 2012), for commercial banks, and high rates of loan growth are shown to be connected with bank risk. The author also states that capital buffer is an important factor in banks, due to their systematic risk during recessions.

2.6 Relationship between capital and profitability

Over the last 20 years, the reappearance of banking crises has appeared and therefore it is more important to focus on the stability of the financial system nowadays. During these 20 years, authors have focused on finding the negative effects that are associated with both market value and accounting profitability and risk-taking in banks. Higher capital is said to be costly for banks and would lead to a reduction of the profitability in banks. The “trade-off” theory state that the risk in banks will also be reduced and costs would compensate the investors instead. Due to the volatility of optimal capital ratios, the relationship between capital and profitability will also vary but it is more likely that the relationship is positive when banks are suffering and thereby increases their capital ratio in order to protect investors from the disasters (Miller, 1995; Buser et al, 1981).

Due to the problem of the high cost associated with capital, Rime (2001) suggests that increasing capital in forms of retained earnings instead of decreasing the risk in the portfolio will result in a less costly situation for the banks. It, therefore, would increase the profitability in banks. Comparable result by Shim (2010), find that insurers rely on retained earnings in order to increase the capital. The profitability measure ROA had a positive impact on changes in capital and this indicates that there is a positive relationship with the pecking order theory. This because the theory states that the best source of funds that could increase the capital are the internal retained earnings, in situations where catastrophes may happen on the stock market, that would decrease the capital level.

Many studies have been conducted concerning the relationship between capital and bank profitability. Athanoglou (2008) argues that capital is an important issue in order to explain the bank's profitability. Mbizi (2012) shows a positive correlation between the amount of capital and banks behaviour. Sulehri & Numair (2015) find that capital adequacy adversely affects the ROA. Berger (1995) document a positive relationship between capital and

profitability when there were crises in the US banking system during the years 1983-1989, but a negative relationship after the crises had ended, due to that banks might have had too much capital ratio, than needed.

Goddard et al. (2004) investigate instead the profitability of six major European banks during the period 1992-1998. The result showed that there was a positive relationship between capital-asset ratio and the profitability in the banks and significant persistence of profit from the first year to the next year despite the competition growth that there was in the financial markets in Europe during that period. The persistence of profit was also investigated by Berger et al. (2000) where they did a research on the US banking industry in order to determine the sources of the firm level rents persistency. They find that banking market competition and informational opacity are the main reasons for the persistence of profit and the factor that is perceptive of the persistence is the regional/macroeconomic shocks.

Jacques and Nigro (1997) base their study on a research by Shrieves and Dahl (1992) in order to see how the impact of the risk-based standards first year in effect had on portfolio risk and bank capital. The ratio of total equity, Tier 1 and Tier 2, to total risk-weighted assets is measuring the capitalization and the risk level. The authors argue that an increase in capital ratios affects the risk-based capital standards and reducing portfolio risk in commercial banks. They also find a significant negative coordination between risk and changes in capital. On the other hand, they find a positive correlation between changes in the profitability measure ROA and capital, which also Iannotta et al. (2007) did. The comparable result of another positive correlation between bank profitability and capitalization level was found by Bougatef and Mgadmi (2016) where they investigated in how the regulatory is affecting the bank's risk-taking behaviour. They estimated a sample of 24 banks operating in the MENA region and covers the period after the Basel II, 2004-2012. The result showed that regulations fail in decreasing the incentive of risk-taking and in the capital increase. Also, that the underdevelopment of MENA countries financial markets builds their capital buffer on their internal resources.

Demirgüç-Kunt and Huizinga (2000), however, investigate the profitability in different countries instead and find that countries with low profitability are associated with those countries in which operating banks have a low Net interest margin. Mentionable countries with this statement were Finland, Ireland, Switzerland and the Netherlands. They further argue that there is a positive relation between profit and equity variable with one lag but also

a positive relationship between an independent macroeconomic variable, GNP per capita, with the profit of banks.

Goddard et al. (2010) examine the determinants and convergence of the accounting based profitability in banks, in eight European Union member countries between the years 1992-2007. They find that in efficient and diversified banks, the ROE profitability measure is higher but in highly capitalized banks the profitability is lower so there is a negative relationship between them. Altunbas et al. (2007) also analyze the relationship between capital, risk and efficiency in European banks during 1992-2000 and argue that inefficient European banks tend to hold more capital.

The article that is most similar to our study is conducted by Lee and Hsieh (2013) and it reflects on how bank capital impacts the accounting based profitability and risk in Asian banking. Data on 42 Asian countries is covered over the years 1994-2008. The authors argue that the investment banks have the lowest and positive capital effect on profitability. Also, the banks that have a higher capital effect on profitability are banks in low-income countries. There are different profitable variables in the method which shows that these have different results on the persistence of profit. However, increasing the capital in banks on profit is significantly positive.

3. Methodology and Data

3.1 Methodology

3.1.1 Model Specification

Like Lee and Hsieh (2013) study, we are interested to study the relationship between capital and profitability. Therefore, to test our hypotheses, we follow the procedure presented by Lee and Hsieh (2013) and replicate their model. Thus, in order to examine our first hypothesis, equation (7) is modelled as follows:

$$\begin{aligned} \pi_{it} = & \alpha + \beta_1 \pi_{it-1} + \beta_2 CP_{it} + \beta_3 LLGL_{it} + \beta_4 NLTA_{it} + \beta_5 LADSF_{it} + \beta_6 INFL_{it} \\ & + \beta_7 GW_{it} + \beta_8 DCP_{it} + \beta_9 RIR_{it} + \varepsilon_{it} \quad \forall i, t. \quad (7) \end{aligned}$$

In equation (7), “t” and “i” refer to time and bank, respectively. The dependent variable π_{it} , denotes the bank profitability. The main variable of interest CP_{it} is the level of bank’s capital. $LLGL_{it}$, $NLTA_{it}$, and $LADSF_{it}$ are our bank-specific variables which refers to loan loss reserves to gross loans, net loans to total assets and liquid assets to the customer and short-term deposits, respectively. $INFL_{it}$, GW_{it} , DCP_{it} , and RIR_{it} , our country-specific variables are inflation, GDP growth rate, domestic credit to private sector and real interest rate, respectively. Finally, ε_{it} denotes the idiosyncratic error term.

To test hypothesis II, in line with Lee and Hsieh (2013), we include two groups of new control variables in our model. With other words, we take market regulations and institutional variables into consideration and a new model equation (8) is created:

$$\begin{aligned} \pi_{it} = & \alpha + \beta_1 \pi_{it-1} + \beta_2 CP_{it} + \beta_3 LLGL_{it} + \beta_4 NLTA_{it} + \beta_5 LADSF_{it} + \beta_6 INFL_{it} \\ & + \beta_7 GW_{it} + \beta_8 DCP_{it} + \beta_9 RIR_{it} + \beta_{10} CAPR_i + \beta_{11} SPR_i + \beta_{12} MDPM_i + \beta_{13} ACTR_i \\ & + \beta_{14} GSP_i + \beta_{15} GCP_i + \varepsilon_{it} \quad \forall i, t. \quad (8) \end{aligned}$$

In equation (8), CAPR, SPR, MDPM, and ACTR refer to capital requirements, supervisory power, market discipline and private monitoring and activity restrictions, respectively. GSP and GCP indicate shareholder protection and creditor protection.

