Corporate Governance in Banks

An empirical study of the effect of board structures on the performance and risk-taking of Western European banks

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Abstract

This thesis investigates the effect of board related corporate governance mechanisms on bank performance and bank risk-taking using a sample of 55 Western European banks from 2007-2016. Through a review of the agency theory, the theoretical corporate governance problems in the banking sector, and the empirical corporate governance literature on banks, we develop six hypotheses which are tested using OLS and fixed effect regressions.

From our empirical results, we find an indication that board size affect both bank performance and bank risk-taking, and that board independence affect bank risk-taking. We find an inverted U-shaped relationship between board size and bank performance and a U-shaped relationship between board size and bank risk-taking. We explain these relationships by the ability of the board directors to advice and monitor management. Using non-performing assets over total assets as a proxy for risk-taking we find an inverted U-shaped relationship between the proportion of independent directors and bank risk-taking. The inverted U-shaped relationship might be explained by the combination of increasing information asymmetry and the changing reputational effects of independent directors.

We contribute to the existing literature as our findings provide indications that the size of the board affects bank performance. Furthermore, we contribute to the limited literature regarding bank risk-taking as we find indications of how specific board related corporate governance mechanisms affect bank risk-taking. Finally, we provide a discussion of the limitations of this thesis and possible areas for future research to investigate within corporate governance for banks.

Contents

1 Introduction

The outbreak and the consequences following the financial crisis in 2008 illustrates the vulnerability of the economy to the excessive risk-taking by banks, and emphasizes the important role of banks to the functioning of the economy (Kirkpatrick, 2009). The important and integrated role of banks in the economy as capital providers, deposit insurance and the fact that some banks are "Too big to fail", causes moral hazard issues, incentivizing bank shareholders to engage in excessive risk-taking (Bebchuk & Spamann, 2009; Macey & O'Hara, 2003). Additionally, information asymmetries arise as banks are complex and opaque, preventing depositors from monitoring banks' behaviour. Consequently, the regulators monitor banks to avoid the economic consequences of bank defaults. Hence, as bank shareholders and the regulators have conflicting interests, this complicates the corporate governance in the banking sector (Macey & O'Hara, 2003). In relation to this, the Basel Committee on Banking Supervision, argues that the stakeholders' interests should be the focus of corporate governance practices in the banking sector, by stating that:

> *"The primary objective of corporate governance should be safeguarding stakeholders' interest in conformity with public interest on a sustainable basis. Among stakeholders, particularly with respect to retail banks, shareholders' interest would be secondary to depositors' interest."*

(Basel Committee on banking supervision, 2015, p. 3)

Additionally, the Basel Committee highlights the importance of bank boards in relation to mitigating bank risk-taking and thus, that bank boards play a vital role in the overall corporate governance of banks (Basel Committee on banking supervision, 2015; Levine, 2004). Hence, from the perspective of the regulator, the board serves as a key mechanism for monitoring management behaviour and providing strategic advice to management (Andres & Vallelado, 2008).

Thus, it is important to investigate how bank risk-taking is affected by bank boards. Interestingly, however, the ability of bank boards to affect bank risk-taking is an area that has received little attention by the existing corporate governance literature (Iqbal, Strobl, & Vähämaa, 2015; Pathan, 2009). Instead, the majority of the existing literature has focused on the effect of bank boards

on bank performance. In addition, to the best of our knowledge only Zagorchev and Gao (2015) investigate the effect of bank boards on both bank performance and bank risk-taking.

This thesis uses a sample of 55 large banks from 15 developed Western European countries for the period 2007-2016. Using OLS and fixed effect regressions, this thesis seek to investigate the effect of bank boards on bank performance and bank risk-taking.

Similar to several other studies regarding bank performance, we find that bank boards affect bank performance. Additionally, we also find that bank boards affect bank risk-taking. Finally, the findings of this thesis imply that there might not necessarily be a risk-return trade-off between bank performance and bank risk-taking when choosing the board size of a bank. However, this trade-off should be further investigated by future research before conclusions can be made. Thus, this thesis contribute to the limited corporate governance literature in two ways. First, we confirm the finding from previous literature that board size affect bank performance. Secondly, we contribute to the limited literature regarding bank boards and bank risk-taking, by investigating the effect of specific board related corporate governance mechanisms on bank risk-taking.

1.1 Research question

The purpose of this thesis is to investigate the effect of specific board related corporate governance mechanisms on bank performance. Furthermore, we seek to investigate the specific link between specific board related corporate governance mechanisms and risk-taking as there is limited evidence within this area of the existing literature (Zagorchev & Gao, 2015; Pathan, 2009). More specifically, we seek to answer the following research question:

"Do board related corporate governance mechanisms affect performance and risk-taking in Western European banks from 2007-2016, and if so, how?"

This research question is answered using specific hypotheses that will be tested empirically using econometric tests. In Section 3, the hypotheses are developed based on relevant corporate governance theory and previous empirical findings. In order to structure the analysis and the review previous literature and theory, the research question has been split into two sub-questions:

1. "Does board size, board independence and gender diversity on boards affect the performance of Western European banks in the period of 2007-2016, and if so, how?"

2. "Does board size, board independence and gender diversity on boards affect the risk-taking by Western European banks in the period of 2007-2016, and if so, how?"

For the purpose of answering the first sub-question, hypotheses related to performance are developed. The aim of the hypotheses related to performance is to investigate the effect of board related variables on performance of banks. In connection to this, performance represents the interests of shareholders who seek to maximize returns. For the purpose of answering the second sub-question, hypotheses related to risk-taking are developed. The aim of the hypotheses related to risk-taking is to investigate the effect of board related variables on risk-taking in banks. In connection to this, risk-taking represents the interests of regulators who seek to minimize excessive risk-taking.

1.2 Delimitation

To limit the scope of this thesis, delimitations are necessary to ensure that only the relevant research area is addressed. The limited scope of this thesis provides a foundation for investigating the effect of bank boards on bank performance and bank risk-taking.

Within corporate governance, different theoretical approaches exist. We choose to investigate the corporate governance of banks from an agency theory perspective, and thus delimit our thesis from using the stakeholder theory or the stewardship theory (Donaldson & Davis, 1991; Freeman & Reed, 1983). Furthermore, we will mainly focus on the broad view of the agency theory as this will allow us to investigate both the interests of bank shareholders and bank stakeholders, i.e regulators. Thereby, we do not focus on the narrow view, which only addresses the conflict between bank shareholders and managers (Macey & O'Hara, 2003). In relation to agency theory, we are aware that we do not solve the potential agency problems that might be present between bank shareholders and stakeholders of the bank. Additionally, there are different types of corporate governance mechanisms which could be studied, such as incentive pay, ownership structure and the board of directors. However, the main focus of this thesis will be on the board of directors.

The types of banks that we have chosen to include in our sample are commercial banks and uni-

versal banks. Commercial banks are banks that provide traditional banking services, and universal banks are banks that provide both traditional- and investment banking services. Furthermore, we only include banks that are publicly listed as private banks do not provide the necessary data. Additionally, we only include Western European banks as the majority of previous literature focuses on US banks.

Endogeneity issues often occur in corporate governance research, and there are several potential ways of accounting for this by using different econometric methods. However, we choose to use the OLS estimator and fixed effects estimator, as more advanced methods, such as system GMM and instrumental variable estimation, are out of scope for this thesis.

1.3 Structure of thesis

This thesis is structured the following way. In Section 2, the general agency theory and the corporate governance problems in the banking sector are outlined. In Section 3, our hypotheses are developed based on board related corporate governance theory and previous empirical findings. In Section 4, our data and methodology is discussed. In Section 5, we test our hypotheses and interpret on the empirical results. Section 6, discusses the limitations of our thesis and provides suggestions for future research. Finally, we conclude in Section 7.

2 Theory of corporate governance in a banking context

The corporate governance theory in a banking context is complex as there are many dynamics affecting the corporate governance of banks. In Section 2.1, two views of the focus of corporate governance are outlined. In Section 2.2, the general agency theory and the narrow view of the corporate governance is explained and elaborated upon. In Section 2.3, the important role of banks in the economy is explained. Furthermore, the implications of bank-specific dynamics are discussed in a corporate governance context. Finally, in Section 2.4, we explain how bank-specific dynamics provide a basis for our investigation of corporate governance mechanisms in banks.

2.1 Two views on the focus of corporate governance

A general corporate governance debate revolves around the issue whether corporate governance research should focus on a narrow view or a broad view. On the one hand, some researchers argue that the focus of corporate governance research should be how to align the interests between managers and shareholders, i.e. a narrow view. On the other hand, some researchers argue that the focus of corporate governance research should be how the interests of managers should be aligned with the interests of both shareholders and general stakeholders, i.e. a broad view (Becht, Bolton, & Roell, 2007; Macey & O'Hara, 2003).

Both the narrow and broad view stem from corporate governance researchers commonly viewing the firm as a nexus of contracts (Coase, 1937; Easterbrook & Fischel, 1989; Kornhauser, 1989). As it is not possible to make a contract that accounts for all possible outcomes, these contracts are non-exhaustive. Hence, a problem occurs when an agent (manager) has to make a decision that has not been specifically defined in the contract. As contracts are non-exhaustive, the aim of corporate governance is to ensure that an agent (manager), acts in the interest of the principal (shareholders), when the limits of a contract does not stipulate what to do.

The narrow view is rooted in the argument that only the contracts of the shareholders are open-ended. This means that after contractual obligations for other constituents, such as employees, suppliers and customers, have been met, only shareholders can claim remaining gains from the company. Thus, as the shareholders bear the residual risk of the company, e.g. in case of default or financial loss, shareholders will receive all of the remaining value in a firm, only after all other stakeholders have been compensated in accordance with their respective contracts (Williamson, 1985, 1984; Jensen & Meckling, 1976). As shareholders can only claim residual value, Jensen and Meckling (1976), argue that the main focus of corporate governance should be on how to ensure that managers increase the value of the firm (Becht et al., 2007).

Although it is important to protect the interests of the shareholders, Freeman and Reed (1983) argues that managers should take the interests of other stakeholders into account, e.g. customers, employees and society. If the interests of stakeholders are not taken into account in the long term, the firm will cease to exist (Freeman & Reed, 1983). Additionally, Hart (1989) argues that when a

firm is formed as a nexus of contracts, the contracts are constructed to accommodate the interests of all relevant stakeholders of the firm. Thus, other stakeholders than shareholders might have incomplete contracts, and their interests should be taken into account. Thus, these arguments provide a theoretical foundation for viewing corporate governance in a broader context, including the interests of both stakeholders and shareholders.

In the case of banks, Macey and O'Hara (2003) argues that society and the regulators are key stakeholders, whose interests have to be taken into account. These stakeholders bear substantial risk in the case of bank default, due to the threat of an economic crisis and potential bailout of the banks. This was evident in the financial crisis in 2008. In relation to this the Basel Committee on banking supervision (2015); Alexander (2006); Macey and O'Hara (2003) argue that a broad view of the role of corporate governance is relevant for the banking sector, including society as a key stakeholder.

2.2 Agency theory and the narrow view

Berle and Means (1932) established the paradigm of corporate governance providing a foundation for the agency problems within the separation of ownership and control. The issue in focus was how managers of a corporation, under the lack of scrutiny of the company's dispersed shareholders, could utilize the resources of the firm so it would benefit them personally. Following this, Jensen and Meckling (1976) introduced the common "principal-agent problem" in the form largely used today. The common agency problem arises when an agent, that is obliged to represent the interests of its principals, acts in her own interest. The key assumption is therefore that the agents (managers) and the principals (shareholders) have diverging interests. First, the counterparts have diverging interests in terms of provision of effort, meaning that managers' effort is costly for managers but creates value for the shareholders. Secondly, they have diverging interests regarding the consumption of perks, i.e. when a manager is not the owner of the firm, she has the incentive to consume perks and other corporate resources beyond what is optimal as she does not bear the cost of consumption. Thirdly, interests diverge with regards to investment decisions, i.e. given that manager's wealth is primarily tied to the firm, managers are likely to take less risky decisions compared to what is optimal from the perspective of diversified shareholders. Thus, according to

the narrow view, the main purpose of corporate governance is to address these issues by the problems that arise when there is separation between ownership and control (Jensen & Meckling, 1976). To address these issues, and mitigate the diverging interests between managers and owners, three major forces help discipline managers: competition in product markets, the internal monitoring systems (board of directors) and the capital market (Jensen, 1986).

The first disciplining mechanism is the product markets. According to Hart (1983), managerial slack is less present in competitive markets. Thus, the disciplinary forces of a competitive market put pressure on managers to act in the interest of shareholders by making sure that the company's competitive edge is sustained. If the manager does not succeed in this act, she will most likely loose her job. Thus, the firm must be able to compete in the market and therefore the product markets is a disciplining force of the manager (Jensen, 1986).

The second disciplinary force of managers is the board of directors. The board of directors monitor the decisions by managers on behalf of the shareholders. The board of directors can monitor and discipline management by implementing penalties through its right to fire under-performing managers. In addition to monitoring management, the board of directors can incentivize managers by designing incentive schemes which are in place to align the interests between managers and shareholders. Aligning the interests of management with shareholders can occur through tying the compensation of the managers to the firm's stock performance. Shareholders make managers co-owners by providing managers with stocks or options as a part of their compensation plan. This directly ties the manager's wealth to the performance of the stock, and thereby connects the manager's interests directly to those of the shareholders. There seems to be broad agreement towards the necessity of using incentive schemes, from both a practical and theoretical perspective (Goergen & Renneboog, 2011; Becht et al., 2007). However, the structure of the compensation plan can significantly affect the risk-taking by managers (Coles, Daniel, & Naveen, 2006).

The third disciplinary force of managers is the capital market. If the capital market does not believe that the board of directors are acting in the interest of shareholders, the capital market can discipline managers and the board of directors trough hostile takeovers, proxy fights and shareholder activism (Becht et al., 2007). If a firm is delivering poor stock performance, it is a signal that the manager is not doing a good job. Consequently, it is more likely that a hostile takeover will happen.

A hostile takeover of a poorly performing firm can be initiated by a competitor or a private equity firm that wants to profit from improving the performance of the firm. Thus, the threat of hostile takeover of a firm, incentivizes and disciplines the manager to do a good job and act in the interest of shareholders. Another way that the capital market can discipline managers is through proxy fights and the presence of active shareholders. In proxy fights, minority shareholders and active shareholders are able to join forces and enforce changes in management and board of directors (Becht et al., 2007). Hence, the threat of a proxy fight disciplines managers to act in the interest of the shareholders.

To address these problems, corporate governance literature has studied various mechanisms, but primarily focused on 1) the monitoring mechanisms, such as ownership concentration, takeovers and the boards of directors, and 2) incentive schemes, i.e. performance-based compensation. In our thesis, the functioning of the board of directors is the main corporate governance mechanism investigated. Nevertheless, the common agency problem is not limited in being present between a manager and the shareholders of the firm. The problem of diverging interests can also occur between managers and other stakeholders. As mentioned in 2.1, incomplete contracts may also exist for stakeholders, such as regulators acting on behalf of societal interests.

2.3 Corporate governance in banks

In the following section, the main dynamics of banks are explained using the following structure. First, the opaque and complex nature of the banking business is elaborated upon. Secondly, the role of banks as capital providers to firms and individuals and the implications of this role are discussed. This includes a discussion of how deposit insurance and the "Too big to fail" issues have caused moral hazard in the banking sector. Furthermore, we will discuss how incentive structures of managers amplifies the moral hazard problem. Finally, implications of the moral hazard issues of banks are discussed in relation to the role of regulators.

2.3.1 Opaqueness and complexity of banks

In general, a party (person) that works in a firm has an informational advantage over another person who does not work in the firm. This is known as information asymmetry (Akerlof, 1978). Thus, information asymmetry occurs when one party has more information than the other party. In the context of corporate governance, managers possess more information about a firm than shareholders do, as the managers are hired to manage the daily operations of the firm. Accordingly, there is most likely information asymmetry between the managers of a firm and the shareholders of a firm.

In the case of large public firms, shareholders are often dispersed and therefore they do not have the time or resources to monitor the actions of the managers. Therefore, the monitoring mechanism is transferred to the board of directors. However, this also implies that the board of directors might face problems of information asymmetry because the board simply does not have as much knowledge and information about what is going on in the firm as the firm's managers (Bebchuk & Spamann, 2009).

Managers might have an interest in limiting the flow of information to the board in order to extract private benefits or hide possible managerial errors. In this instance, information asymmetries arise between the directors on the board, and the management of the firm, because management is able to control the information provided to the board. Thus, due to the information asymmetry between the managers and the board of directors, the manager is able to hide certain information from the board (Becht et al., 2007).

For banks, the degree of information asymmetry between management and the board of directors, is amplified by the complexity and opaqueness of the banking business (Andres & Vallelado, 2008). There are several drivers of the inherent complexity and opaqueness of banks. These drivers include the trading of complex financial products, complicated organizational structures and entanglement of banks between each other (Adams, 2010).

Some of the financial products of banks are based on complex mathematical structures that depend on unforeseeable and volatile macroeconomic factors. The complex financial products causes the banks' portfolio to shift rapidly based on the dynamic changes in available information and economic

data. As the complexity of the financial products increase, it becomes more difficult for people outside the banking sector to understand the products. As an example, the banks' creation of credit default obligations (CDOs), were criticized for being too complex for most people to understand, after the outbreak of the financial crisis in 2008. (Becht, Bolton, & Röell, 2011; Crotty, 2009).

Most large public banks are organized as bank holding companies (BHCs). This means that the holding company owns subsidiary banks that engage in various different banking activities. For instance, each subsidiary bank might have its own board of directors reporting to the bank holding company. Furthermore, the directors on the board of the holding company might also sit on several of the subsidiary boards. Consequently, due to the holding structure and the subsidiary banks, the flow of information is filtered through the subsidiary boards before reaching the management and board of directors in the holding company. Thus, information has to be processed through more actors before it reaches the top management of the bank. This organizational structure makes the decision-making process and the information flow of banks complex and adds to the opaqueness of complexity of the banks (Adams, 2010; Bebchuk & Spamann, 2009).