3.1.2 Model Variables

As we discussed in section 2.1, bank profitability can be proxied by four accounting measures: return on assets (ROA), return on equity (ROE), net interest margins (NIM) and/or net interest revenue against average assets (NR). This means that we run four regressions to analyze the impact of capital on bank profitability in Nordic countries in line with Lee and Hsieh (2013). Although many authors proxied bank profitability by ROA and ROE, we take a more comprehensive view and study different aspects of bank profitability. Even though we know that the market value of the banks equity and debt is also a suitable measurement for the profitability in Nordic banks, we ensure our result by using accounting based measures to avoid the problem with missing data and having assumptions made about the banks debt, from the market value approach (Osborne et al., 2013). Although accounting based measurements may not be a perfect choice, there are, however, previous studies that proxy them for the banking industry, for example Goddard et al. (2004), Altunbas et al. (2007) and Athanasoglou et al. (2009).

We include a lag for the dependent variable (profitability), since accounting profitability measurements usually depend on the previous years' profit in all banks (Berger et al., 2000; Goddard et al., 2004, 2008 and 2011; Athanasoglou et al., 2008; Flamini et al., 2009; Lee and Hsieh, 2013). Profitability might be a dynamic procedure which is dependent on its previous year. We therefore cannot ignore the profitability persistence effect. β_1 refers to persistence coefficient for profitability. If this coefficient is significant, abnormal profitability will be transferred to next years.

For the capital term or CP, we use equity to asset ratio in line with Lee and Hsieh (2013). This ratio can be obtained from two main items in the balance sheet, which shows the capitalization in the banks according to Demirgüç-Kunt and Huizinga (2011). We prefer to use accounting based capital instead of market value due to that Lee and Hsieh (2013) did it in their research as well as to not face any problems with lack of data. However, the main reason is that this capital ratio is linked to the the Basel Committee on Banking Supervision's capital requirements.

For explanatory variables, we include bank-specific and country-specific variables which play important roles in bank profitability. For bank-specific or internal control, we control for loan loss reserves to gross loans (LLGL), net loans to total assets (NLTA), and liquid assets

to the customer and short-term deposits (LADSF) in line with Altunbas et al. (2007), and Lee and Hsieh (2013). LLGL is a proxy for credit risk and its coefficient is expected to be negative. As higher exposure to risky loan increases, the expectation of unpaid loan will be greater and consequently, profitability would be reduced (Miller and Noulas, 1997; Casu and Girardone, 2006; Altunbas et al., 2007; Sufian and Habibullah, 2009). In this direction, Thakor (1987) states that loan loss provision refers to the quality of asset in the bank which bank behaviour could be affected by that in the future. According to Athanasoglou (2008), the specific level of loan loss provision is followed by the country's banking system which is set by the central banks. The provision held for the loan losses is however modified by the bank management, and at the start of every period, the level is decided, hence credit risk should be a predetermined variable. Therefore, LLGL is modelled as a predetermined variable in our specifications.

NLTA could also increase banks risk-taking and lower bank profitability in the future. On the other hand, Lee and Hsieh (2013) suggest an expectation of positive relationship between both LLGL and NLTA with profitability; since they state loans increase the profitability. LADSF is not expected to have a specific relationship with profitability. Some suggest that more liquid assets imply low efficiency in the bank due to low return, however, some also state that more liquid implies less needed capital. According to Mozo (2018), the term deposit holds the customer's money for a predetermined time in order to earn predetermined interest amount. Here, the error term can affect both the NLTA and LADSF in the future and therefore we model them both as a predetermined variable (Athanasoglou, 2008).

All of these bank-specific control variables take risk into consideration. We know that banks take on a lot of risk, and even though the relationship between capital and probability is our focus, the risk aspect is covered by these risk variables in our model. Therefore our thesis will differ a bit from Lee and Hsieh's (2013), where they investigated the relationship between capital with both risk and profitability, as separate models, and we only investigate capital with profitability due to the risk control variables we take into consideration.

Bank behaviour, additionally, is affected by macroeconomic variables and therefore for macro variables such as external control, inflation (INFL), GDP growth rate (GW), domestic credit to private sector (DCPS), and real interest rate (RIR) are country-specific variables. Although Nordic countries might be considered as a family by some authors, each has its own country-specific situation. GDP is the most used macro variables and this could have

different effects on profitability, considering supply and demand within the country. However, higher GDP growth rate increases the bank efficiency and profitability (Sufian and Habibullah, 2009; Petria et al., 2015; Singh 2010). Income shocks that are unpredictable are assumed to be uncorrelated with past GDP but will however be correlated with the GDP in the future (Vinayagathan, 2013). Hence, the GDP growth rate will be assumed as a predetermined variable in our GMM model.

Flamini et al. (2009) suggest that inflation can control risk. The coefficient of INFL and RIR could vary depending on the country. In Nordic countries, the relationships of INFL and RIR with profitability are expected to be positive, as banks can generate more profit from issued loans. Higher domestic credit to private sector leads to a lower profitability. Inflation, real interest rate and the domestic credit to private sector has been considered as predetermined for the current period which therefore models as predetermined variables in our specifications (Kaabia and Gil, 2000; Kitano, 2016; Majeed and Khan, 2008).

According to Agoraki et al. (2011) and Delis et al. (2011), market power and regulations affect the bank behaviour. Regulations are set to be beneficial, however, they might have a different impact in a variety of countries. Countries all over the world have different regulations and supervisions engaged with a variety of dimensions. In line with Barth et al. (2013), banks in Nordic countries are classified as high-level income, however, they do not follow the same regulatory and supervisory process. Iceland and Sweden apply a combination of international accounting standard (IAS) and generally accepted accounting standard (GASS), tailored to each country. On the other hand, Denmark, Finland and Norway apply neither of IAS and GASS and each has a tailored specific method.

Turning to control market regulations, accordance with Agoraki et al. (2011), Delis et al. (2011), and Lee and Hsieh's (2013), we control for capital requirements (CAPR), supervisory power (SPR), market discipline and private monitoring (MDPM), and activity restrictions (ACTR). CAPR refers to initial capital requirement and its stringency. Higher CAPR refers to greater capital stringency. SPR shows the power of supervisory agencies which they can act against bank management and directors, shareholders, and bank auditors. Greater SPR refers more power of supervisory agencies. MDPM shows the level of bank's transparency to the public and if they would like to enhance market discipline. Higher MDPM indicates greater market discipline and private monitoring. ACTR refers to a degree which bank participations is restricted by regulations. Higher ACTR shows greater activity restriction. All these

regulatory variables are either predetermined or endogenous depending on what relationship there is between the banks and regulators. The regulatory variables should be predetermined if banks first see what type of regulation there is and later choose the risk-taking (Bond, 2002). We assume this for the Nordic banks and therefore treat the regulatory variables as predetermined variables in our model.

Next step is to take deposit insurance and legal protections of investors into consideration. Deposit insurance explicit may have an impact on margins according to Demirgüç-Kunt et al. (2015). Banks might take more risk under explicit deposit insurance which affects bank profitability. Deposit insurance is a dummy variable and if the bank has deposit insurance, it takes one; otherwise, it takes zero. Although deposit insurance has been a variable in the previous study, this dummy takes one under our dataset. We, therefore, believe that deposit insurance is not a suitable variable in our study and we will skip it in our model.

Turning to legal protections of investors, shareholder protection (GSP), creditor protection (GCP), and legal efficiency (GLE), these variables should be included in the model according to Lee and Hsieh's (2013). Unlike Modigliani and Miller (1958) theory, protection of corporate shareholders and creditors has become important in recent years (La Porta et al, 1998). GSP, GCP, and GLE are proxies for corporate governance. GSP and GCP are scored from zero to five, where greater score reflects higher protection of shareholders and creditors. GLE, on the other hand, is a multiple value, where higher value shows the higher efficiency of law. In Nordic countries, legal efficiency does not differ, meaning that GLE is not a variable in our study. All of these legal protection variables can be assumed as predetermined or exogenous due to that the legal systems was decided a long time ago and countries hold on to the system by their occupations and colonization (Frederiksluts et al., 2008). We assume that the Nordic countries legal protection of investors should be predetermined variables.

3.1.3 Model Estimation

We have come to the conclusion that system Generalized Method of Moments (GMM) is the best estimator that suits our model. We decided to implement the two-step dynamic panel data, suggested by Arellano & Bover (1995) and Blundell & Bond (2000). GMM approach has been preferred by many researchers in analyzing bank behavior, for example Goddard et al. (2004), Athanasoglou et al. (2008), and Lee and Hsieh (2013). By GMM we can create instruments within the dataset. A problem, however, could be a weak instrument for the first-

differenced regressor in the lagged level of the regressor. There are two “difference” and “system” dynamic panel estimators. The difference estimator address omitted variable bias and the system estimator builds a system of two equations (differences and its transformed) in order to increase the efficiency (Arellano and Bover, 1995).

One argument to use GMM is that we have a lag variable in our model, and therefore we should take that into consideration by the dynamic panel model. Driffill et al. (1998) argue that analysis of short-term lagged term leads to wrong sign or size coefficient in OLS. Traditional static panel data may compensate lack of country-specific effect, however, the model might suffer from endogeneity and importantly it cannot be applied in a dynamic process. According to Roodman (2006), when instrumenting with lags, a system dynamic panel estimator incorporates with this strategy. Due to that we create lags as instruments in our model, we use the “system” over the “difference” estimator.

In addition, our dataset contains quite large numbers of banks and only six years. According to Judson and Owen (1999) and Roodman (2006), using lagged variables as instruments in a GMM estimation is more appropriate compare to implanting a panel data approach. Considering our unbalanced data, we can obtain unbiasedness and more efficiency from a GMM estimator.

We further assume that all of our control variables are predetermined variables, not strictly exogenous variable, due to the knowledge of economic theory. According to Roodman (2006), if a variable is predetermined but not strictly exogenous we use them as moment conditions/instruments in the GMM regression. Predetermined variables are motivated in section 3.1.2. Our model, moreover, might also suffer from an omitted variable or there could be some fixed effects in the six years that we are included in our model. The GMM model also addresses unobserved time effects. However, unobserved country effects should be taken into consideration and for that reason, we should control for them through differencing and instrumentation. Additionally, robust standard errors are implemented to solve the problem regarding heteroscedasticity.

To sum up, in line with Judson and Owen (1999) and Roodman (2006), GMM is applied for the cases with few time periods, many countries, dynamic dependent variable depending on its past, not strictly exogenous variable, fixed effects, and heteroskedasticity and autocorrelation within countries. Thus, with GMM, not only can we overcome biasness from

omitted variables in cross-sectional estimates and the inconsistency from endogeneity, but we can also solve the probable problem of causality, as capital affect the profitability and profitability can also affect the bank profitability.

We run a two-step system GMM using the `xtabond2` program. `Xtabond2` is preferred over `xtabond`, since standard errors are reported in two stages which solve the downward biased problem and instrument matrix can be controlled better due to forward orthogonal deviations presented by `xtabond2` (Roodman, 2006).

3.2 Descriptions and sources of data

Our thesis studies banks in Nordic countries. In this thesis, we have four dependent variables (ROA, ROE, NIM, NR), Equity to Asset ratio and bank-specific variables (LLGL, NITA, LADSF), which are collected from Orbis. We further looked at available bank annual reports on their website to complete some missing data. All of the data for the variables are taken from the end of the year balance sheet. For country-specific variables, we used Worldbank and Trading Economics dataset, end of the year data.

Variables on financial market regulations, which is included in our second model, are scored through answering provided questionnaires by previous literature. Please see Appendix 1. Questions are sent to almost all countries in the world and responses are collected and updated by Barth et al. (2001, 2006, and 2013) which are available at Bank Regulation and Supervision Database, WorldBank. These variables are assumed to be same for all banks in the country for all years. We also look at regulation and supervision of countries in order to fill out some missing data and approve the correctness of our data.

The institutional development variables (DEP, GSP, GCP, GLE) for our second model are also variables collected and valued by previous studies. Here, we followed La Porta et al. (1998) and Demirgüç-Kunt et al. (1999). Please see Appendix 2. Due to lack of data for Iceland, we searched further online and completed our data.

After collecting data, we found that Deposit insurance and Legal efficiency in our study, in contrast to Lee and Hsieh's (2013), have the same values. It means that we should not consider DEP and GLE as variables in our case study. Therefore, our model should differ a bit compare to the model provided by Lee and Hsieh's (2013), where DEP and GLE are excluded.

Due to lack of data and since some banks are new and some are merged, we could not find all six years data for all banks. However, all banks have at least three years in a row data; which those are in minority. Our estimations, therefore, relies on an unbalanced dataset which missing data are random.

In our sample, Denmark has the highest number of observations (39 banks) and Iceland has the lowest (5). In Table 2 below, we present the countries and banks in our dataset together.

Table 2. Summary of banks

Country	Number of banks
Sweden	20
Finland	16
Norway	33
Denmark	39
Iceland	5
Sum	113

The data covers a range of six years from 2011 to 2016 consist of five countries, 113 banks in total. We chose to start from year 2011 in order to remove the effect of the financial crisis in banks and therefore study banks in a relatively normal situation. During our chosen period, however, macroeconomic factors has been strong which could strengthen bank profitability. Although our sample only covers six years, according to Roodman (2006), GMM addresses “small T, large N”; referring to few time periods and many individuals. Therefore, we do not expect anything wrong with the result considering our time period.

We summarize all variables for the first and second hypothesis in Table 3 below:

Table 3. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	654	.9956521	1.373539	-4.88	12.54
ROE	656	9.852455	11.99087	-75.8	57.39
NIM	645	2.417441	2.104305	-1.51	18.1
NR	641	2.034914	1.577994	-1.47	13.98
CP	645	10.59172	10.24662	.124	93.49
LLGL	535	4.296953	8.575653	0	91.98
NLTA	604	65.44325	20.58212	1.2	97.79
LADSF	567	27.67646	31.64548	.06	413.87
INFL	678	1.489233	1.176425	-.2	5.2
GW	678	1.517699	1.288231	-1.4	7.2
DCPS	678	140.163	30.19241	87.3	187.2
RIR	678	-.644174	1.61885	-3.2	5.8
CAPR	678	3.884956	1.87222	1	6
SPPR	678	8.920354	1.776965	6	11
MDEPM	678	5.60177	1.314883	3	7
ACTR	678	2.123894	.6934947	1	4
DEP	678	1	0	1	1
GSP	678	2.858407	.8917868	1	4
CSP	678	2.00885	.8260412	1	3
GLE	678	100	0	100	100

As our dataset includes different type of banks with different size, it is logical that the variation of variables is high. By bank size, we mean bank's asset. The issue of comparing wide range of banks with dissimilar activities can be also solved by taking control variables into consideration as discussed in 3.1.2 section.

The high standard deviation of NTLA, LADSF, and DCPS, also take attentions. We have removed outliers, however we think that there are some variables that are not in the balance sheet and we do not control for them. Merge and acquisition could be examples that may affect our numbers leading to high standard deviation.