Finally, banks trade financial products with each other, non-financial institutions, individuals and governments. This makes the decision-making of banks more complex, as the far-reaching impact of financial investments is difficult to assess. Moreover, the risk that banks pose to the economy, i.e. systemic risk, has been a main driver of regulation which is further elaborated upon in section 2.3.2 to 2.3.4 (Diamond & Rajan, 2001; Levine, 2004; Andres & Vallelado, 2008; Mamatzakis & Bermpei, 2015).

The precedent explanations of the reasons for the complexity and opaqueness of banks amplify the information asymmetry between managers and board directors. The complexity of banking business put high demands on the board members' ability of to understand and challenge new complex business initiatives. Consequently, it is more difficult for the board to advice and monitor the behavior of the bank managers because directors might not fully understand the operations within the bank, or because managers might withhold information (Macey & O'Hara, 2003).

2.3.2 Banks as liquidity providers

Banks have an important role in society because they provide liquidity to the market. More specifically, banks transform deposits from their customers into loans for firms, other banks and individuals that need capital. Banks provide capital to firms, which enables these firms to make investments that create value in the future. The widespread connection of a bank to companies, other banks as well as individuals, implies that a bank default will have large consequences for the overall economy. The economic entanglement of banks is thus referred to as the systemic risk of a bank (Macey & O'Hara, 2017, 2003). In other words, what makes the banking business unique compared to non-financial firms, is its ability to transform short-term liabilities into long-term assets, and its economic entanglement.

Notably, unlike non-financial firms, a loan is an asset for a bank, whereas deposits is the main source of funding for a bank, and therefore deposits is considered a liability on the balance sheet. As deposits are the main funding source, banks are much more levered than non-financial firms, and often finances its assets (bank loans) with more than 90 pct. of liabilities (deposits from customers). As this is the core dynamic of the banking business, it generally means that a bank does not have much equity to cover potential losses. As banks are highly leveraged, banks are more likely to be exposed to financial distress.

In addition, the small amount of equity financing implies that a bank does not have the ability to payout the deposits to all of its customers simultaneously. For these reasons, and because of a bank's role as a liquidity provider, even solvent banks can be exposed to bank runs and therefore risk defaulting (Alexander, 2006).

2.3.3 Deposit insurance

A bank run is a situation where customers fear that the bank is about to default and not able to payout deposits to all customers at the same time. Thus, customers start fearing they will lose their deposits, and subsequently want to withdraw their deposits. As the bank does not possess enough liquidity to serve all the payouts at the same time, it defaults (Alexander, 2006). In 2007, the British bank, Northern Rock, was close to defaulting due to a bank run. As a consequence

the British government had to make a taxpayer-backed guarantee to depositors, and only then did the bank run stop (The Economist, 2007). In order to avoid bank runs and preventing banks from defaulting, governmental institutions have implemented deposit insurances to ensure customers that their savings are safe. Deposit insurance was primarily implemented after bank runs had played a major role in escalating The Great Depression in the 1930's. More specifically, deposit insurance insures the deposits of the individual bank customer, in the case of a bank defaulting (Alexander, 2006). Thus, the role of the bank as a facilitator of liquidity is the main reason that government regulators impose deposit insurances to bank customers (Bebchuk & Spamann, 2009).

When a government provides deposit insurances to bank customers it aims to avoid the case of a bank run. The government wants to avoid this because of the potential chain reaction of several solvent banks defaulting as a result of one bank defaulting. A chain reaction of defaults could ultimately have large negative consequences for the economy and lead to financial and economic crisis, as seen during the financial crisis in 2008. Thus, a bank's size and entanglement with other non-financial firms and banks, imposes the magnitude of a bank's systemic risk (Macey & O'Hara, 2003). These deposit insurance initiatives have been relatively successful in preventing bank runs. However, various problems within the corporate governance of banks have also occurred as a result of deposit insurance (Bebchuk & Spamann, 2009).

2.3.4 Moral hazard of banks

Moral hazard problems occur in banks for two main reasons; because of deposit insurance and because banks are "Too big to fail".

First, deposit insurance might prevent bank-runs, however deposit insurance also removes the incentive for depositors to monitor whether managers on behalf of bank shareholders make excessively risky investments. Excessive risk-taking is defined as making an investment decision that has a negative expected value (Bebchuk & Spamann, 2009). The dynamics of deposit insurances are present in the banking sector but not present for non-financial firms. Thus, in a non-financial firm, debt-holders have an incentive to monitor whether the shareholders of a firm undertake excessively risky investments. When a firm is under financial distress, i.e. as it starts to have difficulties with

paying back its debt, and capital holdings starts to diminish, shareholders will be incentivized to take excessive risk. The reason for this, is that shareholders will not be exposed to the full downside of the excessively risky investment, because the downside will transfer to debt-holders in the case of firm default. In other words, shareholders can expect a large upside from the investment, without facing the risk of paying for the full downside of the investment (Bebchuk & Spamann, 2009). Thus, the upside for shareholders is larger from the risky investment than the potential loss of stock value in case the firm defaults. Hence, as debt-holders bear the potential costs of risky investments they have an incentive to monitor shareholders closely when a company is in financial distress.

As banks are generally highly levered, banks are closer to financial distress. However, because of deposit insurance, the depositors (bank debt-holders) do not have the incentive to monitor the shareholders, to make sure that excessively risky investments are avoided. That is why managers in banks, if they act in the interests of shareholders, might undergo excessively risky investments more often, because they are not monitored by depositors. In this way deposit insurance causes moral hazard problems because depositors are no longer incentivized to monitor whether the bank engages in excessive risk-taking (Bebchuk & Spamann, 2009).

Secondly, large banks imposing high systemic risk, are "Too big to fail", as they serve large capital needs in the market and are entangled with other banks and the economy (Alexander, 2006). The "Too big to fail" issue occurs when a bank is systemically important to the economy. As shareholders and bank managers are aware of the inherent systemic risk of their bank, this causes a moral hazard problem because the shareholders and bank managers know that regulators will bail out the bank in case of bankruptcy. This situation further incentivizes the bank managers to take excessive risk as they do not face the prospect of going bankrupt as result of excessive risk-taking (Bebchuk & Spamann, 2009).

An example of the moral hazard problems in banks is found in the financial crisis in 2008. More specifically, Bebchuk and Spamann (2009) found that while the large US bank, Bear Sterns, was bailed out and sold to another major bank, the top executives gained more than 1.4 billion dollars in cash bonuses. This finding by Bebchuk and Spamann (2009) illustrates the moral hazard problems in the banking sector, as the managers of a defaulted bank did not suffer substantial personal

financial losses, but on the contrary had large financial gains.

2.3.5 Incentive schemes - Enhancing excessive risk-taking and moral hazard

In the context of banks, the effects of compensation plans to managers change because of the moral hazard issues. There are two challenges regarding incentive schemes for banks. First, similar to non-financial firms, the overall challenge of an incentive schemes is to properly align the interests of managers with the interests of shareholders. Secondly, when this alignment is reached through incentive schemes in banks, it incentivizes managers to take even more excessive risk because of the moral hazard issues (Bebchuk & Spamann, 2009).

According to general corporate governance theory, managers are risk-averse and thus less prone to take risks compared to shareholders. The reason is that managers fear for the reputational damages that large risk-taking can cause, which might prevent the managers from getting a future job (Becht et al., 2011). This is an example of the misalignment of interests between managers and shareholders. To solve this issue, incentive schemes are designed to improve the alignment of interests between shareholders and managers. If managers only receive a fixed salary, they have no extra incentive to take more risk.(Goergen & Renneboog, 2011) Therefore, managers are often provided with equity as compensation, and thereby managers become shareholders. As the managers become shareholders of the company, the interests of the managers are more aligned with those of the shareholders. When interests are better aligned, managers may work harder and more efficiently in order to increase the value of the company. However, a caveat of providing management with equity is that a larger portion of the managers wealth is tied to the firm. This in turn decreases the incentive for managers to engage in risk-taking, as the wealth of managers might not be as diversified as the wealth of diversified shareholders (Coles et al., 2006).

To increase the risk-taking behavior of managers, compensation plans can include stock options. The effect of compensating managers with stock options is that managers are directly incentivized to increase the volatility of the stock of the company. As the volatility of the stock increases, the wealth of the managers increase. Hence, including stock options in managerial compensation schemes increase the managerial incentives to engage in risky projects (Coles et al., 2006).

In the case of banks, the effect of stock options on the risk-taking by managers is higher than managers in non-financial firms (Bebchuk & Spamann, 2009). This is because, bank shareholders have an incentive to engage in excessive risk-taking because of the moral hazard problems in banks. Thus, when alignment is increased between bank shareholders and bank managers through stock options, managers will be more inclined to engage in excessive risk-taking (Hagendorff & Vallascas, 2011; Fahlenbrach & Stulz, 2011; Bebchuk & Spamann, 2009; Chen, Steiner, & Whyte, 2006).

2.3.6 Regulation of banks due to corporate governance problems

An effect of deposit insurance is that depositors do not face the risk of losing their deposits, as the deposits are guaranteed by regulators. Therefore, depositors do not have incentive to monitor whether the banks take excessive risks. Additionally, depositors are dispersed and face information asymmetry as they are outsiders. Therefore, the depositors do not have the incentive nor the resources or capabilities to monitor the behavior of banks. As the regulators guarantee the deposits through deposit insurance, the regulators bear the risk of having to compensate depositors in the case of a bank failure. The transfer of risk from depositors to regulators is further complicated by some banks being "Too big to fail". Due to the high systemic risk of large banks, regulators cannot allow these banks to default as it would have large negative consequences for the economic system. This is because if such a bank would default, it would cause other banks to default, and thereby regulators would have to compensate all of the depositors of several banks. Moreover, if several banks default, this could also launch the economy into a financial crisis, which in turn would cause severe economical damages for the main representative of regulators, namely taxpayers. As a consequence of deposit insurance and the "Too big to fail" issues, the regulators possess the risk of paying for the default of the banks and for the widespread consequences of this. To reduce the risk-taking by the banks and thus bank failures, regulators have imposed strict regulation which the banks must comply with. The regulators have strict regulation as failure to regulate the banks lead to taxpayers paying for the risk-taking by the banks. However, as Bebchuk and Spamann (2009) argues, the complexity of the banking sector and the limited resources and information of the regulators cause regulation of banks to be imperfect. That is why, according to Bebchuk and Spamann (2009); Alexander (2006) and Macey and O'Hara (2003), the focus of regulators should

be on aligning the interests of bank managers and taxpayers.

2.4 Key take-aways from the theoretical discussion

As argued in the beginning of the theory section, two views on corporate governance exists, namely the narrow view of corporate governance and the broad view of corporate governance. As previously outlined, the narrow view focuses on aligning the interests between shareholders and managers with the goal of increasing performance, whereas the broad view focuses on aligning the interests between managers and all stakeholders, including shareholders. Based on the previous discussion regarding corporate governance in banks, we want to investigate how corporate governance mechanisms affect both performance and risk-taking in banks. The performance measures will represent the interests of shareholders and the risk measures will represent the interests of the regulators.

The reason why we do not only investigate the performance of banks, but also investigate the risk-taking by banks, is because of the specific dynamics of the banking sector. The important and integrated role of banks in the economy as capital providers causes some banks to be "Too big to fail". This fact combined with the presence of deposit insurance causes a moral hazard issue in banks. The moral hazard incentivizes banks to take excessive risk, which can potentially jeopardize the economic stability. Moreover, the taxpayers, represented by regulators, are the ones paying for the excessive risk-taking by banks in the case of bank default. Consequently, the goal of the regulators is to minimize the excessive risk-taking by banks.

As the goal of the regulators is to minimize excessive risk-taking we want to investigate how board-specific corporate governance variables affect banks' risk-taking as well as how these variables affect performance. Specific hypotheses relating to performance and risk-taking is developed in the next section.

3 Related literature and hypothesis development

The following section provides a review of the corporate governance literature within board structure and composition for banks. Based on the theoretical foundations and the empirical findings

outlined in the following section, the hypotheses which are tested in the empirical analysis are developed.

3.1 Board differences between banks and non-financial firms

The specific corporate governance problems in the banking sector implies that banks might have different corporate governance practices and board structures. Accordingly, Adams and Mehran (2003) investigate whether there is evidence for significant differences in the corporate governance practices between banks and non-financial firms. For example, as bank boards might also represent the interests of other stakeholders, Adams and Mehran (2003) argue that, on average, the optimal size of boards in banks should be higher than in other non-financial firms. Therefore, a larger board size should be positively linked to the size of the bank Adams and Mehran (2003); Hermalin and Weisbach (2001); Baker and Gompers (2000). The larger board size in banks might be justified by bank complexity, thus implying a higher complexity of board work. Additionally, Adams and Mehran (2003) find that banks have a larger proportion of independent directors, compared to non-financial firms. This difference might be due to the regulatory differences between banks and non-financial firms. Conclusively, the empirical evidence delivered by Adams and Mehran (2003), supports the theoretical discussion initiated by Macey and O'Hara (2003). Thus, the bank specific characteristics imply that the 'optimal' governance model of the banks might differ from the one of non-financial firms.

3.2 H_1: Board size and performance

The primary role of non-executive directors on a board is to monitor the management to ensure alignment between management and shareholders (Jensen & Meckling, 1976). However, when the board size increases, its members might be more likely to free-ride due to the expectation that other directors will monitor management. Furthermore, coordination problems occur when several opinions from different directors have to be taken into account, complicating the decision-making process and generally hampering board effectiveness. These arguments are brought forward by Jensen (1993), who argue that larger boards lead to less effective monitoring of the management.

Consequently, it becomes easier for the management to capture the board and extract private benefits of control at the expense of shareholders. Thus, based on Jensen's (1993) arguments, a larger board is negatively related to firm performance.

Accordingly, Pathan and Faff (2013) find a negative relationship between board size and bank performance using a sample of large US banks between 1997 and 2001. Their findings are consistent with the arguments provided by Jensen (1993), and supports the notion that large board causes lower bank performance. More recently, Mamatzakis and Bermpei (2015) confirm these results. Specifically, they find that the performance of a bank starts to decrease for each additional director employed beyond the first ten directors.

Although monitoring of management is an important task of the board of directors, the advising role of the board might be more relevant in banks. This is because the high complexity of the banking business pose a larger advising requirement from managers of banks. Therefore, a larger board might create value for a bank as the pool of resources and expertise on the board increase when the board becomes larger. This is because the board of directors might be able to provide better advice when there is a larger pool of resources and expertise is on the board (Coles, Daniel, & Naveen, 2008; Dalton, Daily, Ellstrand, & Johnson, 1998).

In line with this, the study by Adams and Mehran (2012) find that larger boards positively affect bank performance. Specifically, in line with the advisory contribution of the board, the authors show that the positive relationship can be due to large banks having a higher degree of directors who sit at both the board and the bank's subsidiary boards (Adams & Mehran, 2012). Accordingly, directors who sit at several boards within the same bank are able to provide better advice because they have a larger amount of firm-specific knowledge. Thus, for a complex firm, such as a bank, directors with more bank-specific knowledge might create additional value compared to directors with less bank-specific knowledge.

Andres and Vallelado (2008) find an inverted U-shaped relationship between board size and bank performance. Thus, up until a certain board size, an increase in board size is positively affecting bank performance. However, after a certain board size, an increase in board size negatively affects bank performance. According to Andres and Vallelado (2008), the positive relationship between

board size and performance is an indication that, up to a certain board size, adding an additional director increases the advising capabilities of the board, which positively affects bank performance. However, according to Andres and Vallelado (2008) negative effects arise from free-riding and coordination problems when the board becomes large. Therefore, when the board becomes too large, the negative effects of free-riding problems outweigh the positive effect of a more resourceful board that is able to advice management better. Consequently, Andres and Vallelado (2008) argues that there is a trade-off between the positive effects and the negative effects of a large board.

Based on the arguments presented above and the findings of Andres and Vallelado (2008) we propose the following hypothesis:

H_1: "There is an inverse U-shaped relationship between the board size and bank performance"

3.3 H_2: Board size and risk

For regulators and thereby society, the goal is to reduce excessive risk-taking for banks as regulators are the ones who have to bail out the banks in order to prevent the banks from defaulting. To the best of our knowledge, there is limited theory on the relationship between board size and risk-taking. Furthermore, there has been limited investigations on the isolated effect of board size on the risk-taking by banks, though Pathan (2009) provide results on this. Pathan (2009) finds a negative relationship between board size and bank risk-taking. Pathan (2009) explain this by arguing that a smaller board is more shareholder friendly, which therefore increases risk-taking on behalf of shareholders. Thus, as argued by Macey and O'Hara (2017, 2003) and Bebchuk and Spamann (2009), if the interests of bank managers are aligned with the interests of shareholders, bank managers might be motivated to engage in excessive risk-taking on behalf of the shareholders. This is mainly due to the moral hazard problem which occur from the dynamics of deposit insurance, the "Too big to fail" issues and the high leverage of banks, which incentivize shareholders to engage in excessive risk-taking.

As argued by (Jensen, 1993), and found by previous literature (Pathan & Faff, 2013; Mamatzakis & Bermpei, 2015; Hermalin & Weisbach, 2001), a larger board reduces firm value because of the decrease in monitoring as a result of free-riding problems. According to Jensen (1993) the primary

role of the non-executive directors on the board is to monitor the management to ensure alignment between the interests of management and shareholders. Accordingly, a decrease in monitoring should therefore decrease the alignment between managers and shareholders. Therefore, it can be assumed that the alignment of interests between managers and shareholders increase, when monitoring increase. As a larger board impose free-riding problems and less monitoring, which is the argument by Jensen (1993), we anticipate that a smaller board will have less free-riding problems and more monitoring. As a smaller board will have more monitoring, it could be anticipated that a smaller board will have increased alignment between the interests of managers and shareholders due to the monitoring mechanism. As argued earlier, the moral hazard present in banks, provides an incentive to shareholders to increase risk-taking. Accordingly, managers who are more aligned with shareholders will also have an incentive to increase risk-taking in a bank. Therefore, as a smaller board increases the alignment between managers and shareholders, we anticipate that a smaller board increases risk-taking. Consequently, as found by Pathan (2009), we expect the following:

H_2: "There is a negative relationship between board size and bank risk-taking"

3.4 H_3: Independent directors and performance

According to Jensen and Meckling (1976), independent directors should be more effective monitors because they have a neutral relation to the management. Therefore, independent directors are likely to be more unbiased when monitoring, advising and making decisions affecting management (Hermalin & Weisbach, 2001). Dalton et al. (1998) further argue that having more independent directors on the board reduce the risk of managerial entrenchment because independent directors prevent management from making decisions that are not in the interest of shareholders. This argument is supported by the notion that independent directors value their reputation for the directorship market and therefore act in the interests of shareholders (Fama & Jensen, 1983). Thus, based on the theoretical arguments, more independent directors should positively affect firm performance.