Unlike Lee and Hsieh's (2013), standard deviation DEP and GLE is zero in our case, due to that, these two variables should not be taken into consideration in our model.

We checked all of our independent variables for missing value, outlier and multicollinearity. Our main variable of interest, bank-specific, and country-specific variables are fine when it comes to the mentioned problems. Unfortunately, for the regulation and legal protections variables, our model suffers from multicollinearity which the software Stata solves this problem by dropping these variables. This issue will not be a problem when it comes to the

results, since we exploit regulation and legal protections variables for robustness. We are interested to confirm the relationship between profitability and capital, and therefore this problem will not be a big issue.

Pearson correlation coefficients tests for linear correlation between two different variables. As seen in Table 4 the correlation between the different variables has more or less weak connection and according to Kennedy (2008), there is a problem with multicollinearity if the correlation coefficients are measured above 0.80. In this case, there is no correlation above 0.8.

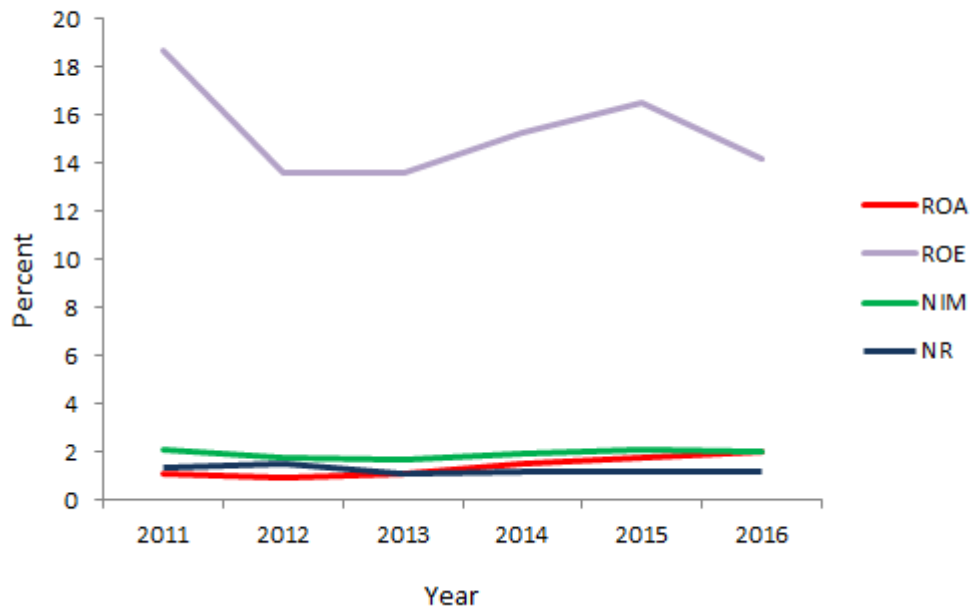
Table 4. Pearson correlation coefficients

	CP	ROA	ROE	NIM	NR	LLGL	NLTA	LADSF	INFL	RIR	DCPS	RIR
CP	1											
ROA	0.4320* (0.00)	1										
ROE	0.031 (0.432)	0.6110* (0.00)	1									
NIM	0.2209* (0.00)	0.3033* (0.00)	0.0453 (0.251)	1								
NR	0.2037* (0.00)	0.2208* (0.00)	0.0053 (0.894)	0.7923* (0.00)	1							
LLGL	0.6768* (0.00)	0.2299* (0.00)	-0.1781* (0.00)	0.3702* (0.00)	0.3475* (0.00)	1						
NLTA	-0.2104* (0.00)	-0.0263 (0.5196)	0.0596 (0.1432)	-0.0701 (0.0852)	-0.0372 (0.3616)	-0.3038* (0.00)	1					
LADSF	0.3700* (0.00)	0.1074* (0.0105)	-0.0542 (0.1978)	0.1347* (0.0013)	0.1398* (0.0009)	0.4346* (0.00)	-0.6261* (0.00)	1				
INFL	-0.0205 (0.6031)	-0.0262 (0.5038)	-0.0802* (0.0403)	-0.0005 (0.9897)	0.0774 (0.0506)	-0.1284* (0.003)	0.2344* (0.00)	-0.1417* (0.0007)	1			
GW	-0.0088 (0.8247)	0.1735* (0.00)	0.1699* (0.00)	0.1205* (0.0022)	-0.0206 (0.6024)	-0.0479 (0.2699)	0.0613 (0.1327)	-0.0222 (0.5980)	0.1237* (0.0013)	1		
DCPS	-0.033 (0.4034)	-0.2463* (0.00)	-0.3378* (0.00)	0.2618* (0.00)	0.3656* (0.00)	0.3877* (0.00)	-0.0978* (0.0164)	0.2498* (0.00)	-0.0341 (0.3747)	-0.0525 (0.1718)	1	
RIR	0.072 (0.0682)	0.1505* (0.0001)	0.1511* (0.0001)	-0.0044 (0.9107)	-0.0861* (0.0294)	-0.0972* (0.0248)	0.0208 (0.6106)	-0.0319 (0.4485)	-0.2607* (0.00)	0.3351* (0.00)	-0.4193* (0.00)	1

Numbers in parentheses are p-values. Significant levels is 5%. CP: Equity-to-total-assets; ROA: Return on assets; ROE: Return on equities; NIM: Net interest margin; NR: Net interest revenue against average assets; LLR: Loan loss reserves; LLGL: loan loss reserves to gross loans; NITA: Net loans to total assets; LADSF: Liquid assets to customers and short-term deposits; INFL: Inflation; GW: GDP growth rate; DCPS: Domestic credit to private sector; RIR: Real interest rate.

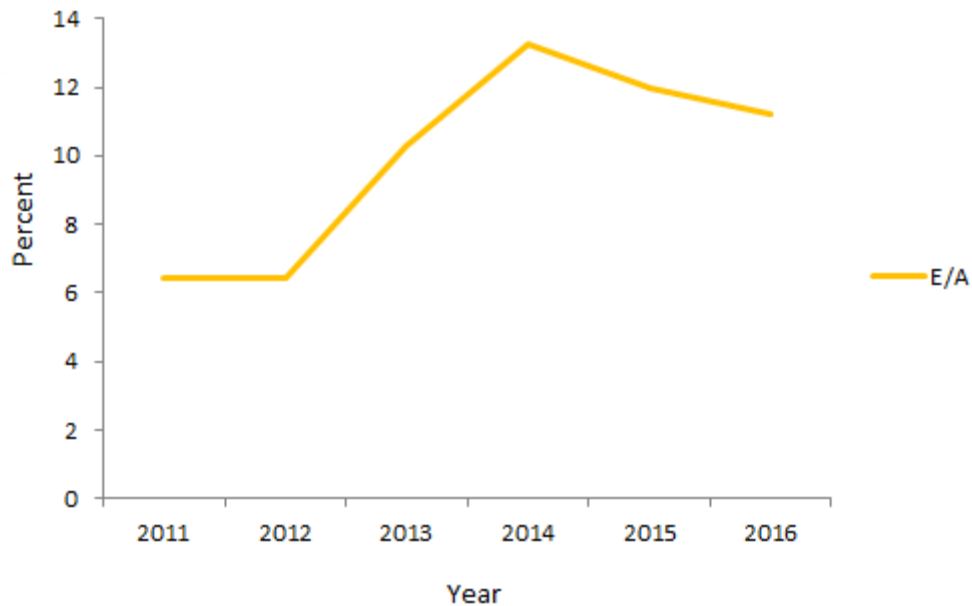
The average behaviour of our dependent variables is shown in Figure 1. As seen, the ROE is much higher than the ROA, NIM and NR, and this is due to the leverage that ROE takes into consideration.

Figure 1. Profitability behaviour



The average behaviour of our main variable of interest variable is shown in Figure 2, below:

Figure 2. Equity to Asset ratio behaviour



4. Results

4.1 Benchmark Results

In order to test our hypothesis I, we regress the banks profitability on capital considering bank-specific and country-specific variables. We run four models from different views of bank profitability discussed in section 2.1 and apply a two-step GMM dynamic system estimator.

In Table 5, we present our estimation results for our four models. The first column (1) is representing the estimation of the ROA with the capital. Second (2), third (3) and fourth (4) columns are estimation of the ROE, NIM and NR, respectively.

Table 5. Estimation results of capital and profitability

	(1)	(2)	(3)	(4)
L1.ROA	0.4498638 (0.001)			
L1.ROE		0.3320848 (0.002)		
L1.NIM			0.9781374 (0.000)	
L1. NR				0.442541 (0.185)
CP	0.0644457 (0.0262198)	-0.0852808 (0.626)	0.0027493 (0.877)	0.0618019 (0.224)
LLGL	-0.0463728 (0.0171761)	-0.7075382 (0.000)	-0.0000021(1)	0.0312184 (0.213)
NLTA	0.0064465 (0.0045376)	-0.0147374 (0.834)	0.0072595 (0.06)	-0.0003543 (0.952)
LADSF	0.0063066 (0.0023271)	0.0467883 (0.231)	0.002489 (0.224)	-0.0076865 (0.348)
INFL	0.0153733 (0.059714)	0.0503722 (0.922)	0.0222319 (0.714)	0.0752232 (0.091)
GW	0.0670373 (0.035536)	1.188144 (0.003)	0.1183345 (0.105)	-0.037746 (0.667)
DCPS	-0.0027724 (0.0026419)	-0.0222498 (0.311)	-0.0003708 (0.821)	0.0118326 (0.161)
RIR	-0.0078621(0.0452021)	-0.220204 (0.531)	0.0226985 (0.571)	0.0787698 (0.4)
AR (1)	0.006	0.021	0.024	0.025
AR (2)	0.408	0.31	0.479	0.862
Sargan-Hansen test	0.941	0.965	0.91	0.915
Number of banks	113	113	113	113
Observations	423	424	423	422
Dependent variable is profitability: ROA, ROE, NIM and NR, respectively. Estimation method is the two-step GMM dynamic panel estimator. Significant level is 5%. The null hypothesis of the Sargan-Hansen test is that the instruments used are not correlated with residuals (over-identifying restrictions). The null hypothesis of the serial correlation test is that the errors has no second-order serial correlation. P-values are in parentheses. ROA: Return on assets; ROE: Return on equities; NIM: Net interest margin; NR: Net interest revenue against average assets; CP: Equity-to-total-assets; LLGL: loan loss reserves to gross loans; NITA: Net loans to total assets; LADSF: Liquid assets to customers and short-term deposits; INFL: Inflation; GW: GDP growth rate; DCPS: Domestic credit to private sector; RIR: Real interest rate.				

The table shows that the persistence of profit for ROA, ROE, NIM and NR have all positive relationship, meaning that the positive profitability will be transferred to next year. They have positive coefficients at 0.45, 0.33, 0.98 and 0.44, respectively. The highly significant coefficient of the lag of profitability variables confirms the dynamic character of the model specification. These results are consistent with the findings of Goddard et al. (2004), who use ROE as a profitability measurement. Lee and Hsieh (2013), however, find that for all of these four different variables, only NIM and NR have persistence of profit, which our result also suggests. Further, only ROA, ROE and NIM are significant at a 5% significance level.

Our main variable of interest, capital, diversely behaves in overall Nordic banks from 2011 till 2016, considering different views of profitability. The relationship between ROA and capital is significantly positive in accordance with Jacques & Nigro (1997), Lee & Hsieh (2013) and Bougatef & Mgdmi (2016). The capital coefficient, 0.064, indicates that if the bank increase capital, ROA increases by 6.4 units. The significantly positive relationship of the equity to asset ratio with ROA implies that banks are well-capitalized and successful in gaining profitability according to Athanasoglou et al. (2008). They can efficiently take advantages of their opportunities as well as overcome problems engaged with unexpected losses. The relationships between capital with ROE, NIM, and NR are negative, positive and positive, respectively, in line with Lee and Hsieh's (2013).

When it comes to bank-specific control variables, we expected that higher exposure to risky loan adversely affects the profitability. In this direction, loan loss reserve to gross loans has significantly negative relationships with ROA and ROE and their coefficients are -0.46 and -0.71, respectively, in line with Miller and Noulas (1997), Casu and Girardone (2006), Altunbas et al. (2007), Sufian and Habibullah (2009) and Thakor (1987), and in contrast to Lee and Hsieh (2013). Higher net loan to total asset which could increase both risk and income for banks has a positive effect on ROA and NIM with coefficients of 0.006 and 0.007 in the same direction as Lee and Hsieh (2013). Liquid assets to the customer and short-term deposits also have a significant positive effect on ROA, meaning that more LADSF implies higher profitability by the coefficient of 0.006 for banks.

Among the other control variables, such as the country-specific variables, the inflation (INFL) shows a positive relationship with all of the profitability variables. As mentioned before by Flamini et al. (2009), the coefficients of inflation are expected to be positive in Nordic countries and this result confirms this statement, with coefficients of 0.015, 0.050, 0.022 and 0.075, respectively for the profitability variables.

The coefficients of the GDP growth rate (GW) are positive in ROA, ROE and NIM but negative in NR. ROA, ROE and NIM will have a positive relationship with GW, which means that the development of the economy will improve the profitability of the Nordic banks. Further, only ROA and ROE are significantly positive. This result matches our expectation, where the Nordic banks have different specifications which Sufian and Habibullah (2009), Petria et al. (2015) and Singh (2010) argued.

Our expectations stated by Flamini et al. (2009) was that higher domestic credit to private sector (DCPS) will lead to a decrease in profitability. Our results on ROA, ROE and NIM confirm this issue, with a negative coefficient of -0.003, -0,022, -0.0004, respectively. The NR, however, show a positive coefficient of 0.012. The only variable that is significant, is the ROA.

The last country-specific variable in our model is the real interest rate (RIR). The findings show that both ROA and ROE have a negative relationship with RIR, with coefficients of -0,008 and -0.22 and only ROA is significant at a 5% level. However, NIM and NR have on the other hand a positive relationship with RIR (coefficient of 0.023 and 0.079). This was not accordingly to our expectations, because banks can generate more profit from issued loans so, therefore, the relationship between RIR and profitability should be expected to be positive for the majority of the profitability variables, not only half.

To further analyse the result, we divide the Nordic banks into two groups, Savings banks and Commercial banks, in order to see the differences between these groups. The analysis shows that in savings banks, the persistence of profit is positive in ROA and NIM, while it is negative in ROE and NR. The only significant profitability variable is NIM. However, in commercial banks, all of the profitability variables are significantly positive, meaning this year's profitability will transfer to next year.

Further, investigating the relationship between capital and profitability, we find that in savings banks the relationships are all positive with coefficients of 0.05, 0.11, 0.005 and 0.13, respectively. However, the only variable that is significant is NR. The same result is shown in commercial banks, where the coefficients are instead 0.09, 0.10, 0.006 and 0.04, respectively and show a positive relationship between capital and profitability. Here, the only significant variable is instead ROA. Please, see Appendix 3 and Appendix 4 for further findings.