In line with these theoretical arguments, empirical findings confirm the positive effect of board independence on performance. Zagorchev and Gao (2015) find that board independence is significantly

positively related to bank performance, consistent with theory. The positive relationship between board independence and performance is further confirmed by the findings by Liang, Xu, and Jiraporn (2013) for a sample of Chinese banks. This positive relationship between the proportion of independent directors and bank performance, is partly supported by Andres and Vallelado (2008). More specifically, Andres and Vallelado (2008) find an inverted U-shaped relationship between the proportion of outsiders on the board and the performance of banks, suggesting that there is an optimal balance of independent directors on the board. Andres and Vallelado (2008) explain this relationship with a trade-off between the monitoring and advising effects of the board. The positive effect of monitoring happens when there is an increase in the proportion of independent directors. However, this effect only positively affects firm value to a certain point. After a certain point, a higher proportion of independent directors on the board is negatively related to bank performance. The negative effect of having too many independent directors on the board is due to the board lacking enough inside directors with firm-specific knowledge. As the proportion of inside directors decrease, the advising capabilities of the board decrease. Consequently, the board is not able to provide the same level of advice to management, which explains the decrease in bank performance.

However, most other empirical studies on banks only identify a negative relationship between board independence and bank performance. For example, Erkens, Hung, and Matos (2012) investigate the influence of corporate governance on bank performance during the financial crisis. Specifically, the paper finds that during the financial crisis, banks with more independent directors experienced worse performance than banks with fewer independent directors. Erkens et al. (2012) argues that a possible explanation for this is that independent directors pressured management to raise more equity during the financial crisis to enable payback of debt and thereby avoid default. This in turn led to worse stock performance during the crisis, as value was transferred to debtholders. Consequently, the findings suggest that during the crisis, independent directors' objectivity, or fear of damage to their career by leading a bank in default, helped banks avoid possible bankruptcy costs, at the expense of worse stock performance (Erkens et al., 2012). Notably, the findings suggest that the independent directors acted in the interest of the stakeholders by pressuring the bank to raise equity through capital markets instead of being bailed out by government as the "Too big to fail" notion would argue.

Pathan and Faff (2013) and Adams and Mehran (2012) find that the proportion of independent directors is negatively related to bank performance. Pathan and Faff (2013), partly explain this by arguing that the role of the independent directors is to comply with regulatory requirements. Thus, when regulations require a higher proportion of independent directors on the board, banks might have difficulties in finding enough competent independent directors with bank-specific knowledge. Consequently, independent directors without bank-specific knowledge might decrease bank performance, according to Pathan and Faff (2013). Following the argumentation by Pathan and Faff (2013), banks might benefit more from having inside directors with firm-specific knowledge, due to the high level of information asymmetry that is present in banks (Macey & O'Hara, 2003). Inside directors, or independent directors with bank experience are probably able to advice the management better due to the complexity of the banking sector (Fama & Jensen, 1983). As a result, the business complexity, information asymmetry and the complication of the monitoring role of the boards, reduce the effect of monitoring by independent directors, thus limiting the value they create on the board. Conclusively, Raheja (2005) argue that the CEO and the other inside directors have an information advantage over the independent directors due to asymmetric information.

Following the precedent discussion, the high complexity and asymmetric information of banks makes it difficult for independent directors to add value through monitoring. Consequently, inside directors with more bank-specific knowledge can create more value by advising management. Thus, we anticipate that a higher proportion of independent directors limits the advising capabilities of the board and therefore decreasing bank performance. This leads to our next hypothesis:

H_3: "A higher proportion of independent directors is negatively related to bank performance"

3.5 H_4: Independent directors and risk

Generally, theory on the relationship between the independent directors on risk-taking is limited. However, according to Fama and Jensen (1983), independent directors value their reputation in the directorship market. Therefore, the aim of independent directors is to ensure that managers act in the interests of shareholders, in order to maintain a good reputation as an independent director. Due to the moral hazard problems in the banking sector, shareholders are incentivized to increase risk-

taking. Accordingly, if independent directors act in the interest of shareholders, more independent directors on the board should increase bank risk-taking. Unlike the theoretical arguments that independent directors should increase risk-taking in banks, empirical evidence suggest otherwise. Erkens et al. (2012) finds that independent directors raised more equity during the financial crisis in order to prevent the banks from defaulting. This indicates that independent directors do not increase risk-taking in order to accommodate shareholder interests. Consequently, in the case of banks, independent directors seem to reduce risk-taking in banks that are under financial distress. This could be an indication that independent directors value their reputation, as being on the board of a bank that defaults is likely to harm the directors future career. In addition, Zagorchev and Gao (2015) and Pathan (2009) find a negative relation between the risk-taking in banks and board independence. This leads to our next hypothesis:

H_4: "A higher proportion of independent directors is negatively related to bank risk-taking"

3.6 H_5: Gender diversity and performance

The topic of board diversity, and gender diversity on the board, has received increasing attention within the corporate governance literature and the public debate. According to Adams and Ferreira (2009) diversity improves board effectiveness by adding different perspectives and discussions as well as mitigation of group-think on the board. Erhardt, Werbel, and Shrader (2003), further argue that boards with directors that have different skill-sets, educational and cultural backgrounds might increase firm performance. In the case of gender diversity, Robinson and Dechant (1997) argue that female directors contribute to firm value by increasing board effectiveness through better decision-making and problem solving. Robinson and Dechant (1997) explain the increased board effectiveness by the general notion that female directors are considered better communicators and come better prepared for board meetings. However, Westphal and Milton (2000) pinpoint that the effect of female directors on the board might be diminished. Westphal and Milton (2000) highlights that because female directors are a minority on the board, they might face difficulties in impacting decision-making on the board. In this context, Eagly and Carli (2003) use the metaphor of the "glass ceiling", to demonstrate the additional discriminative obstacles that female directors are facing when aiming for a promotion. Thus, according to Eagly and Carli (2003), female directors

who manage to break through the glass ceiling, must have demonstrated extraordinary abilities to reach top positions within a firm.

Consistent with the theoretical arguments, Carter, Simkins, and Simpson (2003) find that more female directors on the board is positively associated with better firm performance for non-financial firms. In the case of banks, Farag and Mallin (2017) and Pathan and Faff (2013) also find a positive relation between a higher proportion of female directors on the board and bank performance. The theoretical arguments and the empirical evidence on the relation between board gender diversity and performance for banks, lead to our next hypothesis:

H_5: "A higher proportion of female directors on the board is positively linked to firm performance"

3.7 H_6: Gender diversity and risk

To the best of our knowledge, the effect of board gender diversity on risk-taking for firms is not a widely investigated area of corporate governance. However, Schubert, Brown, Gysler, and Brachinger (1999) states that there is a general prejudice about females and risk-aversion. According to Schubert et al. (1999) it is a general belief that females are more risk-averse than males. Furthermore, it is also a general belief that making risky decisions is critical for the success of a firm, according to Schubert et al. (1999). Schubert et al. (1999) argues that because females are perceived as being more risk-averse, it is more difficult for females to break through the glass ceiling and thus reach executive positions within a firm. Therefore, the prejudice about females being risk-averse might limit the success of females in their career.

Empirically, Adams and Funk (2012) investigate the risk-aversion of female directors. Contrary to the belief that females are more risk-averse than males, Adams and Funk (2012) find that female directors are less risk-averse than male directors. These findings are confirmed by Berger, Kick, and Schaeck (2014) who find that increasing the proportion of female directors on the board positively affects risk-taking in banks. The reason for these findings might be that female directors who have broken through the glass ceiling must demonstrate that they are able to take riskier decisions due to the belief that risky decisions are necessary for firm success. To demonstrate that they are

able to make risky decisions, female directors must therefore take relatively more risk, in order to overcome the prejudice that females are more risk-averse than males. Due to this argumentation, we anticipate that female directors that have broken through the glass ceiling are less risk-averse than male directors, otherwise the female directors would not have broken through the glass ceiling. This leads to the our next hypothesis.

H_6: "A higher degree of female directors is positively related to bank risk-taking"

3.8 Overview of hypotheses

The proposed hypotheses regarding board size, board independence and board gender diversity on bank performance are summarized in the Table 1. Likewise, the proposed hypotheses in relation to bank risk-taking are summarized in Table 2

Table 1: *Hypotheses related to bank performance*

Hypothesis	**Variable**	**Hypothesized relationship**
H_1	Board Size	Inverted U-shape
H_3	Board Independence	Negative
H_5	Gender Diversity	Positive

Table 2: *Hypotheses related to bank risk-taking*

Hypothesis	**Variable**	**Hypothesized relationship**
H_2	Board Size	Negative
H_4	Board Independence	Negative
H_6	Gender Diversity	Positive

4 Data and methodology

The purpose of the data and methodology section is first to assess the reliability and validity of our data. Secondly, the purpose is to address and discuss the methodological considerations in regard to testing the data. Section 4.1, outlines the sample selection process. Section 4.2, presents the

variables used in our regressions. Section 4.3, provides descriptive statistics on the chosen variables. Finally, Section 4.4, discusses the methodology and the empirical regression models used for the analysis.

4.1 Sample selection

This section describes how the final sample has been selected and collected. In Section 4.1.1 the sample identification process is outlined. Section 4.1.2 describes how data availability has reduced our sample of banks. In Section 4.1.3 we address potential survivorship bias. Finally, Section 4.1.4 summarizes the final sample, which is illustrated in Figure 2.

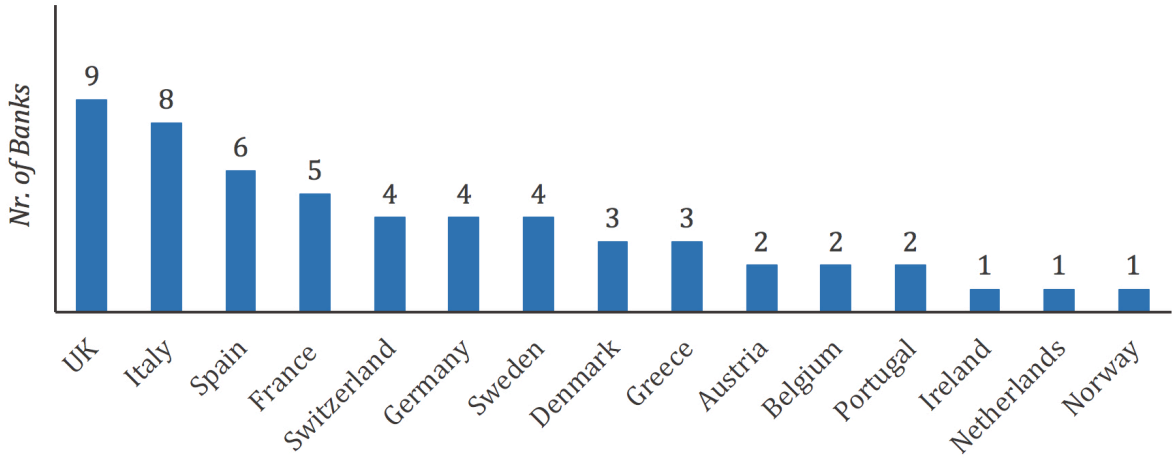
4.1.1 Sample identification

The sample consists of panel data which includes observations on 55 banks from Western and Southern Europe for the period 2007 to 2016. These banks have been chosen based on multiple criteria. First, our sample is limited to including commercial banks, i.e. banks that provide traditional banking services, and universal banks, i.e. banks that provide both traditional- and investment banking services. Thus, we only include banks that take deposits and provide loans to customers. Consequently, insurance companies, pension companies and asset management companies are excluded from our sample. We distinguish between banks and other financial firms because banks face specific dynamics with regard to deposit insurance that can lead to moral hazard problems. Moreover, banks are complex and opaque and very important to the functioning of the overall economy. Thus, banks are different to other financial firms and other non-financial firms (Macey & O'Hara, 2003).

Secondly, we limit the geographical area of our sample to only include banks from Western and Southern European countries. This is because we want to make sure that the countries included in the sample are relatively similar in terms of economic development and political systems. Therefore, we include the EU membership countries from the period before 2004, as many Eastern European countries became members of the EU after 2004. This group of countries include Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden and

the UK. Hence, Eastern European countries are excluded from the sample. Moreover, we include Norway and Switzerland in the sample, as both of these countries already had well-developed economic systems with similar strict requirements and developed economies before 2004. These are included because the Swiss banking sector is central to the European economy and because Norway is highly similar to the other Scandinavian countries. Figure 1 shows the number of banks in each of the sample countries.

Figure 1: *Number of banks in each sample country*



Thirdly, the sample period from 2007 to 2016 is chosen in order to include the financial crisis, while at the same time optimizing the trade-off between a longer time-period and data availability. Furthermore, we want to maximize the sample period length after the financial crisis occurred, to investigate how board structures in banks affect performance and risk-taking in a post-financial crisis context. When extracting corporate governance data from the selected databases for Western and Southern European banks, going back further than 2007 would have reduced the sample size significantly due to limited availability of corporate governance data.

4.1.2 Data availability

All banks in our sample are publicly listed. The reason is that board-specific corporate governance data, and bank-specific financial data are difficult to obtain from privately-owned banks. Clearly, it is required that board-specific corporate governance data is available for each bank in the time of the sample period. We used the Thomson Reuters Eikon database to collect the corporate governance

data. Thomson Reuters Eikon provides corporate governance data, including data on board size, board independence, gender diversity on boards and other board-specific variables. For the purpose of testing the hypotheses, we collected bank-specific financial data, such as total loans, deposits and tier 1 capital from the database called SNL. After collecting the data, ISIN-numbers were used to match the corporate governance data from Thomson Reuters Eikon with the bank-specific data from SNL. Finally, market capitalization measures for calculating Tobin's Q were extracted from Bloomberg.

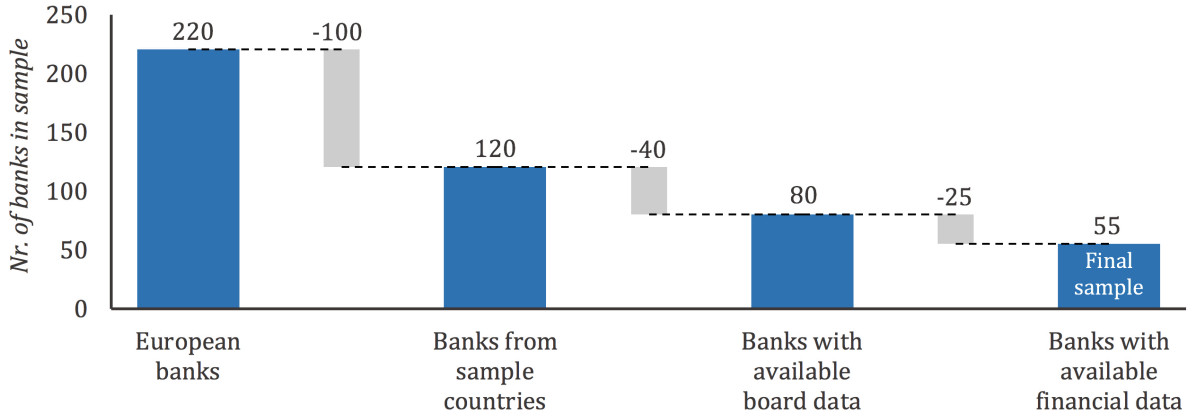
4.1.3 Survivorship bias

The requirements imposed on the availability of data could cause a survivorship bias in our sample as a consequence of excluding firms that have been delisted during the sample period. However, it can be argued that survivorship bias is not an issue in the banking sector because regulators in general do not allow large banks to default. This is because these banks are "Too big to fail" (Boyd & Runkle, 1993; O'Hara & Shaw, 1990). As the banks in our sample are large, these are likely to be bailed out by the regulators. Thus, similarly to Adams and Mehran (2012) we argue that survivorship bias is not a serious issue in our sample because of the limited probability that a large bank would default. Thus, we do not expect survivorship bias to have large implications for our analysis.

4.1.4 Final sample and extraction

To summarize the extraction and selection process, 220 listed banks in Europe were identified in Thomson Reuters Eikon. Out of these 220 banks, 120 banks were domiciled in the 15 selected countries. For 80 of these 120 banks, Thomson Reuters Eikon provided the required board-specific corporate governance data. After pulling the corporate governance data, the bank-specific financial data was extracted from SNL, limiting the sample size to 55. Finally, the market capitalization data was available for all banks across the time period as none of the banks had an initial public offering during the sample period. Conclusively, the final sample consists of 55 banks from 15 Western- and Southern European countries. The sample extraction process is summarized in Figure 2.

Figure 2: *Summary of sample selection process*



4.2 Description of regression variables

In the following section, we introduce and argue why we use the regression variables for the analysis. In Section 4.2.1 we explain and discuss the dependent variables. Section 4.2.2 outlines the explanatory corporate governance variables. Section 4.2.3 explains the choice of control corporate governance variables and Section 4.2.4 outlines the financial control variables. Table 3 on page 39, summarizes the definition of the variables.