By these results we have to reject the hypothesis I, that capital and profitability will have a positive relationship within Nordic banks. We can however say that the only significant profitability variable is ROA, and it shows a positive relationship between capital and profitability.

4.2 Robustness Analysis

In order to test our hypothesis II, we have to check for robustness of our existing findings. We modify our model the same way Lee and Hsieh's (2013) did in their research. We add the market regulation variables CAPR, SPR, MDPM, ACTR, and also the legal protections variables GSP, GCP into the same model as before. Due to the multicollinearity problem, Stata automatically drops the variables CAPR and MDPM which is therefore empty in our Table 6 below.

Table 6 shows the result after adding the new control variables to the model.

Table 6. Robustness estimation results of capital and profitability

	(1)	(2)	(3)	(4)
L1.ROA	0.438856 (0.002)			
L1.ROE		0.3041703 (0.006)		
L1.NIM			0.9380579 (0)	
L1. NR				0.4335032 (0.188)
CP	0.0538077 (0.025)	-0.0640383 (0.738)	0.0061227 (0.74)	0.061572 (0.253)
LLGL	-0.0529869 (0.001)	-0.7053042 (0)	-0.0051515 (0.701)	0.0324603 (0.315)
NLTA	0.0124709 (0.048)	-0.009299 (0.908)	0.01584 (0.068)	-0.0029677 (0.673)
LADSF	0.0076652 (0.007)	0.0467818 (0.256)	0.0041391 (0.149)	-0.0083792 (0.344)
INFL	0.0692796 (0.51)	0.4637102 (0.454)	0.1917976 (0.077)	0.1129907 (0.024)
GW	0.0698501 (0.263)	0.8925419 (0.028)	0.1780616 (0.095)	-0.063525 (0.567)
DCPS	-0.0171745 (0.144)	-0.1751925 (0.036)	-0.0091826 (0.475)	-0.0046238 (0.348)
RIR	-0.0693008 (0.386)	-0.753383 (0.156)	0.053329 (0.031)	0.0485423 (0.438)
CAPR				
SPR	0.1831231 (0.34)	2.203998 (0.068)	0.042071 (0.808)	0.2434691 (0.095)
MDPM				
ACTR	0.6101109 (0.289)	8.20729 (0.018)	0.1831941 (0.627)	0.6256416 (0.181)
GSP	0.0228439 (0.922)	2.196243 (0.178)	0.173629 (0.143)	0.3031491 (0.251)
CSP	0.63813 (0.233)	7.691583 (0.07)	0.7149423 (0.233)	0.3901668 (0.187)
Number of banks	113	113	113	113
Observations	423	424	423	422
Dependent variable is profitability. The estimation method is the two-step GMM dynamic panel estimator. Confidence level is 5%. P-values are in parentheses. The null hypothesis of the Sargan test is that the instruments used are not correlated with residuals (over-identifying restrictions). The null hypothesis of the serial correlation test is that the errors exhibit no second-order serial correlation. To save space we do not report the p-value for the tests as it is almost the same result as in table 5. ROA: Return on assets; ROE: Return on equities; NIM: Net interest margin; NR: Net interest revenue against average assets; ; CP: Equity-to-total-assets. LLGL: loan loss reserves to gross loans; NITA: Net loans to total assets; LADSF: Liquid assets to customers and short-term deposits. CAPR: Capital requirements; SPR: Supervisory power; MDPM: Market discipline and private monitoring; ACTR: Activity restrictions; GSP: Shareholder protection; GCP: Creditor protection.				

If we compare the new findings with the previous result in Table 5, by taking the market regulatory and legal protections variables into considerations, the result will still show a positive persistence of profitability for all of the variables. ROA, ROE and NIM are further still positively significant.

We further find that ROA, NIM and NR has still a positive relationship to capital. The coefficients are 0.054, 0.006 and 0.061, respectively. For the variable ROE, it also turned negative but with a coefficient of -0.064. However, ROA is still the only variable that is significant with a 5% significance level.

Nordic countries with higher supervisory power (SPR), higher activity restrictions (ACTR), higher shareholder protection (GSP) or higher creditor protection (CSP) will increase bank's profitability. All of the coefficients for all of the profitability variables are positive and the only significant variable is ROE for the ACTR.

By these findings, we suggest that our hypothesis II is correct and that we can not therefore reject it; that regulation/institutional factors will not disturb the results of capital and profitability within Nordic banks.

4.3 Test

4.3.1 Instrument Validity

We have to test for autocorrelation in the error term and as shown in Table 5, there is a first-order autocorrelation in the error term. This should however not cause any problem according to Habimana (2016), due to that the dependent variable has one lag. Testing for second-order autocorrelation we find insignificant p-value which indicates that we do not reject the null hypothesis that the errors have no second-order serial correlation. Therefore we have created lags as instruments in our model.

According to Roodman (2006), it is necessary to check for overidentifying restrictions when running an `xtabond2` in GMM. Therefore we need to test for overidentifying restrictions by performing the Sargan-Hansen test. The null hypothesis is that the instruments are valid instruments, and therefore uncorrelated with residuals. All of the p-values in Table 5 are insignificant and do not reject the null hypothesis, which concludes that the instruments are valid.

4.3.2 Stationarity Test

In order to determine if there is any non-stationarity or unit root in our data, there is a test called Augmented Dickey-Fuller (ADF) to find this problem. Unit root means that our data follows a certain trend which is bad for purpose of the analysis. The result from the test shows that our dependent variables ROA, ROE, NIM and NR are stationary and have no unit root.

4.4 Discussion

In our first estimation, we conclude that there is a significant positive relationship between capital and ROA. When a bank increases the capital, the profitability will increase by around 6.4 units. ROA is the most common measurement used by researchers. ROA by net income, usually has quite a low percentage, but it takes both liabilities and equity into consideration, and therefore it is argued by Hassan and Bashir (2003), Singh (2010) and Rahman et al. (2015), to be the best measurement for industries like banks. Through our result, we have to agree with this statement, due to that the only significant measure in our estimation is the ROA and that net income in the profitability measure, reflects interest paid debt which is good for our study with capital. We can also confirm that the best profitability measure which suits equity to asset ratio is ROA according to Athanasoglou et al. (2008).

However, all of these four “return” and “margin” measures, do not appear to be "equivalent" in terms of the importance of capital, even if there is a link between them. The fact that ROA is affected positively indicates that capital replaces interest-bearing loans. In accounting, equity does not cost anything and with a smaller proportion of interest-bearing loans, everything else is equal to the net income, because of lower interest costs. If ROA had become significantly negative, it would indicate that the lending was affected negatively, due to adverse selection of, for example, smaller loan portfolio or more risky customers. Further, we also find a negative relationship between capital and ROE, on the other hand, it is not significant. Athanasoglou et al. (2008) suggest that the capital adequacy ratio is more suitable when using ROE as a measurement and in this direction, the result could have become better if we used the capital adequacy ratio for capital instead. From a shareholders point of view, if the relationship between ROE and capital were significantly negative, the returns to shareholders would be negatively affected, by increasing the capital in banks.

As discussed by Goddard et al. (2004 and 2010), they prefer using ROE as a measurement due to the different cost of capital in different countries. Goddard et al. (2010) also find a negative relationship between capital and ROE, and according to Mehta and Bhavani (2016) and Peavler (2017), ROE takes leverage into consideration and ROE will always be higher than ROA for example. If ROE were significant and positive, this would regard stronger evidence than the positive ROA coefficient, and would show that from a shareholder point of view, that they are satisfied. It would have indicated that, despite lower interest costs, there is

no higher return on the margin invested capital. Unfortunately, the ROE is not significant in this case so we can only make the conclusion that ROA is significantly positive, even if the other measures are more or less important than ROA.

We expected that all of our profitability measurements would either get significant or insignificant results, since Saunders and Cornett (2012) shows that there is a link between all of the profitability accounting measures. Therefore the insignificance of ROE, NIM and NR were surprising. We further thought that by dividing banks as we do in the second estimation, more significance would occur, but this did unfortunately not happen. The biggest difference between our research and Lee and Hsieh's (2013), is that we have data on fewer countries, and banks, and therefore fewer observations. This difference might be a reason for the insignificance in our model. Another reason for the insignificance could be that we used accounting based measures instead of the market value based, on all of the profitability and capital measures for the banks. However, as Osborne et al. (2013) argue, it is not easy to find market based data on banks.

As mentioned, ROA had a significantly positive relationship with capital and according to Admati & Hellwig (2014) and Olalekan (2013), capital will decrease the probability of bank failure, necessary in negative circumstances, efficiently change the allocation of downside risk between taxpayers and stockholders and protect high leverage banks. According to Berlin (2011), banks should have a higher capital due to that banks do not take some costs into consideration. It is also important for banks to take systematic risk into consideration, especially in highly leveraged firms like banks. As discussed by Jokipii & Milne (2011), banks increase their capital in reaction to an increase in risk, and that the risk-taking will increase if there is a higher capitalization level. In our model, we take credit risk into considerations which is a major risk in banks according to Bank for International Settlement (2016). Therefore we make the conclusion that a high capital is necessary in order to stay profitable in the long run and be safe from different banking risks. However, as mentioned before, in the recent years there have been a strong economy overall and the banks could have still remain or increased their profits due to a stronger economy and not to higher capital. Therefore it can be argued that it is not necessary that the relationship is causal.

Discussing the different capital structure theories, we clearly state that Modigliani-Miller theorem and the Tradeoff theory is not convenient to our findings for the only significant ROA measure for Nordic banks. Banks usually have high leverage and therefore higher debt-

to-equity ratio compared to other firms. The agency theory suggests that debt ratio should be high in higher profitability firms but as we see through the result that capital increases the profitability, the incentive to hold more capital can control for agency problems and give higher profitability in banks.

In our second estimation, we divided our sample into “Commercial banks” and “Savings banks”. We conclude that capital and profitability have a positive relationship with the significant result in NR for savings banks and ROA in commercial banks. When a bank increases its capital, it is expected that NR increases by 12.7 units in savings banks. ROA in commercial banks will also increase by 8.77 units. Our result in commercial banks is in accordance with Lee and Hsieh (2013). In line with Jacques and Nigro (1997), we also expected that the relationship between profitability and capital in commercial banks should be higher due to higher risks, in forms of liquidity, credit and systematic risks. According to Marco and Fernández (2004), commercial banks have a stronger tendency to risk-taking than in savings banks, and Köhler (2012) show that high rates of loans to growth, that there is in commercial banks, is connected with banking risk. Therefore banks, especially commercial banks, should have a capital buffer to protect themselves from systematic risk, during economic recession. Our findings support this argument when it comes to comparing the commercial banks with the whole sample of banks.

Our result on persistence effect shows that NIM has the highest persistence effect in both savings and commercial banks and ROA has the lowest in commercial banks. Our results on commercial banks are in the same direction as Lee and Hsieh (2013). To sum up, we observe that commercial banks behaviour is more similar to our first estimation results, considering both persistence effect and significant profitability measure. It can be said that our main result is more affected by commercial banks than savings banks. This result was expected due to that from our own knowledge, for example in Sweden, the four major commercial banks have together a strong position on the market with much more than half of the total market share.

In our third estimation, by adding regulation and institutional factors to all of the Nordic countries which are set to reduce bank risk-taking according to Agoraki et al. (2011), we will not reject hypothesis II and therefore say that it is correct. We observe that by taking these factors into consideration, the positive relationship between capital and profitability, ROA the only significant measurement, will not be disturbed. Our findings in Nordic countries are in

line with Lee and Hsieh (2013) in Asian banks. However, unlike their study, where they find significant results for all of the profitability measures, we only got the significant relationship between ROA and capital.

According to Barth et al. (2013), all Nordic banks fulfil a minimum of 8% capital adequacy and they all have implemented Basel II. As Nordic banks, belongs to high-income banks, we would say that they implement the right policies and regulations to achieve profitability. Moreover, all Nordic banks have more or less the same strictness in capital requirement. Regulation and institutional factors have already reflected on the capital term, and including them as control variable should not change the relationship between capital and profitability, or persistence of profit in a significant way. In line with our expectation, the result from our second model does not differ from our first model which is in accordance with Lee and Hsieh (2013).

5. Conclusions

This thesis investigates the relationship between capital and profitability in Nordic banks using data from 113 banks in five Nordic countries between the years 2011-2016. We apply the system Generalized Methods of Moments (GMM) approach in our study to compensate potential endogeneity, heteroscedasticity, and autocorrelation problems in the data. We test the following hypothesis: (i) Capital and profitability will have a positive relationship within Nordic banks and (ii) regulation/institutional factors will not disturb the results between capital and profitability within Nordic banks.

Our result suggests that increasing capital in Nordic banks will positively affect the profitability, by the measure ROA. We also find a positive persistence of profit for the profitability variables, which indicates that profitability in current year will be transferred to next year. By dividing our dataset into commercial and savings banks, we conclude that commercial banks affect the whole sample of banks more than savings banks in both relationships between capital and profitability, and persistence effect. We also find that when running the new robustness model with regulation and institutional variables, the result does not change from our first estimation. ROA is still significantly positive, and all of the profitability variables have persistence of profit.

Important policy implications arise from our empirical results. We show evidence that profitability measurement ROA will increase by holding higher capital in Nordic banks. We also suggest that authorities should consider using more than one profitability measurement, due to different results, and using only one single profitability variable can give totally wrong policy. It is also important now that our results show that commercial banks play a big role in the Nordic banking industry, since we find a positive persistence of profit. Nordic banks have a stable regulatory and banking system but due to our results, that capital improves the profitability, we suggest Nordic banks to implement the new Basel III capital requirement of 10.5% instead of 8% as long as there is a strong economy as it has been during the recent years.

We believe that further research is necessary. By changing the capital ratio from equity-to-asset to capital adequacy ratio, the result might change, and give more significant variables to the estimations. Also by changing from accounting based profitability measures to total market value of the banks (market value of debt and equity). Another future research is to

expand the numbers of countries and timeline, and this can give different result due to more observations. By investigating in European countries instead of only Nordic countries, and not all of the banks fulfil the Basel II capital requirements might give more interesting and discussible results.