4.2.1 Dependent variables

ROA

In accordance with the existing literature we use the accounting measure, return on assets (ROA) as a measure of bank performance. ROA is a commonly used performance measure for the profitability of a bank in the corporate governance literature on bank performance (Farag & Mallin, 2017; Liang et al., 2013; Grove, Patelli, Victoravich, & Xu, 2011; Andres & Vallelado, 2008). ROA measures how efficiently a bank use its assets to generate profits. ROA is calculated as net income before taxes divided by the total assets. More specifically, we calculate ROA as:

$$\text{Return on Assets (ROA)} = \frac{\text{Net Income Before Tax}}{\text{Total Assets}} \tag{1}$$

Tobin's Q

Tobin's Q (TOBINSQ) is a commonly used measure of firm value as it considers both the book value and the market valuation of a firm (Zagorchev & Gao, 2015). Tobin's Q is used as a proxy for bank performance in the existing literature (Zagorchev & Gao, 2015; Andres & Vallelado, 2008; Hermalin & Weisbach, 1991). Furthermore, Tobin's Q is a fairly easy measure to understand and interpret. A Tobin's Q ratio below one reflects that the market value of a bank's assets is lower than the book value of assets. A Tobins's Q ratio above one reflects that the market value of a bank's assets is higher the book value of assets. Similar to Zagorchev and Gao (2015), we calculate Tobin's Q as the market value of assets divided by the book value of assets. The market value of assets is calculated as the book value of assets plus the equity market capitalization minus common equity and net deferred taxes. More specifically, we calculate Tobin's Q as:

$$\text{Tobin's Q} = \frac{\text{Total Assets + Market Cap - Total Equity - Net Deferred Tax}}{\text{Total Assets}} \tag{2}$$

Main Performance Measure

In previous literature, the performance of banks has commonly been measured by ROA and Tobin's Q as elaborated upon in the precedent subsections. However, there are some key differences between using one measure over the other. As ROA is an accounting measure, it is backward looking and therefore reflects the actual performance of the bank. Tobin's Q, on the other hand, is a forward looking measure which reflects future performance expectations of the shareholders through the equity market capitalization.

As argued by Wintoki, Linck, and Netter (2012), using Tobin's Q as a measure for performance in corporate governance research can pose several problems. Wintoki et al. (2012) argue that as Tobin's Q is a forward looking market measure, there is reason to believe that this measure causes changes in corporate governance structures rather than being a result of corporate governance structures. Several empirical papers, including Lehn, Patro, and Zhao (2009); Linck, Netter, and Yang (2008); Boone, Field, Karpoff, and Raheja (2007) provide evidence for this notion. Consequently, Tobin's Q have received a lot of criticism due to endogeneity concerns (Dybvig & Warachka, 2012; Grove et al., 2011). In line with Wintoki et al. (2012), we use ROA as the main proxy for bank

performance. However, we use Tobin's Q as a measure for performance in some of the robustness tests.

Non-performing assets / total assets

To test our hypotheses related to risk-taking, we use non-performing assets divided by total assets (NPATA) as a proxy for risk-taking. We also refer to non-performing assets over total assets as the non-performing asset ratio. In this context, a non-performing asset is defined as a loan that is expected to default during the financial year. Thus, a non-performing asset can be seen as lost capital for a bank as it will not be repaid to the bank. By dividing the non-performing assets by total assets we obtain a ratio which measures the riskiness of the bank's assets. Thus, as the ratio of non-performing assets to total assets increases, the risk-taking by the bank increases. Ceteris paribus, a bank must be taking more risk when a higher proportion of its assets default, as riskier loans have a higher probability of default (Bouvatier & Lepetit, 2008). Therefore, non-performing assets is a measure that is important for credit agencies when conducting a risk-assessment of banks (Farag & Mallin, 2017; Grove et al., 2011). The use of total assets as a denominator makes it easy to compare risk-taking between banks, which may vary in size. Finally, other researchers investigating corporate governance within the bank sector also use this variable as a risk measure (Farag & Mallin, 2017; Zagorchev & Gao, 2015; Grove et al., 2011; Berger & DeYoung, 1997; Berger, Herring, & Szego, 1995).

$$\text{Non-performing Assets ratio (NPATA)} = \frac{\text{Non-performing Assets}}{\text{Total Assets}} \tag{3}$$

Z-score

The z-score is another measure for risk-taking used by the corporate governance literature investigating risk-taking by banks (Laeven & Levine, 2009). The z-score is inversely related to the probability of a bank defaulting. Thus, the z-score is a measure for the distance to insolvency (Roy, 1952). The interpretation of a higher z-score is that a bank is less risky whereas a lower z-score indicates that a bank is more risky, i.e. closer to default. The z-score is calculated as ROA *plus* the capital asset ratio, *divided* by the standard deviation of the ROA. Consequently, the z-score measures how many standard deviations that the ROA of a bank has to drop until there is

no equity left to cover potential losses. Following the approach of Laeven and Levine (2009), we take the logarithm of the z-score in our regressions. The z-score is calculated as:

$$\begin{aligned} \text{Z-Score} &= \frac{(\text{ROA} + \text{Capital Asset Ratio})}{\sigma(\text{ROA})} \\ &= \frac{\left(\dfrac{\text{Net Income Before Tax}}{\text{Total Assets}} + \dfrac{\text{Total Equity}}{\text{Total Assets}}\right)}{\sigma(\text{ROA})} \end{aligned} \tag{4}$$

Main Risk Measure

Both the non-performing assets ratio and the z-score are two commonly used measures for bank risk-taking in the corporate governance literature. We have chosen the non-performing asset ratio as the main proxy for risk-taking. This variable is considered by the credit agencies as an important measure of bank risk-taking (Grove et al., 2011). Furthermore, a majority of the existing corporate governance literature on bank risk-taking uses the non-performing assets ratio as risk-taking measure. Additionally, the non-performing assets ratio specifically reflects the riskiness of a bank's assets through the quality of the loans.

4.2.2 Explanatory corporate governance variables

Board size

A board size variable (BOARDSIZE) is used to test hypothesis 1 and 2, i.e. the effect of board size on the performance and risk-taking by banks. The board size variable measures the number of directors on the board, reported by Thomsen Reuters Eikon.

Independent directors

A variable for the proportion of independent directors on the board (INDDIR) is used to test hypothesis 3 and 4, i.e. the effect of independent directors on the performance and risk-taking by banks. It should be noted that we also refer to the proportion of independent directors on the board as board independence. Generally, a director is classified as independent if the director has no ties to the firm in which she has a board position. This means that the director does not hold

a management position or hold other responsibilities for the firm besides the board position. The proportion of independent directors on the board is reported by Thomson Reuters Eikon, and is measured on a scale from 0 to 100. Thus, when this variable has a value of 50, the proportion of independent directors on the board is 50%.

Gender diversity

A variable for the proportion of female directors on the board (GENDIV) is used to test hypothesis 5 and 6 regarding the effect of gender diversity on boards in relation to the performance and risk-taking by banks. It should be noted that we also refer to the proportion of female directors on the board as board gender diversity. The proportion of female directors on the board is reported by Thomson Reuters Eikon, and is measured on a scale from 0 to 100. Thus, when this variable has a value of 50, the proportion of female directors on the board is 50%.

4.2.3 Control corporate governance variables

Corporate governance committee

We include a dummy variable for the presence of a corporate governance committee (CGCOMM) to control for the effect of a corporate governance committee on bank performance, bank risk-taking, and other corporate governance mechanisms. The dummy variable takes a value of 1 if a corporate governance committee is present in the bank, and 0 otherwise. The purpose and general task of a corporate governance committee is to ensure that corporate governance codes outlined in a firm are actually followed by the board of directors and management. Furthermore, it is an important task of a corporate governance committee to make sure that the corporate governance codes of a firm are in accordance with new regulation and guidelines. An example of the responsibilities of a corporate governance committee of a bank is attached in Appendix B.

Blockholders

We include a blockholder dummy variable (BLOCK) in our regressions to control for the effect of blockholders on the corporate governance practices, risk-taking and performance of a bank. We define a blockholder as a shareholder that owns 10% or more of the outstanding shares in a

bank. This definition is in line with previous literature (Laeven & Levine, 2009; Caprio, Laeven, & Levine, 2007). Depending on the size and motive of the blockholder, a blockholder can either add value through monitoring of the management or extract private benefits of control at the expense of other shareholders (Holderness, 2003). Furthermore, the role of the blockholder in monitoring management includes the ability to sue the board members, gain board seats through proxy fights and engage other shareholders to achieve the blockholder's objectives (Adams & Mehran, 2003).

Board meetings

Following Andres and Vallelado (2008), we include a variable for the number of board meetings held each year (BOARDMEET). The variable for board meetings serves as a proxy for the internal functioning of the board. Thus, as more board meetings increase the communication between the directors, this variable is included to control for the effect of the board's activity level on other corporate governance mechanisms, bank risk-taking and bank performance.

Board attendance

A variable for board attendance (BOARDATT) is included in the regressions. This variable measures the average attendance rate of directors at the board meetings throughout the year. Similar to the variable for board meetings, board attendance serves as a proxy for the internal functioning of the board.

Board Skills

We include a variable yielding the percentage of the directors on the board having a financial background or previous experience within the banking sector (BOARDSKILLS). Generally, the argument for having directors with a financial background on the board is that this expertise will lead to improved monitoring, and thereby better care-taking of shareholder interests (Güner, Malmendier, & Tate, 2008). Because of the opaque nature and important role of banks in the overall economy, it is interesting to investigate how bank-specific skills of the directors affect the performance and risk-taking by the banks. For a bank, a director with previous financial sector experience might reflect in a more thorough risk return assessment when making business decisions. Additionally, a director with such experience, might be a better monitor of management due to the director's industry specific knowledge (Minton, Taillard, & Williamson, 2014; Harris & Raviv,

2006). Furthermore, the focus of having independent bank-specific knowledge on the board has been called upon from various researchers (Kirkpatrick, 2009). Not many previous studies have investigated the effect of directors with bank-specific experience on either risk-taking or performance of banks. Though, Minton et al. (2014) finds that directors with bank and financial expertise were associated with higher risk-taking up to and during the financial crisis. Furthermore, Aebi, Sabato, and Schmid (2012) finds that a higher percentage of directors with bank-specific knowledge were negatively related to bank performance during the financial crisis. Therefore, we include the board skills variable as a corporate governance control variable.

Dual-board

We include a two-tier board dummy variable (DUALBOARD) to control for the effect of a one-tier or two-tier board structure on other corporate governance mechanisms, bank risk-taking and bank performance, in line with (Farag & Mallin, 2017). The two-tier dummy takes a value of 1 if the bank has a two-tier board structure, and 0 if the bank has a one-tier board structure. The main difference between a one-tier board structure and a two-tier board structure is the separation of management and the non-executive directors on the board. In a one-tier board structure, boards are composed by both management and non-executive directors. This means that the CEO can sit on the board. In a two-tier board structure, the management and the non-executive directors are separated. The management sit on (what is commonly referred to as) the management board, and the non-executive directors sit on the supervisory board. This means that the CEO cannot sit on the supervisory board. The separation between management and non-executive directors might have different effects on the corporate governance mechanisms of a bank (Becht et al., 2007).

It can be argued that the CEO more easily can influence non-executive directors in a one-tier board structure relatively to a two-tier board structure. Thus, the CEO can capture the board by being able to influence the board's decision-making. Consequently, the monitoring effect of the board might decrease when the board is captured by the CEO. Compared to management, non-executive directors on the board face information asymmetry, as they are not in charge of the daily operations of the bank. It can be argued that the information asymmetry is higher in a two-tier board structure than in a one-tier board structure. As the management and the non-executive directors are not separated under a one-tier board structure, the non-executive directors might face less information

asymmetry as they are able to engage more with management. As the management and the non-executive directors are separated in a two-tier board structure, the non-executive directors might face more information asymmetry as they engage less with management. Consequently, it might be more challenging for non-executive directors to advice and monitor management, when facing higher information asymmetry (Becht et al., 2007).

Board Tenure

The variable for board tenure (BOARDTEN) indicates the average tenure of the board and is measured as the tenure of all of the board members, divided by the number of board members. As argued by Anderson, Mansi, and Reeb (2004), directors with higher tenure might be able to better advice and monitor management because they have an increased bank-specific knowledge. Conversely, board members with higher tenure over time might become entrenched because relationships are formed with management (Byrd, Cooperman, & Wolfe, 2010; Anderson et al., 2004; Vafeas, 2003). Therefore, we include board tenure as a corporate governance control variable, following the approach of Pathan and Faff (2013) and Vafeas (2003).

Staggered boards

We include a staggered board dummy variable (STAGG) to control for the effect of a staggered board. The reason for controlling for this effect is that a staggered board prevents shareholders from replacing the majority of the board at once. Thus, if an acquiring shareholder wants to replace the entire board it will take multiple annual board elections to do so. Consequently, a staggered board makes it harder for an acquiring company to gain control of a firm (Bebchuk & Cohen, 2005; Pathan & Skully, 2010). This means that a staggered board decreases the threat of a hostile takeover, which is a corporate governance mechanism that disciplines managers to act in the interests of shareholders. Additionally, a staggered board protects incumbent directors on the board that might be captured by the CEO, and therefore the presence of a staggered board might not be in the best interest of shareholders. Consequently, a staggered board can be used as a proxy for poor governance. In relation to this, Bebchuk and Cohen (2005) find that the presence of a staggered board decreases firm value. Because of these effects, we include a staggered board dummy in our robustness test as a corporate governance control variable, following the approach

of Zagorchev and Gao (2015).

4.2.4 Financial control variables

Total Assets (Bank size)

It is common practice to control for company size when investigating the effect of corporate governance variables on the performance of companies (Nguyen & Nielsen, 2010; Coles et al., 2008; Laeven & Levine, 2007). For corporate governance research regarding banks, it is also common practice to control for bank size using total assets as a size proxy (Zagorchev & Gao, 2015; Pathan & Faff, 2013; Andres & Vallelado, 2008). An argument for controlling for size is that the size of banks could affect the governance practises implemented. This effect is seen as larger banks are more likely to be "Too big too fail" and therefore large banks face regulatory pressure to have more developed governance structures (Boyd & Runkle, 1993). Bank size (BANKSIZE) is measured by the logarithm of the book value of total assets, and controlled for throughout the analysis (Farag & Mallin, 2017; Zagorchev & Gao, 2015; Pathan & Faff, 2013; Pathan, 2009; Andres & Vallelado, 2008).

Tier 1 capital ratio

As suggested by Kanagaretnam, Krishnan, and Lobo (2009) and Zagorchev and Gao (2015), we use the tier 1 capital ratio (TIER1) to control for the banks' financial strength and the ability to avoid default. The tier 1 capital ratio is calculated by dividing tier 1 capital by risk-weighted assets. Tier 1 capital consists of the bank's accumulated common equity and retained earnings. Basel III regulations consider tier 1 capital to be the capital needed for a bank to continue its activities and to remain solvent (Basel Committee on banking supervision, 2017). Risk-weighted assets are the total assets of a bank weighted by each asset's individual credit risk. The weighting and assessment of the credit risk of the assets is done according to Basel III guidelines. Thus, risky loans held by a bank will yield a lower agency credit rating and will therefore increase the risk-weighted assets of the bank proportionally (Basel Committee on banking supervision, 2017). The tier 1 capital ratio compares a bank's tier 1 capital to its risk-weighted assets. This relative measure gives an indication of how much actual equity the bank holds in light of the risk-taking by the bank. Thus,

this measure is an indicator of the solvency of a bank. Regulators set legal requirements for tier 1 capital ratio levels to make sure that banks do not take excessive risk compared to the amount of losses that a bank is able to cover by itself. Consequently, a bank that has high risk-weighted assets is required to have more tier 1 capital to account for its balance sheet risk.

Earnings before taxes and loan loss provisions/Total assets

Following Kanagaretnam et al. (2009); Kanagaretnam, Lobo, and Yang (2005), we control for earnings before taxes and loan loss provisions divided by total assets (EBTPTA). This is done to control for the potential effect of operational effectiveness of a bank on its performance and risk-taking. Loan loss provisions are the provisions that a bank sets aside on a yearly basis to cover the expected losses on its expected defaulting loans. Thus, we adjust earnings before taxes with loan loss provisions to control for the possibility that bank managers are able to smooth the income of a bank across periods by adjusting the loan loss provisions (Kanagaretnam et al., 2005).

Loans/Assets

We control for total loans divided by total assets (LOANSTA) to account for the amount of assets that a bank has placed in loans (Andres & Vallelado, 2008). Contrary to a non-financial firm, loans are placed on the asset side of the balance sheet for banks. Usually, the main part of a commercial bank's income is generated by interest rates on the loans that it provides to customers. Banks can also generate income from other sources than loans. Beside earning income from loans, banks can also earn income from non-interest income sources Kirkpatrick (2009). Such non-interest income sources include various financial instruments, stock-holdings and advanced loan-bundles. Typically, investments in assets that generate non-interest income are seen as higher risk investments than regular loans. Thus, we include the ratio of loans divided by total assets to account for differences in how banking businesses generate income (Andres & Vallelado, 2008).

Change in Total Assets

Following Zagorchev and Gao (2015), we include a variable for the relative change in total assets (CHGTA) to control for the differences in asset growth between banks. As for a non-financial firm, the growth of a bank's business might have an effect on its risk-taking and performance.

Table 3: *Description of variables*

Notation	Variable name	Definition
Panel A: Dependent variables		
ROA	Return on assets	The pre-tax income as a percentage of total book value of assets
TOBINSQ	Tobin's Q	The sum of book value of total assets *plus* market capitalization *minus* book value of equity *minus* net deferred tax *divided* by the book value of total assets
NPATA	Non-performing assets ratio	Non-performing assets divided by total assets
ZSCORE	Z-score	The sum of the return on assets *plus* book value of equity *divided* by total assets *divided* by the standard deviation of the return on assets
Panel B: Explanatory Corporate Governance variables		
BOARDSIZE	Board size	The number of directors on the board
BOARDSIZE SQ	Board size squared	Board size squared
INDDIR	Independent directors	The proportion of directors who are independent (On a scale from 0 to 100, where 50 equals a proportion of 50%)
INDDIR SQ	Independent directors squared	The proportion of directors who are independent squared
GENDIV	Female directors	Proportion of female directors on the board (On a scale from 0 to 100, where 50 equals a represents 50%)
Panel C: Control corporate governance variables		
CGCOMM	Corporate governance committee	A dummy variable which equals 1 if a corporate governance committee is present, otherwise 0
BLOCK	Blockholder	A dummy variable which equals 1 if a shareholder owns more than 10% of outstanding shares, otherwise 0
BOARDMEET	Board meetings	Number of board meetings held in a given year
BOARDATT	Board attendance	The average attendance of the board (On a scale from 0 to 100, where 50 equals an attendance rate of 50%)
BOARDSKILLS	Board skills	Proportion of directors that possess industry specific skills
DUALBOARD	Two-tier board	A dummy variable which equals 1 if the bank has a two-tier board structure, otherwise 0
BOARDTEN	Board tenure	Average tenure of the directors on the board
STAGG	Staggered board	A dummy variable which equals 1 if the bank has a staggered board, otherwise 0
Panel D: Financial Control variables		
BANKSIZE	Bank size	Log of total assets at the end of fiscal year
TIER1	Tier 1 capital ratio	Tier 1 capital *divided* by risk-weighted assets
LOANSTA	Loan ratio	Total loans *divided* by total assets
CHGTA	Asset growth	Total assets at time t *divided* by total assets at t-1 *minus* one
EBTPTA	Earnings before taxes and loan loss provisions ratio	Earnings before taxes and loan loss provisions *divided* by total assets

Financial crisis dummy

Following the approach of Mamatzakis and Bermpei (2015), we include a financial crisis dummy variable (FINCR) to control for the difference in levels of risk-taking and performance during and after the financial crisis. This variable equals 1 in the years 2007, 2008 and 2009, and otherwise equals 0. We use this dummy variable for a robustness test.

4.3 Descriptive statistics

The purpose of the following descriptive statistics section is first to describe and understand our panel data set. Secondly, the purpose is to validate the data by comparing it to the data of previous literature. The data validation is important in order to legitimize our analysis and empirical results. When investigating the data, we focus on the dependent variables and the explanatory corporate governance variables as the latter are the variables related to the hypotheses. Moreover, we provide descriptive statistics on both the control corporate governance variables, and the financial control variables. The variables that provide interesting insights are discussed more in depth. In regard to this, bank size is investigated to provide a perspective on how large the banks in our sample are, in relation to country GDPs and the "Too big to fail" notion. Consequently, we outline and discuss the descriptive statistics of the dependent variables in Section 4.3.1. Section 4.3.2 examines the characteristics of explanatory corporate governance variables. In Section 4.3.3, the characteristics of the control corporate governance variables are presented. Finally, Section 4.3.4 examines the characteristics of the financial control variables.

4.3.1 Characteristics of performance and risk measures

ROA

Table 4 shows that the mean of ROA in our sample is 0.40% and the median is 0.47%. This reflects that some banks in the sample have had large negative earnings, which have caused them to have negative ROA in some years. This is further confirmed by the minimum ROA of -9.08%, which is a high negative return on assets. Contrarily, it can be seen that the maximum ROA of 7.78% in our sample shows that the sample also has high performing banks in terms of ROA. Consequently,

Table 4: *Descriptive statistics*

Variables	Observations	Mean	Median	Std.Dev	Min	Max
Panel A: Dependent variables						
ROA	546	0.40 %	0.47 %	1.10 %	-9.08 %	7.73 %
TOBINSQ	544	1.01	0.99	0.05	0.94	1.58
NPATA	489	4.27 %	2.22 %	6.02 %	0.02 %	36.78 %
ZSCORE	539	2.59	2.71	0.83	-0.80	4.67
Panel B: Explanatory Corporate Governance Variables						
BOARDSIZE	543	14.52	14.00	5.25	6.00	30.00
INDDIR	508	50.69 %	56.13 %	26.89 %	0.00 %	100.00 %
GENDIV	541	18.46 %	16.67 %	13.05 %	0.00 %	60.00 %
Panel C: Control corporate governance variables						
CGCOMM	543	32.78 %	0.00 %	46.98 %	0.00 %	100.00 %
BLOCK	550	54.18 %	100.00 %	49.87 %	0.00 %	100.00 %
BOARDMEET	501	12.81	11.00	6.63	2.00	47.00
BOARDATT	408	91.86 %	94.70 %	10.04 %	50.00 %	100.00 %
BOARDSKILLS	528	46.81 %	46.67 %	23.61 %	0.00 %	100.00 %
DUALBOARD	550	56.55 %	1.00 %	49.61 %	0.00 %	100.00 %
BOARDTEN	417	5.98	5.45	2.64	1.00	17.78
STAGG	505	47.92 %	0.00 %	50.01 %	0.00 %	100.00 %
Panel D: Financial control variables						
BANKSIZE	546	473,531	209,317	581,496	1,424	2,521,529
TIER1	491	12.89 %	12.29 %	4.14 %	5.13 %	29.27 %
LOANSTA	508	60.56 %	63.16 %	16.40 %	10.33 %	91.49 %
CHGTA	544	4.25 %	2.10 %	16.68 %	-50.67 %	153.10 %
EBTPTA	507	0.96 %	0.92 %	0.65 %	-1.99 %	4.01 %

the wide spread of ROA provides a foundation for the analysis, as the sample contains both low and high performing banks. These ROA measures are generally a bit lower than the ones of other samples. Andres and Vallelado (2008), reports a mean ROA of 1.01%, and Liang et al. (2013) reports a mean of 1.00%. This difference can probably be contributed to the fact that our sample does not include a larger part of the period before the crisis, where the performance of banks was generally higher. Table 5 reports the country statistics for ROA. Here it is seen that the mean ROA for Greece and Ireland are both negative. In the case of Greece, this reflects the effect of the European debt crisis, which is also evident in Table 6 that shows 2011 as the only year with an average negative ROA across the whole sample.

Table 5: *Descriptive statistics by country*

Country	Number of Banks	ROA	TOBINSQ	NPATA	ZSCORE	BOARD-SIZE	INDDIR	GENDIV	CGCOMM	BLOCK	BOARD-MEET
Austria	2	0.64 %	0.98	8.53 %	2.80	15.05	51.95 %	19.45 %	0.00 %	100.00 %	6.15
Belgium	2	0.11 %	1.00	2.13 %	1.46	17.95	27.83 %	12.69 %	0.00 %	85.00 %	13.20
Denmark	3	0.53 %	1.00	3.03 %	2.89	11.17	41.67 %	20.34 %	0.00 %	53.33 %	23.10
France	5	0.27 %	0.99	1.48 %	3.05	16.48	45.80 %	27.69 %	70.00 %	70.00 %	10.05
Germany	4	0.92 %	1.04	1.62 %	2.69	14.62	14.63 %	19.78 %	17.95 %	65.00 %	7.38
Greece	3	-0.64 %	1.00	18.80 %	1.49	18.00	27.89 %	8.56 %	26.67 %	46.67 %	23.47
Ireland	1	-0.75 %	0.98	14.52 %	1.53	9.60	71.95 %	25.77 %	0.00 %	70.00 %	18.40
Italy	8	0.05 %	0.99	8.60 %	2.22	19.77	57.76 %	15.97 %	25.97 %	22.50 %	16.42
Netherlands	1	0.37 %	0.99	1.67 %	2.58	10.80	90.56 %	19.70 %	100.00 %	0.00 %	10.80
Norway	1	0.91 %	1.00	1.08 %	3.51	8.30	58.93 %	44.48 %	0.00 %	100.00 %	15.40
Portugal	2	0.15 %	1.00	4.14 %	2.16	20.15	31.54 %	5.69 %	100.00 %	85.00 %	11.75
Spain	6	0.60 %	1.01	3.51 %	3.05	15.30	50.34 %	16.38 %	28.00 %	40.00 %	13.06
Sweden	4	0.70 %	1.01	0.58 %	3.48	12.35	62.80 %	35.97 %	0.00 %	80.00 %	14.55
Switzerland	4	0.50 %	1.02	0.37 %	2.49	9.42	62.06 %	12.76 %	35.09 %	40.00 %	11.80
UK	9	0.71 %	1.01	2.69 %	2.62	12.36	61.84 %	15.64 %	56.67 %	54.44 %	10.10
Average		**0.40 %**	**1.01**	**4.27 %**	**2.59**	**14.52**	**50.69 %**	**18.46 %**	**32.78 %**	**54.18 %**	**12.81**

Country	Number of Banks	BOARD-ATT	BOARD-SKILLS	DUAL-BOARD	BOARD-TEN	STAGG	BANK-SIZE	TIER1	LOANSTA	CHGTA	EBTPTA
Austria	2	50.00 %	36.73 %	100.00 %	5.42	100.00 %	158,225	10.52 %	68.88 %	5.45 %	1.62 %
Belgium	2	91.89 %	39.46 %	0.00 %	3.74	100.00 %	349,635	13.67 %	57.27 %	-4.73 %	0.48 %
Denmark	3	91.84 %	36.91 %	100.00 %	7.13	63.33 %	172,050	14.53 %	62.32 %	7.58 %	0.99 %
France	5	91.64 %	49.77 %	25.00 %	5.24	90.00 %	1,313,246	11.20 %	38.32 %	3.03 %	0.55 %
Germany	4	92.65 %	25.88 %	100.00 %	5.63	40.63 %	624,411	13.25 %	47.15 %	1.76 %	0.47 %
Greece	3	88.21 %	31.89 %	0.00 %	7.63	20.83 %	86,656	12.24 %	48.25 %	8.58 %	1.28 %
Ireland	1	96.32 %	58.14 %	0.00 %	4.12	100.00 %	54,990	20.03 %	68.09 %	-9.81 %	0.14 %
Italy	8	89.96 %	33.47 %	97.50 %	3.45	27.54 %	260,315	9.64 %	70.91 %	4.69 %	1.14 %
Netherlands	1	95.51 %	49.77 %	100.00 %	3.89	100.00 %	1,160,955	14.76 %	55.6 %	-3.21 %	0.71 %
Norway	1	90.41 %	32.99 %	100.00 %	5.55	0.00 %	256,662	12.04 %	65.35 %	6.58 %	1.10 %
Portugal	2	87.04 %	46.96 %	70.00 %	12.31	0.00 %	64,651	10.36 %	72.15 %	0.06 %	1.03 %
Spain	6	95.56 %	44.67 %	0.00 %	8.59	80.49 %	474,445	10.56 %	69.97 %	6.84 %	1.39 %
Sweden	4	95.41 %	59.99 %	100.00 %	6.49	0.00 %	325,374	16.68 %	66.73 %	4.24 %	0.82 %
Switzerland	4	94.22 %	49.56 %	98.33 %	5.70	30.36 %	321,556	16.57 %	53.98 %	7.69 %	0.60 %
UK	9	96.46 %	70.96 %	0.00 %	5.32	46.67 %	801,621	13.30 %	52.34 %	4.15 %	1.22 %
Average		**91.86 %**	**46.81 %**	**56.55 %**	**5.98**	**47.92 %**	**473,531**	**12.89 %**	**60.56 %**	**4.25 %**	**0.96 %**

Table 6: *Descriptive statistics by year*

Year	ROA	TOBINSQ	NPATA	ZSCORE	BOARD-SIZE	INDDIR	GENDIV	CGCOMM	BLOCK	BOARD-MEET
2007	1.20 %	1.05	1.81 %	2.60	14.20	56.17 %	11.22 %	27.45 %	47.27 %	10.64
2008	0.44 %	1.00	2.16 %	2.29	14.28	54.16 %	12.41 %	25.93 %	52.73 %	12.72
2009	0.47 %	1.01	3.48 %	2.56	14.44	53.08 %	12.19 %	35.19 %	54.55 %	12.76
2010	0.54 %	1.00	3.80 %	2.58	15.44	49.44 %	14.84 %	36.36 %	56.36 %	11.90
2011	-0.11 %	0.99	4.29 %	2.58	15.29	53.34 %	16.01 %	36.36 %	60.00 %	12.74
2012	0.23 %	0.99	4.41 %	2.58	14.95	53.07 %	19.13 %	36.36 %	58.18 %	13.33
2013	0.20 %	1.01	5.47 %	2.61	14.71	56.00 %	20.50 %	36.36 %	56.36 %	13.23
2014	0.28 %	1.00	5.54 %	2.67	14.58	45.87 %	22.51 %	30.91 %	54.55 %	13.45
2015	0.42 %	1.00	5.73 %	2.73	13.95	43.55 %	26.26 %	30.91 %	50.91 %	13.71
2016	0.38 %	1.00	5.82 %	2.71	13.31	45.00 %	28.75 %	31.48 %	50.91 %	13.38

Year	BOARD-ATT	BOARD-SKILLS	DUAL-BOARD	BOARD-TEN	STAGG	BANK-SIZE	TIER1	LOANSTA	CHGTA	EBTPTA
2007	89.60 %	47.16 %	56.36 %	5.89	63.27 %	456,333	9.30 %	61.38 %	16.10 %	1.28 %
2008	89.69 %	48.61 %	58.18 %	5.70	59.62 %	496,782	9.62 %	59.97 %	9.41 %	0.91 %
2009	89.87 %	47.72 %	58.18 %	5.62	62.26 %	455,201	11.68 %	60.02 %	1.16 %	1.10 %
2010	89.82 %	49.23 %	58.18 %	6.05	56.60 %	483,376	12.21 %	59.49 %	8.64 %	1.02 %
2011	90.91 %	49.67 %	58.18 %	6.34	40.00 %	502,070	12.33 %	58.34 %	4.31 %	0.92 %
2012	92.84 %	49.46 %	56.36 %	6.21	38.78 %	491,939	13.81 %	57.47 %	1.30 %	0.89 %
2013	93.38 %	48.85 %	56.36 %	6.12	43.14 %	443,682	14.35 %	58.54 %	-5.40 %	0.86 %
2014	93.79 %	41.43 %	54.55 %	5.92	41.18 %	479,436	14.21 %	58.35 %	6.50 %	0.92 %
2015	93.87 %	44.79 %	54.55 %	5.93	37.25 %	466,790	15.19 %	60.37 %	0.74 %	0.92 %
2016	93.80 %	41.29 %	54.55 %	6.04	34.78 %	459,654	15.72 %	59.90 %	-0.04 %	0.84 %

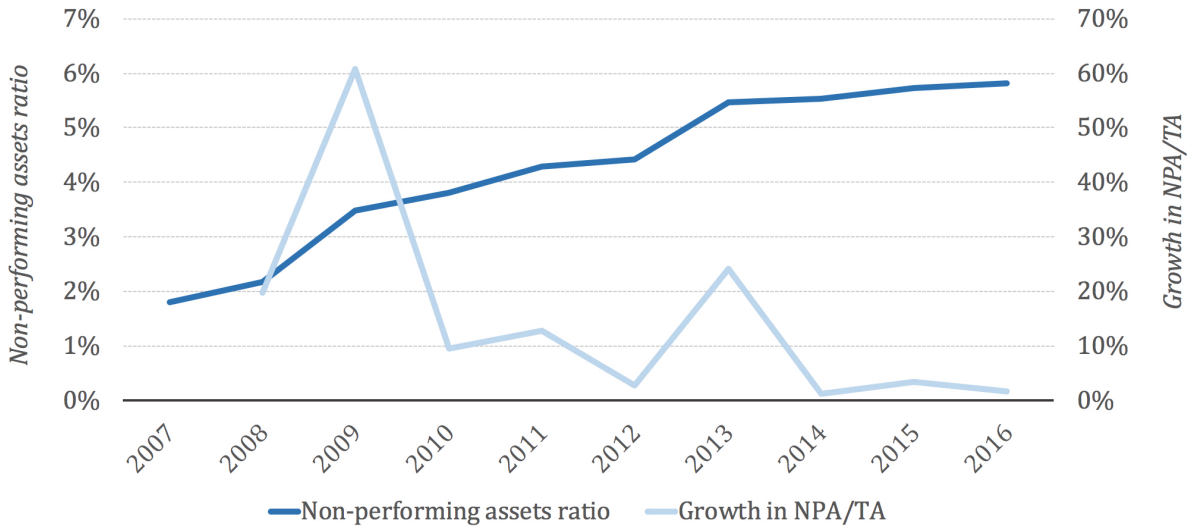
Tobin's Q

Table 4 shows that the mean of Tobin's Q is 1.01 and the median is 0.99. This reflects that the market value of assets is only slightly higher than the book value of assets for the banks in our sample. Additionally, the minimum Tobin's Q is 0.94, suggesting that for some banks in our sample, the market value of assets is lower than book value of assets. On the other hand, the maximum Tobin's Q of 1.58 suggests that some banks have a relatively high market value of assets, compared to the average bank. Overall, the mean found for Tobin's Q in our sample is lower than the mean found in previous studies by Zagorchev and Gao (2015); Andres and Vallelado (2008), who find a mean of 1.05 and 1.14 respectively. This could be due to the fact that our sample include the financial crisis and the post-financial crisis period, and not the pre-financial crisis period.

Non-performing assets/Total Assets

The mean ratio of non-performing assets divided by total assets (NPATA) is 4.27% whereas the median is 2.22% (Table 4). This reflects that some banks in our sample have had high non-performing assets to total asset ratios, skewing the mean upwards. Thus, the higher relative amount of non-performing assets indicates that some banks might have faced issues with poor performing loans and other investments. Consequently, a bank such as the one in the sample yielding the maximum non-performing assets to total assets ratio of 36.78%, will probably have been close to default (Kanagaretnam et al., 2009). Conversely, the minimum observation of non-performing assets to total assets is 0.02%, illustrating that there are also banks with low risk investment portfolios in the sample. The wide spread of the non-performing assets ratio provides a foundation for the analysis, as there is evidence of a large difference in individual bank risk-taking across the sample. Table 5, shows that non-performing assets over total assets is especially high for the Greek banks. This could be contributed to the European debt crisis in 2011. When looking at the development of the non-performing assets ratio over the years of the sample period, Figure 3 does not illustrate a higher average ratio during the financial crisis or the European debt crisis. Instead, the non-performing assets ratio is continually rising from 2007 to 2016, which is illustrated in Figure 3. However, when investigating the relative year on year growth in the non-performing asset ratio in Figure 3, the relative growth is notably higher during the financial crisis years from 2008 to 2009.