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Appendix

Appendix 1. Summary and descriptions of variables on financial market regulations

<p>Capital requirements (CAPR)</p>	<p>This variable is determined by adding 1 if the answer is yes to questions 1–6 and 0 otherwise, and the opposite occurs for questions 7 and 8 (i.e., yes 0, no 1). The questions are: (1) Is the minimum required capital asset ratio (risk weighted) in line with Basel guidelines? (2) Does the ratio vary with market risk? (3–5) Before determining minimum capital adequacy, are any of the following deducted from the book value of capital? (a) Market value of loan losses not realized on the financial statements, (b) unrealized losses on securities portfolios, and (c) unrealized foreign exchange losses. (6) Have regulatory/supervisory authorities verified the sources of funds to be used as capital? (7) Can assets other than cash or government securities provide the initial or subsequent injections of capital? (8) Can borrowed funds provide the initial disbursement of capital? Thus, CAPR is an index of capital requirements that accounts for both initial and overall capital stringency. CAPR takes values between 0 and 8, with higher values indicating greater capital stringency.</p>
<p>Supervisory power (SPR)</p>	<p>This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each of the following 14 questions: (1) Does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors legally required to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Does the institution disclose off-balance sheet items to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend directors' decisions to distribute dividends? (8) Can the supervisory agency suspend directors' decisions to distribute bonuses? (9) Can the supervisory agency suspend directors' decisions to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare the bank insolvent? (11) Does banking law allow a supervisory agency or any other government agency (other than a court) to suspend some or all ownership rights at a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) supersede shareholder rights? (13) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace management? (14) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than a court) remove and replace directors? Thus, SPR is a measure of the power of supervisory agencies indicating the extent to which these authorities can take specific actions against bank management and directors, shareholders, and bank auditors. This index takes values between 0 and 14 with higher values indicating more SPR.</p>
<p>Market discipline and private monitoring (MDPM)</p>	<p>This variable is determined by adding 1 if the answer is yes to questions 1–7 and 0 otherwise, and the opposite occurs for questions 8 and 9 (i.e., yes 0, no 1). (1) Is subordinated debt allowed (or required) as capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance-sheet items disclosed to the public? (4) Must banks disclose their risk management procedures? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by a certified/licensed auditor mandatory for banks? (8) Does accrued, unpaid interest/principal on nonperforming loans appear on the income statement? (9) Is there an explicit deposit-insurance protection system? Thus, MDPM is an indicator of market discipline and shows the degree to which banks are forced to disclose accurate information to the public and whether there are incentives to increase market discipline. This index ranges between 0 and 8 with higher values indicating greater MDPM.</p>
<p>Activity restrictions (ACTR)</p>	<p>The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted, or prohibited and receive values of 1, 2, 3, or 4, respectively. We create an overall index by calculating the summation value of the four categories. ACTR ranges from 4 to 16, with higher values indicating higher restrictions.</p>

Source: Lee and Hsieh (2013). p.262 and 263

Appendix 2. Summary and descriptions of variables on institutional development

DEP	Deposit Insurance explicit 1; otherwise 0.
GSP	Shareholder protection; index scales range from 0 to 5, with higher scores for higher protection.
GCP	Creditor protection; index scales range from 0 to 5, with higher scores for higher protection
GLE	Legal efficiency is the multiple values for the rule of law and the efficiency of the judicial system, with higher scores for higher legal efficiency.

Source: Lee and Hsieh (2013). p.264

Appendix 3. Estimation results of capital and profitability for Savings banks

	(1)	(2)	(3)	(4)
L1.ROA	0.2677533 (0.144)			
L1.ROE		-0.0602996 (0.469)		
L1.NIM			0.8312517 (0.000)	
L1. NR				-0.0168711 (0.871)
CP	0.0495447 (0.104)	0.1142611 (0.58)	0.0051039 (0.841)	0.1270789 (0.001)
LLGL	-0.0676614 (0.000)	-0.949749 (0.000)	0.0098963 (0.368)	0.0262023 (0.186)
NLTA	0.0188795 (0.101)	0.1462252 (0.039)	0.0028147 (0.5)	-0.109098 (0.025)
LADSF	0.0303567 (0.000)	0.1425175 (0.025)	0.0034513 (0.498)	-0.0904996 (0.038)
INFL	0.0709419 (0.345)	0.9246107 (0.056)	0.0510514 (0.316)	0.2435286 (0.034)
GW	0.1725416 (0.019)	1.864702 (0.003)	0.0478092 (0.406)	-0.0593196 (0.557)
DCPS	-0.0111964 (0.022)	-0.0497819 (0.114)	0.0021314 (0.544)	0.0346629 (0.001)
RIR	-0.0610347 (0.46)	-0.0704647 (0.871)	0.0261027 (0.552)	0.3623805 (0.002)
AR (1)	0.066	0.048	0.068	0.074
AR (2)	0.582	0.609	0.909	0.156
Sargan-Hansen test	1	1	1	1
Number of banks	63	63	63	63
Observations	243	243	243	242
<p>Dependent variable is profitability: ROA, ROE, NIM and NR, respectively. Estimation method is the two-step GMM dynamic panel estimator. Significant level is 5%. The null hypothesis of the Sargan-Hansen test is that the instruments used are not correlated with residuals (over-identifying restrictions). The null hypothesis of the serial correlation test is that the errors has no second-order serial correlation. P-values are in parentheses. ROA: Return on assets; ROE: Return on equities; NIM: Net interest margin; NR: Net interest revenue against average assets; CP: Equity-to-total-assets; LLGL: loan loss reserves to gross loans; NITA: Net loans to total assets; LADSF: Liquid assets to customers and short-term deposits; INFL: Inflation; GW: GDP growth rate; DCPS: Domestic credit to private sector; RIR: Real interest rate.</p>				

Appendix 4. Estimation results of capital and profitability for Commercial banks

	(1)	(2)	(3)	(4)
L1.ROA	0.4054226 (0.005)			
L1.ROE		0.4768062 (0.038)		
L1.NIM			0.8265998 (0.000)	
L1. NR				0.7542277 (0.000)
CP	0.0877129 (0.028)	0.0967506 (0.825)	0.0057688 (0.845)	0.0430013 (0.443)
LLGL	-0.0325921 (0.277)	-0.4029426 (0.575)	0.0258326 (0.409)	0.0280361 (0.299)
NLTA	0.0084337 (0.266)	0.0153763 (0.896)	0.0112276 (0.064)	0.0051193 (0.237)
LADSF	0.0049262 (0.051)	0.0427124 (0.226)	0.0009919 (0.62)	-0.0003536 (0.887)
INFL	-0.0375707 (0.466)	-0.4602243 (0.599)	0.0274712 (0.714)	0.05749 (0.41)
GW	0.0238686 (0.459)	0.4575428 (0.512)	0.1386797 (0.139)	0.0275785 (0.604)
DCPS	-0.0066163 (0.278)	-0.0327659 (0.526)	0.0004796 (0.912)	-0.0028284 (0.498)
RIR	-0.0461807 (0.159)	-0.2183999 (0.714)	0.0509381 (0.337)	-0.0625058 (0.15)
AR (1)	0.027	0.042	0.042	0.021
AR (2)	0.746	0.345	0.345	0.283
Sargan-Hansen test	1	1	1	1
Number of banks	50	50	50	50
Observations	180	180	180	180

Dependent variable is profitability: ROA, ROE, NIM and NR, respectively. Estimation method is the two-step GMM dynamic panel estimator. Significant level is 5%. The null hypothesis of the Sargan-Hansen test is that the instruments used are not correlated with residuals (over-identifying restrictions). The null hypothesis of the serial correlation test is that the errors has no second-order serial correlation. P-values are in parentheses. ROA: Return on assets; ROE: Return on equities; NIM: Net interest margin; NR: Net interest revenue against average assets; CP: Equity-to-total-assets; LLGL: loan loss reserves to gross loans; NITA: Net loans to total assets; LADSF: Liquid assets to customers and short-term deposits; INFL: Inflation; GW: GDP growth rate; DCPS: Domestic credit to private sector; RIR: Real interest rate.