Figure 3: *The non-performing assets ratio development and growth*



Z-Score

Table 4 shows that the mean of the logarithm of the z-score is 2.59 and the median is 2.71. As the mean is below the median, this indicates that some banks might have been close to default and therefore these banks pull down the mean of the z-score. This tendency is evident as the minimum logarithm of z-score is negative and -0.80. A negative z-score indicates that some banks in the sample have actually been on the verge of default, and have probably needed to raise outside equity to survive. When investigating this further, three banks in our sample have had a negative z-score during the sample period, and one of these is the large Swiss bank, UBS. Interestingly, the z-score is negative for UBS in 2008, the same year that UBS received a direct capital injection bailout of 5.3 USD billion from the Swiss government (Alan Cowell, 2008). Conversely, the maximum log of the z-score is 4.67 which illustrates that some banks in the sample are very solvent.

Table 5 shows that there is notable variation between the banks of different countries related to the z-score. The Greek and Belgium banks are the banks which have the lowest average logarithm of z-score on 1.49 and 1.46, respectively. Hence, these banks are generally closer to default compared to the more solvent banks in Sweden, where the average logarithm of z-score is 3.48. Table 6 shows that the z-score for the banks in our sample decreased from 2.60 in 2007 to 2.29 in 2008. This is most likely due to the outbreak of the financial crisis in 2008. Furthermore, it can be seen that the z-score has increased since 2008. The increase in z-score since 2008 could be due to the Basel

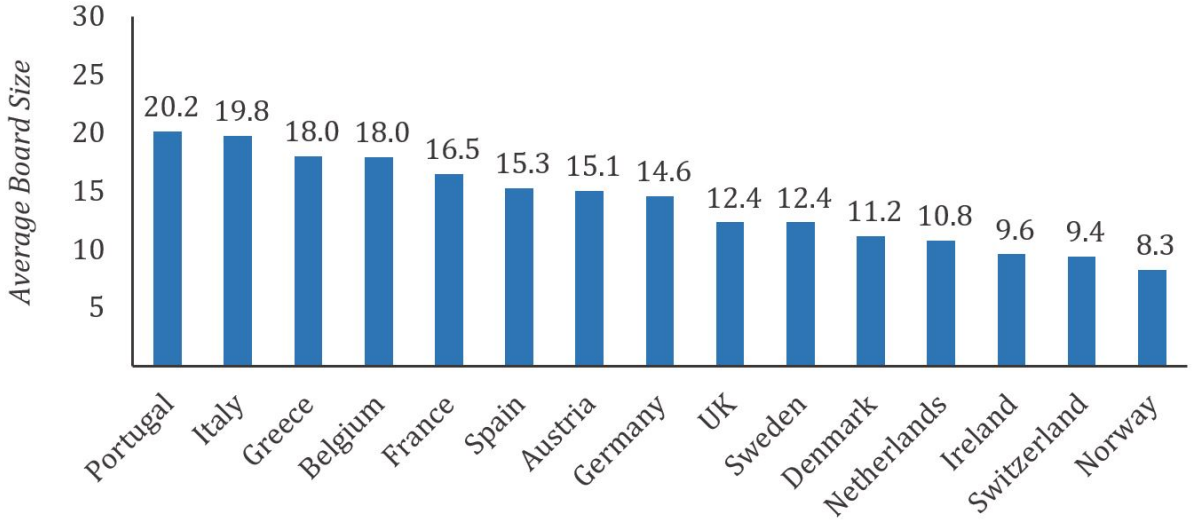
III regulations requiring banks to fund themselves with a higher proportion of equity since 2010 (The Economist, 2017).

4.3.2 Characteristics of explanatory corporate governance variables

Board size

Regarding board size, Table 4 shows that the mean board size is 14.52 for our bank sample. The smallest board size is 6 and the largest board size is 30. Hence, there is a relative large range between the smallest board and the largest board in our sample. The mean board size in our bank sample is comparable to the mean board size found in previous literature. The average board size in the sample used by Andres and Vallelado (2008) is 16, and contains banks from six countries (US, Canada, UK, France, Spain and Italy). Pathan and Skully (2010) find an average board size of 12.92 for a US bank sample, and Pathan and Faff (2013) find an average board size of 12.68 for a sample of US banks.

Figure 4: *Average board size by country*



In Figure 4, we find that there are large differences in the average board size between the countries in our sample. In general, Northern European banks have smaller boards compared to Southern European banks. Norway, Denmark, Ireland and Netherlands have the smallest boards with an average board size between 8 to 11. Portugal, Italy and Greece, on the other hand, have the largest average board sizes in the interval of approximately 18 to 20. Thus, there are relatively large

differences in board size between the countries.

Board independence

As reported in Table 4, the proportion of independent directors on the board is on average 50.69%. The minimum proportion of independent directors on the board is 0% and the maximum proportion of independent directors is 100%. Hence, there are large differences between the proportion of independent directors between the banks in our sample. This could be due to the varying definitions that each bank uses to classify a director as independent. The average proportion of independent directors on the board in our sample is lower than what is reported by previous literature. Andres and Vallelado (2008) have a less strict definition of outside directors due to data set limitations, and report that the average proportion of outsiders on the board is 80% for a sample of European and North American banks. This reported average is in line with that of Pathan and Skully (2010) on 65% and that of Pathan and Faff (2013) on 70% who investigate US banks. Finally, Farag and Mallin (2017), investigate European banks and report an average proportion of independent directors of 46%, similar to the average in our sample. Thus, the differences in sample averages of the proportion of independent directors on the board, might be caused by differences between Europe and USA. However, the difference between the proportions of independent directors could also be a results of general changes in corporate governance practices over time. Such tendencies would become evident, as our sample is quite recent, and as samples of comparable literature include a larger period of time before the financial crisis (Pathan & Faff, 2013; Pathan & Skully, 2010; Andres & Vallelado, 2008; Adams & Mehran, 2003). In regard to this, Table 6 shows that the average proportion of independent directors in our sample has fallen from 56% to 45%. In contrast, Adams and Mehran (2003) reports an increase in the proportion of independent directors during the sample period of 1986-1999 of 70% to 75%, for US banks, and Pathan and Faff (2013), reports a rise of 65% to 80% from 1997 to 2011, for US banks.

Table 5 illustrates that the proportion of independent directors vary across countries. A possible explanation for this is that the regulatory requirements of how to classify a director to be independent, can differ across countries. Additionally, country specific requirements to board composition can affect the proportion of independent directors. An example of this is how German unions require employee representatives on German boards. These country specific discrepancies seem

to be evident in our sample. For example, it is seen that German bank boards on average has 15% independent directors on boards, whereas UK bank boards on average has 90% independent directors.

Gender Diversity

Table 4 shows that the average proportion of female directors on the board is 18.46%. The median is lower, and indicates a proportion of 16.67%. In relation to previous research, Pathan and Faff (2013) report that the average proportion of female directors on the board is only 8% in their sample on US banks from 1997 to 2011. Moreover, Farag and Mallin (2017) find the average proportion of female directors on two-tier boards to be 13%, using an European bank sample from 2004-2012. Thus, the average of the proportion of female directors on the board in our sample seem to be notably higher than previous literature. However, these differences might be due to the difference in sample periods and a tendency to include more female directors on the board. This is illustrated in Table 6 which shows that the average proportion of female directors on the board in our sample, increase from 11% in 2007 to 29% in 2016. Pathan and Faff (2013) also find that the proportion of female directors on the board increases over years and report a mean of 5% in 2007 and 12% in 2011. Additionally, Farag and Mallin (2017) find that the proportion of female directors on the board has increased from 12% to 16% for two-tier boards. Thus, as our sample is more recent, this tendency explains why the average proportion of female directors on the board of our sample is higher.

Table 4 shows the minimum proportion of female directors on the board is 0% and the maximum proportion of female directors on the board is 60% for the banks in our sample. The large differences between the proportion of female directors on the board between individual banks, might be due to cross-country differences. The cross-country differences in Table 5 show that gender diversity on the board differs notably between countries. As an example, the Greek banks in our sample has on average 9% female directors on the board. In contrast, the Swedish banks in our sample has on average 36% female board members. In relation to this, Farag and Mallin (2017) also report differences in the average proportion of female directors on the board across countries.

4.3.3 Characteristics of control corporate governance variables

On average, a corporate governance committee (CGCOMM) is present in 33% of the banks. Looking at Table 5, it is seen that banks in the Scandinavian countries have not implemented a corporate governance committee. Additionally, Table 6 shows that there has been a slight increase in the proportion of banks with a corporate governance committee in our sample. The blockholder dummy (BLOCK) is 1 when a bank has a large owner holding more than 10% of the shares of a bank, and 0 otherwise. Table 4 shows that 54.18% of the banks in our sample have a blockholder. The average number of board meetings (BOARDMEET) per year for the banks in our sample is 12.8. Furthermore, the minimum number of board meetings in a year is 2 and the maximum number of board meetings is 47. Interestingly, the maximum number of board meetings were held by UBS in 2008, where UBS were on the verge of bankruptcy. Moreover, the average number of board meetings increased with 20% from 10.6 in 2007 to 12.7 in 2008. Hereafter, from 2008 to 2016 the average number of board meetings is within the interval of 12-14 per year.

For board attendance (BOARDATT), Table 4 shows a mean of 91.86%. There are no notable developments over the sample period, as the average attendance rate is approximately 90% across both years and countries. Table 4 shows a mean of 46.81% regarding board skills (BOARDSKILLS). Thus, on average 46.81% of the board members have a bank-specific or financial background. Table 5 show that the banks in the UK have the highest proportion of directors with bank-specific skills, with an average of 70.96%, whereas Germany has the lowest proportion of directors with bank-specific skills, with an average of 25.88%. On average, 56.55% of the banks in our sample has a tier-two board structure (DUALBOARD). Our sample average is in line with that of Farag and Mallin (2017) who report a proportion of tier-two boards on 53%. The differences in board structure between banks depend on the regulations of the different countries. In accordance with this, Table 5 shows that the banks from Scandinavian and German speaking countries all have a two-tier board structure, whereas UK and Spanish banks all have a one-tier board structure.

The average board tenure (BOARDTEN) is 5.98 years. The minimum average board tenure for our bank sample is 1 year, whereas the maximum average board tenure is 17.78 years. Table 4 shows that, on average, 47.92% of the banks in our sample have a staggered board (STAGG).

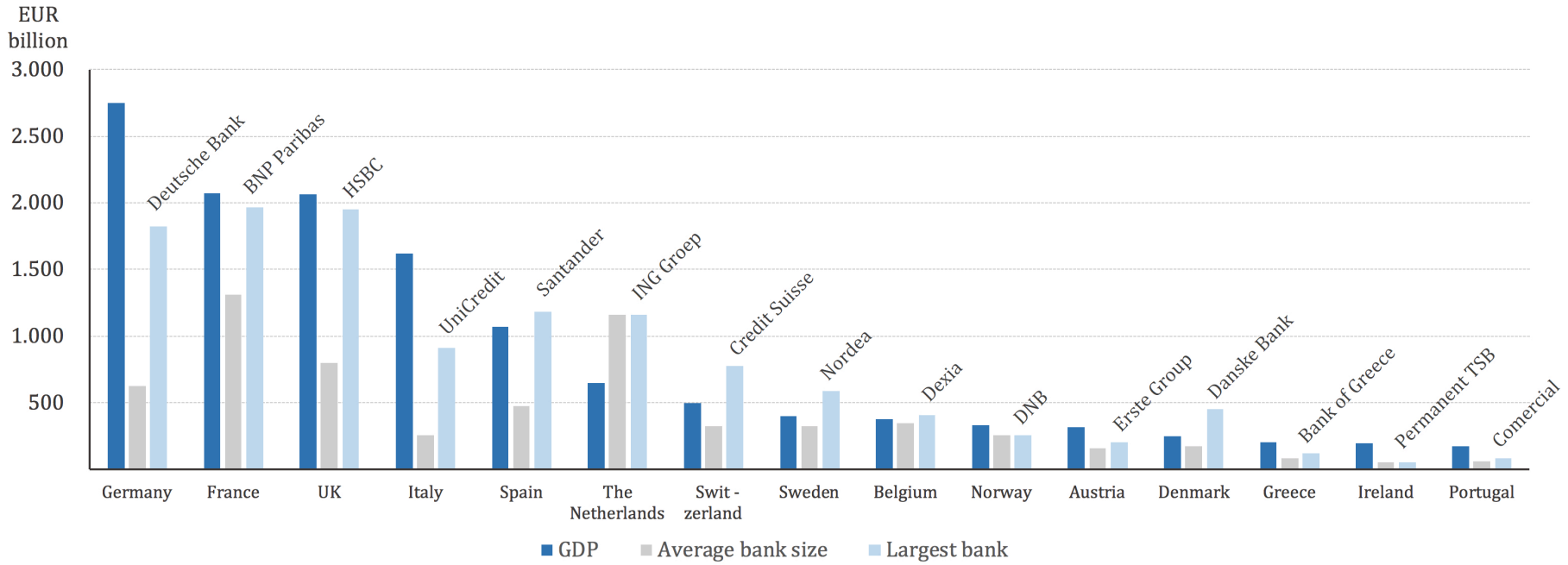
Interestingly, the proportion of banks with a staggered boards has been falling drastically since the financial crisis with a mean of 63% in 2007 to 33% in 2016, as seen in Table 6. Comparing the averages to that of other papers, the proportion of banks with staggered boards in our sample seems low. Zagorchev and Gao (2015) report a sample mean of 87% and Pathan (2009) reports a sample mean of 79%. Both of these samples are for US banks, and the sample of Pathan (2009) consists of observations from the pre-financial crisis. This might account for some of the discrepancies, but it generally seems that less European banks have staggered boards relative to US banks.

4.3.4 Characteristics of financial control variables

Table 4 shows that the mean of total assets (BANKSIZE) for the banks in our sample is EUR 474,000 million. Comparing this to the median of EUR 209,000 million, there is a relatively large difference, indicating that the large banks in our sample are pulling up the average. Iqbal et al. (2015) report a mean total assets of USD 257,000 million, and Andres and Vallelado (2008) report a mean of total assets of USD 184,000 million. Thus, the banks in our sample are on average larger than the banks investigated by previous literature. The minimum value of total assets is EUR 1,424 million, which is notably smaller than the maximum total assets of EUR 2,521,590 million in 2008. Hence, the largest observed value of total assets of the largest bank is more than 1770 times larger than the smallest observed value of total assets of the smallest bank. Thus, there is large variation in size measured by total assets, between the banks in our sample. However, a large variation in bank size is also evident in other papers researching the impact of corporate governance practices on the risk-taking and performance of banks. Iqbal et al. (2015) reports the smallest bank to have USD 540 million in total assets and the largest bank to have USD 3,300,000 million in total assets.

Andres and Vallelado (2008) report that the smallest bank in their sample has total assets of USD 80 million and the largest largest bank to have USD 1,500,000 million in total assets. Hence, the average banks size in our sample is larger than the average bank size in previous literature. However, the large variation of bank size in our sample is similar to the large variation of bank size in previous literature. As the variation of total assets is very large, we take the logarithm of total assets and use this as an indicator of bank size in our regressions.

Figure 5: *Bank size measured by total assets and GDP by country*



Note: The dark blue column is the GDP in each of the sample countries. The grey column denotes the average bank size measured by total assets of the banks in the respective countries. The light blue column shows the size of the largest bank in the given country, measured by total assets.

Figure 5 compares the size of the largest bank in each of the sample countries to the GDP of each country in our sample. Furthermore, the figure shows the average bank size of the banks in each of the countries in our sample. When comparing the average bank size per country to the respective GDP, it is evident that the banks in our sample are large. The average bank size level is, for most countries in the sample, half the size of the respective country's GDP. Additionally, in six out of the 15 countries in our sample, the largest bank in the respective country has total assets worth more than the entire GDP of that country. These countries include Denmark, Belgium, Netherlands, Spain, Sweden and Switzerland. Moreover, the total assets of the largest banks in Germany, France and the UK is close to the GDP of each of these countries. Thus, for the purpose of providing a perspective of the size of the banks in our sample, this illustration serves as an example of the potential impact a default of one of these large banks could have on the economy. Hence, this indicates that some of these banks might be "Too big to fail", and therefore these banks might be subject to moral hazard problems. Consequently, this supports why we investigate the impact of corporate governance on bank risk-taking.

Table 4 shows that the mean tier 1 capital ratio (TIER1) is 12.89%. The tier 1 capital ratio is calculated as tier 1 capital divided by total risk-weighted assets. Thus, the average bank can cover a potential loss of 12.89% of its total risk-weighted assets with common equity and retained earnings. In relation to previous literature, Zagorchev and Gao (2015) report a mean tier 1 capital ratio of 11% between the years 2002 and 2009 for a sample of US banks. The minimum tier 1 capital ratio for a bank in the sample is 5.13% whereas the highest tier 1 capital ratio in the sample is 29.27%. According to Basel III based regulations, the tier 1 capital ratio minimum requirement is 6% and the target ratio is 8.5% to 11%. Hence, the average bank in our sample has sufficient tier 1 capital to comply with the Basel III based regulations (Basel Committee on banking supervision, 2017).

Table 5 shows that there is a high variation in the tier 1 capital ratio across countries in our sample. Italy has the lowest ratio of 9.6%, whereas Sweden has one of highest tier 1 capital ratios of 16.7%. Furthermore, Table 6 shows that the average tier 1 capital ratio has increased from 9.3% in 2007 to 15.7% in 2016, an increase of 6.4% points. The increase in the tier 1 capital ratio across the years, is most likely due to the Basel III based regulations which were implemented in 2013 for European banks. These regulations require the banks to increase the tier 1 capital ratio so the banks are

better capitalized and can cover more potential losses from non-performing assets.

The mean of total loans to total assets (LOANSTA) in our sample is 60.56% whereas the median is 63.16%. The minimum observed value for total loans to total assets is 10.33% whereas the maximum observed value for total assets to total loans is 91.49%. Interestingly, the minimum value of 10.33%, belongs to one of the largest banks in our sample, Deutsche Bank. Generally, Deutsche Bank, and other large banks in our sample including Credit Suisse and UBS, all have low loans to total asset ratios. This could be an indication that some of the large banks generally generate income from non-interest income assets.

The mean change in total assets (CHGTA) is 4.25%, whereas the median is 2.10%. The minimum is -50.67% and the maximum is 153.10%. Thus, there is large variation in the growth of assets between the different years and different banks of the sample. When looking at the yearly average change in total assets, it can be seen that the growth in 2007 (i.e. from 2006 to 2007) on average was 16.10%. This is notably higher than any other average growth rate in any other year of the sample, which are all under 10%.

Finally, the mean earnings before tax and loan loss provisions over total assets (EBTPTA) is 0.96%. Hence, the average bank has earnings of 0.96% of its total assets, before accounting for loan loss provisions. The minimum EBTPTA, is -1.99% and the maximum EBTPTA is 4.01%.

4.4 Methodology and empirical models

The purpose of this section is to address and discuss the methodology and econometric approach which provide a foundation for analyzing our panel data. Subsequently, we will discuss endogeneity issues, as this is important to be aware of within corporate governance research. Moreover, we will only address the most important assumptions of the chosen econometric models, and how these are accounted for.

The research design for this thesis is presented in Section 4.4.1. In Section 4.4.2, the endogeneity issues related to corporate governance are presented. Section 4.4.3 discusses how different estimation methods account for the endogeneity issues. Section 4.4.4 provides a discussion of the econometric methods that are used in the thesis and how we account for endogeneity issues in the regression

models. Finally, Section 4.4.5 presents the empirical econometric models on bank risk-taking and bank performance.

4.4.1 Research design

The applied research approach of this thesis is deductive. The deductive approach starts with an understanding of the relevant theory and based on this theory, testable hypotheses are developed. In order to test the hypotheses, data is collected and analyzed. The findings are then interpreted in light of the developed hypotheses, which are either supported or not supported. Finally, the theory is revised. During this last step the theory that made the foundation for conducting the research might be altered because of new empirical findings (Bryman & Bell, 2015). Thus, the deductive approach is predominantly a linear process, where the findings flow back to the original theoretical foundation through the last step of revision.

For the purpose of this thesis, relevant corporate governance theory and empirical studies have been reviewed, followed by formulation of hypotheses regarding the effect of corporate governance on performance and risk-taking in the financial sector. Afterwards, corporate governance data and financial data on banks in Europe have been collected. Subsequently, the hypotheses were refined such that these were able to be tested using the selected econometric methods and the available data. Based on the collected data and econometric tools, the empirical results were presented and compared to existing theory and literature in relation to support or not support the stated hypotheses.

4.4.2 Endogeneity issues

Within corporate governance research, issues of endogeneity are sometimes present. Thus, properly accounting for this endogneity is important when aiming to estimate causal effects between corporate governance factors and firm outcomes (Wintoki et al., 2012). Endogeneity within econometrics is generally defined as a situation where an explanatory variable, or a dependent variable, is correlated with the error term of the regression. In corporate governance research, the endogeneity problems materialize as it is difficult to determine if for instance, performance depends on corporate

governance mechanisms, if corporate governance mechanisms depends on performance, or if both performance and the corporate governance mechanisms depend on an unobservable factor (Wintoki et al., 2012)

The challenge of properly accounting for endogeneity is optimally solved by identifying natural experiments that can be used for estimating how an exogenous shock causes an unpredicted change in corporate governance structures. The effect of the change in corporate governance structures on firm performance can then be investigated without concerns of endogeneity, because of the causality of the unexpected shock on the corporate governance structures. Such a variable, which represents an exogenous shock, is commonly called an instrumental variable (Wooldridge, 2015).

To account for possible endogeneity issues related to the effect of board independence on performance, Nguyen and Nielsen (2010) use sudden deaths of independent directors as a natural experiment to analyze the effect of independent directors in relation to firm performance. Thus, by using sudden deaths of independent directors as an instrumental variable, the paper uses an exogenous shock to avoid potential endogeneity issues. However, identifying a strong instrumental variable for solving endogeneity issues is very difficult and is out of scope for this thesis (Wooldridge, 2015). This thesis uses other econometric methods to account for possible endogeneity issues.

Omitted variable bias

Omitted variable bias occurs in an econometric model, when variables that correlate both with the independent and the dependent variable are not included in the model. The bias occur when a model is underspecified, because not all of the relevant factors for explaining the dependent variable are included in the model. Thus, the effect of the independent variable on the dependent variable is biased because the model does not account for the effect of the omitted variable. Omitted variable bias therefore causes endogeneity as the omitted variable is a part of the error term, when excluded (Wooldridge, 2015).

Unobservable heterogeneity

The entities of panel data, e.g. firms, individuals, countries or industries, might have different starting points of time-invariant factors. An example of this could be firm-specific cultures which vary from firm to firm. Firm-specific cultures would still affect firm outcomes, but firm-specific

cultures would be unobservable or immeasurable in an econometric context. The different starting points of the time-invariant factors cause endogeneity problems as they are a part of the error term. Thus, this creates an issue of endogeneity as there might be some unobservable, entity-specific factors that influence both the corporate governance structure of the firm and firm performance. Thus, the unobservable heterogeneity between firms might cause endogeneity issues (Wooldridge, 2015; Wintoki et al., 2012).

Dynamic endogeneity

Dynamic endogeneity is present, when the current corporate governance structure depends on past performance. Thus, the explanatory variables in a regression depend on the lagged dependent variable. To exemplify this, Hermalin and Weisbach (1988) argue that the level of board independence depends on the bargaining power of the CEO, which in turn depends on past performance. Initially, the bargaining power of the CEO depends on her perceived ability. Hermalin and Weisbach (1988) argue that the perceived ability of the CEO depends on how the current shareholders, and thus board, assess the CEO's ability based on the past performance of the company. Consequently, if a firm has performed well in the past, the CEO has more bargaining power. When a CEO's bargaining power is high, the level of independent directors is expected to be low, since the CEO is able to bargain for less monitoring. Thus, the past performance of a firm affects the level of independent directors on the board (Wintoki et al., 2012).

Simultaneity

If a firm chooses its board structure based on the expectation of higher performance, the causality is blurred as the level of performance is chosen simultaneously with the corporate governance structure. Thus, a simultaneity problem occur as the governance characteristics are chosen in anticipation of a certain level of performance. Therefore, board structure is not exogenously developed, as it is chosen because of the expected level of performance (Wooldridge, 2015; Wintoki et al., 2012).

4.4.3 Estimation methods

OLS

A discussion of the different estimators that can be used for analyzing panel data starts with a discussion of the ordinary least squared (OLS) estimator. The main purpose of the OLS estimator is to minimize the residual errors between each observation and its fitted value. OLS is simple in its specification and its goodness of fit estimator is relatively easy to interpret on. Furthermore, OLS is an unbiased estimator when its conditions are fulfilled. When the OLS estimator is used for analyzing panel data, the specification is referred to as pooled OLS. When using OLS, endogeneity can be accounted for by including additional relevant variables that would otherwise create omitted variable bias. However, pooled OLS has different caveats when applied to panel datasets in the context of corporate governance. A main drawback of OLS, is that it does not account for unobservable heterogeneity. This can lead to biased coefficients of the explanatory variables and thus misleading results (Wooldridge, 2015).

Fixed Effects

To overcome the unobservable heterogeneity issues which the OLS estimator does not account for, a within estimator, i.e. a fixed effects model, can be used. The coefficients estimated by a fixed effects model are equivalent to the coefficients estimated by a pooled OLS model, where a dummy variable is included for each entity. The fixed effects estimator does this by taking the differences in mean for each entity for each variable, and hereafter minimize the residual errors between each observation and its fitted value on these estimates. Thus, the main advantage of the fixed effects model compared to OLS is that it accounts for the unobservable factors that belong to the specific firm and do not vary over time (Wooldridge, 2015).

GMM

Although the fixed effect estimator takes unobservable heterogeneity into account, Hermalin and Weisbach (2001) argue that board structure is determined endogenously. Consequently, the fixed effect estimator is still biased as it does not account for dynamic endogeneity. As mentioned, dynamic endogeneity occurs when the board structures of a firm are determined by the firm's past performance. Additionally, Wintoki et al. (2012) argue that in the presence of a dynamic endogeneity bias, the direction of the coefficients will be biased oppositely of their actual direction. Thus, estimates of the fixed effects model, will have the opposite direction of their actual

direction, if dynamic endogeneity is present. Wintoki et al. (2012) argue that a dynamic system GMM estimator can account for the effect of past performance on corporate governance structures. Therefore, Wintoki et al. (2012) argue that a system GMM is the optimal choice for analyzing causal relations between corporate governance structures and firm performance. However, a dynamic system GMM estimator is a very advanced econometric technique that is out of scope for this thesis. Furthermore, there are also disadvantages regarding the dynamic system GMM estimator. As past performance measures are used as instruments for the system GMM, the validity of these instruments is questionable. Furthermore, measurement errors in past performance variables might be enhanced, because wrong measurements will reflect in biased coefficients of the predicted effects of the system GMM. Finally, when having to use past lags of variables as instruments, this can quickly limit sample size, because years in the beginning of the sample have to be used as instruments instead of observations of the sample (Wintoki et al., 2012).

4.4.4 Discussion of econometric models

Similar to most previous literature we use the pooled OLS estimator to provide a base for the discussion of the empirical results. As mentioned before, the OLS is simple in its specification and is relatively easy to interpret on. Furthermore, we use the fixed effects estimator, because it accounts for unobserved heterogeneity. Both estimators have important assumptions which we have aimed to account for.

First, we have accounted for multicollinearity, because including highly correlated independent variables make it difficult to assess the effect of an independent variable on a dependent variable. This is done to avoid unstable coefficients of the variables included in the regressions. More specifically, we have excluded potential independent variables which had a correlation on 50% or higher, with other independent variables in the regressions.

Two assumptions of the pooled OLS and the fixed effects estimator are that the error terms should be homoskedastic and that the error terms should not be auto correlated. Homoskedasticity means that variance of the error terms is constant when the values of the independent variables change. Auto correlation exists when the error terms correlate with each other. In order to accommodate

the assumptions regarding homoskedasticity and no auto correlation, all regressions are run with firm clustered standard errors. Like robust standard errors, clustered standard errors account for possible heteroskedasticity in the error term. Moreover, the clustered standard errors account for the possibility that the error terms are auto correlated across time for a specific bank (Wooldridge, 2015).

Another assumption of the OLS and FE assumptions is that the error term should not be correlated with the dependent variable or the explanatory variables, i.e. omitted variable bias (Wooldridge, 2015). To account for this endogeneity problem, we have included control variables in the OLS and fixed effect regressions to limit potential omitted variable bias. We have therefore included financial control variables and additional corporate governance variables besides the corporate governance variables used to test our hypotheses. We have previously referred to these additional corporate governance variables as control corporate governance variables in Section 4.2. Including the control corporate governance variables is in line with the arguments presented by (Adams & Mehran, 2012). Adams and Mehran (2012) argue that the results become more reliable when including more corporate governance variables to limit omitted variable bias.

As mentioned earlier, there are endogeneity problems within corporate governance research which the OLS estimator does not account for. However, the fixed effect model accounts for one of these endogeneity problems by taking unobservable heterogeneity into account when controlling for bank fixed effects. As a consequence of including bank fixed effects, an important assumption when using the fixed effects estimator, is that the values of the tested independent variables vary across the years within each individual bank. E.g. the board size of a bank has to change over the sample period for there to be within firm variation. Thus, it makes sense to interpret on the fixed effect results, only if there is within firm variation for an adequate amount of all firms for a specific variable. We have chosen a threshold of 40% to assess if a variable has adequate firm within variation. Consequently, we find enough within firm variation on the variables for all our explanatory corporate governance variables: board size, board independence and gender diversity. Thus, we test these explanatory corporate governance variables using the fixed effect estimator. Furthermore, we also find enough within firm variation for board meetings, board attendance, board skills, staggered boards and board tenure.

When using the fixed effects model we control for bank fixed effects, thus controlling for unobservable heterogeneity. However, we are not able to control for country fixed effects. The reason we are not able to control for country fixed effects, is that for some countries in our sample, there is only one bank in our sample. Thus, if country fixed effects were included, there would be perfect multicollinearity between the country fixed effect and the bank fixed effect for the countries with only one bank. Consequently, we are not able to include country fixed effects, as one of the shortcomings of our panel data is the limited amount of banks in each country.

Finally, another limitation of the chosen estimation methods, i.e. OLS and fixed effects, is that there might still be dynamic endogeneity and simultaneity problems which are not accounted for. This decreases the validity of our results, and is a limitation of our methodology. Thus, we recognize that our investigations possibly suffer from endogeneity problems. Consequently, we cannot assert causality from our results, but merely claim associations.

4.4.5 Empirical regression models

To analyze the effect of the corporate governance mechanisms on bank performance and bank risk-taking, regression models are developed. In general, the explanatory corporate governance variables are included. Additionally, the control corporate governance variables and financial control variables have been included to isolate the effect of the corporate variables related to our hypotheses. This is done to limit the potential bias in the regression coefficients.

Empirical regression models on performance

OLS regression model on performance

The following regression in Equation 5, is specified as an OLS model.

$$\begin{aligned}\gamma_{it} = \beta_0 + \beta_1(\text{BOARDSIZE})_{it} + \beta_2(\text{BOARDSIZE SQ})_{it} + \beta_3(\text{INDDIR})_{it} \\ + \beta_4(\text{GENDIV})_{it} + \beta_5(\text{CG CONTROL})_{it} + \beta_6(\text{FIN CONTROL})_{it} + \theta_t + \epsilon_{it}\end{aligned} \tag{5}$$

where γ is represented by return on assets, ROA, as the main dependent variable, and Tobin's Q is used as the dependent performance measure for the robustness test in Table 9. The subscript

i denotes the individual banks and the subscript t denotes the years. CG CONTROL is a vector of the control corporate governance variables. These variables include the effect of a corporate governance committee, blockholders, the number of board meetings, the average board attendance, the average boardskills, if the bank has a dual-board and the average board tenure of the directors. These variables are further discussed in Section 4.2.3. FIN CONTROL is a vector of the financial control variables, which include bank size, tier 1 capital ratio, earnings before taxes and loan loss provision ratio, loans ratio and change in total assets. These variables are further explained in Section 4.2.4. The parameter θ represents the year fixed effects. Finally, ϵ denotes the error term.

Fixed effects regression model on performance

The following regression in Equation 6, is specified as a fixed effects model where the main explanatory variables are board size (BOARDSIZE), board independence (INDDIR) and gender diversity (GENDIV). The fixed effects performance model is developed to test hypothesis H_1, H_3 and H_5, by investigating the association between the independent variables and performance:

$$\begin{aligned}\gamma_{it} = \beta_0 &+ \beta_1(\text{BOARDSIZE})_{it} + \beta_2(\text{BOARDSIZE SQ})_{it} + \beta_3(\text{INDDIR})_{it} \\ &+ \beta_4(\text{GENDIV})_{it} + \beta_5(\text{CG CONTROL})_{it} \\ &+ \beta_6(\text{FIN CONTROL})_{it} + \eta_i + \theta_t + \epsilon_{it}\end{aligned} \tag{6}$$

where γ is represented by return on assets, ROA, as the main dependent variable, and Tobin's Q is used as the dependent performance measure for the robustness test in Table 9. The subscript i denotes the individual banks and the subscript t denotes the years. The squared terms on board size and board independence have been included to investigate if a non-linear relationship exists. CG CONTROL is a vector of the control corporate governance variables. FIN CONTROL is a vector of the financial control variables. The parameter η denotes the bank fixed effect, which accounts for the unobserved heterogeneity of the individual banks. The parameter θ represents the year fixed effects. Finally, ϵ denotes the error term.

Empirical regression models on risk-taking

OLS regression model on risk-taking

The following regression in Equation 7, is specified as an OLS model.

$$\begin{aligned}\gamma_{it} = \beta_0 + \beta_1(\text{BOARDSIZE})_{it} + \beta_2(\text{INDDIR})_{it} + \beta_3(\text{GENDIV})_{it} \\ + \beta_4(\text{CG CONTROL})_{it} + \beta_5(\text{FIN CONTROL})_{it} + \theta_t + \epsilon_{it}\end{aligned} \tag{7}$$

where γ is represented by non-performing assets over total assets, as the main dependent variable, and the z-score is used as the dependent risk measure for the robustness test in Table 13. The subscript i denotes the individual banks and the subscript t denotes the years. CG CONTROL is a vector of the control corporate governance variables. FIN CONTROL is a vector of the financial control variables. The parameter θ represents the year fixed effects. Finally, ϵ denotes the error term.

Fixed effects regression model on risk-taking

The following regression in Equation 8, is specified as a fixed effects model where the main explanatory variables are board size (BOARDSIZE), board independence (INDDIR) and gender diversity (GENDIV). The fixed effects performance model is developed to test hypothesis H_2, H_4 and H_6, by investigating the association between the independent variables and risk:

$$\begin{aligned}\gamma_{it} = \beta_0 + \beta_1(\text{BOARDSIZE})_{it} + \beta_2(\text{INDDIR})_{it} + \beta_3(\text{GENDIV})_{it} \\ + \beta_4(\text{CG CONTROL})_{it} + \beta_5(\text{FIN CONTROL})_{it} + \eta_i + \theta_t + \epsilon_{it}\end{aligned} \tag{8}$$

where γ is represented by non-performing assets over total assets, as the main dependent variable, and the z-score is used as the dependent risk measure for the robustness test in Table 13. The subscript i denotes the individual banks and the subscript t denotes the years. CG CONTROL is a vector of the control corporate governance variables. FIN CONTROL is a vector of the financial control variables. The parameter η denotes the bank fixed effect, which accounts for the unobserved heterogeneity of the individual banks. The parameter θ represents the year fixed effects. Finally, ϵ denotes the error term.

5 Empirical results and analysis

In Section 5.1, the empirical results on bank performance are presented and related to previous literature. Furthermore, based on the empirical results for both the OLS and fixed effects regression models, preliminary conclusions of the stated hypotheses are presented. In Section 5.2, the empirical results related to the stated hypotheses are summarized and discussed. Hereafter, hypothesis 1, 3 and 5 are concluded upon. In Section 5.3, the empirical results on bank risk-taking are presented and related to previous literature. Furthermore, based on the empirical results for both the OLS and fixed effects regression models, preliminary conclusions of the stated hypotheses are presented. In Section 5.4, the empirical results related to the stated hypotheses are summarized and discussed. Hereafter, hypothesis 2, 4 and 6 are concluded upon.

5.1 Empirical results - Performance

In Subsection 5.1.1, the baseline results on the relationship between board related corporate governance mechanisms and bank performance measured by ROA are presented and analyzed. It should be noted that EBTPTA is excluded from the ROA regressions as it is very similar to ROA. Furthermore, we have excluded the BOARDSKILLS variable, as the coefficient on this variable is zero and we want to avoid overestimating the model. Subsection 5.1.2, reports the results of the robustness test using a staggered board variable and a financial crisis dummy. Subsection 5.1.3, reports the results of the robustness tests using Tobin's Q as the dependent variable for performance. The results of the robustness tests are compared to the baseline results of Subsection 5.1.1.

5.1.1 Main table related to performance

In Table 7, Model 1-3 shows the regression results using the OLS estimator. Model 1 shows the relationship of the key explanatory variables with the measure for performance, return on assets, as the dependent variable. Model 2 includes the control corporate governance variables and Model 3 includes the squared term of the proportion of independent directors (INDDIR SQ). Model 4-6 shows the regression results using the fixed effects estimator. Model 4 includes the explanatory and

financial control variables, however the control corporate governance variables are excluded. Model 5 includes the control corporate governance variables and Model 6 includes the squared term of the proportion of independent directors (INDDIR SQ).

OLS results regarding performance

Model 1-3 in Table 7 shows the results of the OLS regressions. It should be noted that when including the control corporate governance variables, the number of observations fall. However, as the number of banks only fall by six, this might suggest that our sample does not suffer from a sample selection bias that could affect our results.

The coefficients on board size (BOARDSIZE) are negative in Model 1, positive in Model 2 and negative in Model 3. Hence, the sign of the coefficients on board size are inconsistent using the OLS estimator. Furthermore, the coefficients on board size throughout Model 1-3 are insignificant at the 10% significance level using ROA as dependent variable. Thus, using the OLS estimator and ROA as proxy for performance, there is no support for H_1, where we proposed an inverted U-shaped relationship between board size and performance.

The coefficients on board independence (INDDIR), are positive in Model 1-3. Hence, the positive sign of the coefficients on board independence are consistent using the OLS estimator. However, the coefficients are insignificant. Thus, using the OLS estimator and ROA as proxy for performance, there is no support for H_3, where we proposed a negative relationship between board indpendence and performance.

The coefficients on gender diversity on the board (GENDIV), are positive in Model 1-3. Furthermore, the positive coefficients are significant at the 10% level in Model 1 and significant at the 5% level in Model 2 and 3. This indicates that a higher proportion of female directors on the board positively affects performance measured by ROA. Using the OLS estimator and ROA as proxy for performance this finding supports H_5, where we proposed that there is a positive relationship between gender diversity and performance. The reason that a higher proportion of female directors positively affects performance could be due to the arguments provided by Robinson and Dechant (1997) that female directors contribute to firm value by increasing the effectiveness of the board through better decision-making. Robinson and Dechant (1997) further argue that female directors

are better communicators and they come better prepared to board meetings which is reflected in better decision-making on the board. This result is in line with the findings by Farag and Mallin (2017) and Pathan and Faff (2013) who also find that a higher proportion of female directors is positively related to bank performance.

In relation to the control corporate governance variables, the coefficients on board meetings (BOARDMEET) are negative and statistically significant at the 1% level in Model 2 and 3. This is interesting, as we argued earlier that the variable for board meetings is a proxy for the internal functioning of the board. Therefore, this result indicates that a better internal functioning of the board, decreases the ROA in a bank. Though, this result might be due to reverse causality. For example, when banks experience poor performance, the board of directors might be obligated to take more meetings with the purpose of solving the issues that has led to the poor performance of the bank. Unfortunately, the empirical setting of this study does not allow us to address this issue more in detail.

The coefficients on board tenure (BOARDTEN) are positive and statistically significant at the 5% level in Model 2 and 3. This result suggests that as the average tenure on the board increases, performance increases. This can be interpreted as an indication that more experienced board members are able to improve the decision-making on the board of banks. As banks are complex, more tenured directors might possess better bank-specific knowledge, enabling them to make better decisions. This notion is supported by the arguments by Anderson et al. (2004). Anderson et al. (2004) argue that directors with higher tenure might be able to better advice and monitor management because of their higher bank-specific knowledge.

The coefficient on the change in total assets (CHGTA) is positive and statistically significant at the 1% level. This partly supports the notion that banks with higher growth in their total assets perform better.

Fixed effects results regarding performance

In Table 7 Models 4-6 shows the results of the fixed effect estimations. Model 4 shows that the coefficient on board size is positive but statistically insignificant. However, Model 5 and 6 in Table 7, shows that the coefficients on board size (BOARDSIZE) are positive and statistically

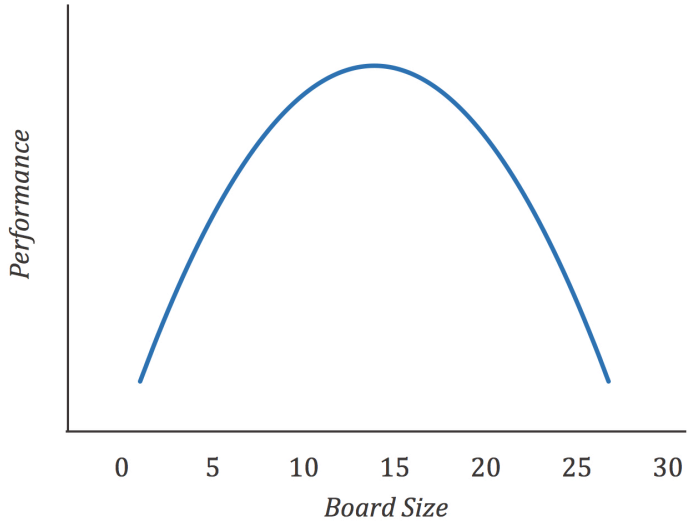
Table 7: Main table on bank performance. This table reports the OLS and fixed effects regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. The dependent variable is return on assets, ROA, i.e. net income before tax divided by total assets. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy variable that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET measures number of board meetings in a year. BOARDATT measures the average attendance of the directors on the board. BOARDSKILLS measures the proportion of directors with bank specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN measures the average tenure of the director on the board. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital ratio calculated as the tier 1 capital divided by risk-weighted assets. LOANSTA is the total loans divided by the total assets. CHGTA is the total assets a time t divided by total assets at t-1 minus one.

	OLS			Fixed Effects		
	1	2 (Base)	3	4	5 (Base)	6
	Explanatory CG Only	CG Control Included	Independent Director Sq.	Explanatory CG Only	CG Control Included	Independent Director Sq.
Variables	*Dependent Variable: ROA*					
BOARDSIZE	-0.00048	0.00011	-0.00005	0.00009	0.00116*	0.00121*
	(0.00076)	(0.00078)	(0.00076)	(0.00076)	(0.00059)	(0.00066)
BOARDSIZE SQ	0.00001	-0.00001	-0.00000	-0.00000	-0.00004*	-0.00004*
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
INDDIR	0.00001	0.00002	0.00008	0.00001	0.00003	0.00001
	(0.00001)	(0.00002)	(0.00008)	(0.00002)	(0.00002)	(0.00007)
INDDIR SQ			-0.00000			0.00000
			(0.00000)			(0.00000)
GENDIV	0.00009*	0.00012**	0.00012**	0.00002	0.00003	0.00003
	(0.00005)	(0.00005)	(0.00005)	(0.00004)	(0.00005)	(0.00005)
CGCOMM		0.00225	0.00232		-0.00079	-0.00077
		(0.00174)	(0.00176)		(0.00099)	(0.00101)
BLOCK		-0.00010	-0.00036		0.00059	0.00059
		(0.00111)	(0.00113)		(0.00138)	(0.00139)
BOARDMEET		-0.00031***	-0.00031***		-0.00034***	-0.00033***
		(0.00009)	(0.00009)		(0.00007)	(0.00007)
BOARDATT		-0.00002	-0.00003		-0.00023	-0.00023
		(0.00005)	(0.00005)		(0.00015)	(0.00015)
DUALBOARD		-0.00028	0.00003		0.01229	0.01219
		(0.00213)	(0.00222)		(0.00994)	(0.00981)
BOARDTEN		0.00051**	0.00049**		0.00045*	0.00045*
		(0.00019)	(0.00019)		(0.00024)	(0.00025)
BANKSIZE	-0.00038	-0.00136	-0.00132	-0.00032	-0.00287**	-0.00294**
	(0.00116)	(0.00128)	(0.00126)	(0.00177)	(0.00138)	(0.00135)
TIER1	0.03423	0.02102	0.02071	0.11836***	0.06439***	0.06442***
	(0.02501)	(0.02005)	(0.01990)	(0.02994)	(0.01180)	(0.01163)
LOANSTA	-0.00075	0.00115	0.00115	0.02127***	0.01456**	0.01429**
	(0.00690)	(0.00473)	(0.00471)	(0.00776)	(0.00668)	(0.00646)
CHGTA	0.27271***	0.18179***	0.18151***	0.21394***	0.14472***	0.14560***
	(0.08926)	(0.05376)	(0.05363)	(0.07886)	(0.03364)	(0.03524)
Constant	0.01183	0.02029	0.02085	-0.01310	0.03316*	0.03426*
	(0.01983)	(0.01861)	(0.01866)	(0.02289)	(0.01852)	(0.01866)
Observations	448	287	287	448	287	287
R-squared	0.19372	0.37136	0.37332	0.23875	0.42022	0.42045
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Banks	51	45	45	51	45	45

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

significant at the 10% level. Additionally, the results show that the coefficient on board size squared (BOARDSIZE SQ) is also statistically significant at the 10% level. This indicates that there is an inverted U-shaped relationship between board size and ROA, which is illustrated in Figure 6. Hence, the empirical results using the fixed effect estimator and ROA as proxy for performance, supports H_1, where we proposed an inverted U-shaped relationship between board size and performance.

Figure 6: *Inverted U-shaped relationship between board size and bank performance*



Note: Performance on the y-axis is measured by ROA

Figure 6 plots the predicted inverted U-shaped relationship, and illustrates that performance is maximized at a board size of 14. Hence, when the board size is below 14, adding a director to the board increases performance. Conversely, when the board size is above 14, adding an additional director is associated with a decrease in performance. A board size of 14 might be considered to be relatively large which goes against the trend and recommendations of having a smaller board to avoid free riding problems (Jensen, 1993). However, as banks are opaque and complex, a larger board might be needed for banks. Thus, larger board size allows the board to be more competent and provide better advice as more directors increase the pool of resources on the bank boards. Our finding that the optimal board size for banks is 14, suggests that banks should have a larger board size than what is normally recommended for firms. The finding that banks should have larger boards is supported by the findings by Adams and Mehran (2003). They find that banks in general have larger boards than non-financial firms. Coles et al. (2008) also find that complex

firms, including financial firms, should have larger boards than non-financial firms, as a relatively larger board increase the performance of complex firms.

Our findings are in line with the findings of Andres and Vallelado (2008), who find an inverted U-shaped relationship between board size and performance. The positive relationship between board size and performance when the board size is below 14 could be explained by the better advising and monitoring effects from a larger board. When the board becomes larger, the expertise of the board increases. The increase in expertise on the board improves the board's ability to monitor and advice management which increases the performance of the bank (Andres & Vallelado, 2008; Dalton et al., 1998). The negative relationship between board size and performance that occur when the board size is above 14, could be explained by free-riding and coordination problems that occur on the board as the board becomes larger. Thus, as the board becomes larger, the directors have less incentive to monitor the management because of the expectation that other directors will monitor the management instead, i.e. free-riding problems occur. (Jensen, 1993). Thus, our findings suggest that there is positive effects and negative effects of a large board. This indicates that the costs of free-riding and coordination problems outweigh the benefits of better advising and monitoring capabilities on the board as the board size becomes larger than 14.

In Table 7, Model 3-6 shows that the coefficients on board independence (INDDIR) are positive but statistically insignificant. Hence, this relationship does not support H_3, where we proposed that a higher proportion of independent directors is negatively related to bank performance. In fact, the positive coefficient is the opposite of what was expected in the hypothesis. Consequently, we find that independent directors do not affect bank performance, in line with Adams and Mehran (2012). This result is not in line with the empirical findings by Zagorchev and Gao (2015) and Liang et al. (2013) who find that independent directors is significantly positively related to firm performance. Furthermore, our findings do not support the findings by Erkens et al. (2012) and Pathan and Faff (2013) that both find independent directors to be significantly negative related to firm performance. The reason for why independent directors do not add value to a firm, could be attributed to the information asymmetry that exists between the independent directors and the management of the firm. For a bank, the degree of information asymmetry between management and the board of directors, is amplified by the complexity and opaqueness of the banking business.

As independent directors by definition are outsiders to the firm, these might not posses the firm specific knowledge needed to contribute value to the board. Thus, independent directors might not be able to add value to the bank due to the information asymmetry that exists because of bank complexity. Other previous literature also find no relationship between independent directors and performance (Hermalin & Weisbach, 2001; Mehran, 1995). As Mehran (1995) point out, the missing effect between board independence and performance could be evidence that independent directors are forsaking their obligation to shareholders in terms of increasing firm performance.

Table 7 shows that the coefficients on gender diversity (GENDIV) in Model 4-6 are positive. The positive coefficients on gender diversity are in line with the hypothesis, H_5, where we proposed that a higher proportion of female directors on the board is positively linked with bank performance. However, it should be noted that the results are not significant at the 10% level. Unlike the findings by Farag and Mallin (2017) and Pathan and Faff (2013), who find that female directors increase performance, we do not find this positive relationship to be significant. One explanation for our finding could be that female directors, being a minority on the board, have to reach a critical mass before the impact of more diversity on decision-making emerge (Joecks, Pull, & Vetter, 2013). Thus, when we control for unobserved heterogeneity using fixed effects, we do not find that a higher proportion of female directors on the board affects bank performance positively. This is unlike the results found when using the OLS estimator, where we found that the effect of gender diversity on performance was positive and significant at the 5% level.

The coefficients on board meetings (BOARDMEET) in Model 4-6 are negative and statistically significant at the 1% level. Hence, more board meetings are negatively associated with bank performance. This is similar to the OLS results in Model 2 and 3. As argued earlier, the negative relationship between board meetings and ROA could be due to reverse causality, as the board of directors are more likely to hold more meetings with the purpose of solving the issues that has led to the poor bank performance. The coefficients on board tenure (BOARDTEN) in model 4-6 are positive and statistically significant at the 10% level. Similar to the OLS results in Model 2 and 3, this result supports the notion that a board with higher tenure might contribute with greater advice and monitoring which increases bank performance.

The coefficients on bank size (BANKSIZE) are negative and statistically significant at the 5%

level in Model 5 and 6. This indicates that smaller banks have performed better than large banks throughout the sample period. This could be evidence that larger banks suffered more than smaller banks during and after the financial crisis. The coefficients on the tier 1 capital ratio (TIER1) are positive and significant at the 1% level in Model 4-6. Our finding that tier 1 capital ratio is positively linked to performance might be because banks with higher tier 1 capital ratios needed to raise less capital during the financial crisis. Banks with high tier 1 capital ratios might have been able to cover their losses with internal capital. Conversely, banks with low tier 1 capital ratios might have needed to raise external capital during the financial crisis. Raising external capital is believed by the finance literature to be more expensive than using internal available capital. Hence, this could have resulted in lower performance, because shareholders had to incur the costs of raising new capital to cover potential losses. Therefore, banks with low tier 1 capital ratios might have experienced a transfer of wealth from shareholders to debt-holders, because of the need to service debt payments with newly raised capital (Erkens et al., 2012).

The coefficients on the ratio of loans over total assets (LOANSTA) are positively related to ROA. As the loans to total assets ratio is positive and statistically significant at the 5% level, this indicates that banks which have a larger part of their capital invested in loans perform better. Finally, the coefficients on the change in total assets (CHGTA) are positive and statistically significant at the 1% level. This partly supports the notion that banks with higher growth in total assets perform better.

5.1.2 Robustness test 1: Staggered board and financial crisis dummy

In order to check the validity of our results of the baseline OLS and fixed effect regression models, we conduct robustness tests. Table 8 illustrates the results of the robustness tests, using a staggered board variable and a financial crisis dummy for both the OLS and fixed effect estimators. We control for the impact of staggered boards following the approach of Zagorchev and Gao (2015) and the financial crisis, following the approach of Mamatzakis and Bermpei (2015). The baseline models in Table 7 have been included in Table 8. These have been included to simplify the comparison between the baseline results and the robustness results. Model 1 shows the baseline performance model using the OLS estimator and Model 4 shows the baseline model using the fixed effects

Table 8: Robustness test 1 on bank performance. This table reports the OLS and fixed effect regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. The dependent variable is return on assets, ROA, i.e. net income before tax divided by total assets. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. STAGG is a dummy variable which equals 1 if the bank has a staggered board, otherwise 0. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy variable that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET measures number of board meetings in a year. BOARDATT measures the average attendance of the directors on the board. BOARDSKILLS measures the proportion of directors with industry specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN measures the average tenure of the director on the board. The control variables follow. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital ratio calculated as the tier 1 capital divided by risk-weighted assets. LOANSTA is the total loans divided by the total assets. CHGTA is the total assets a time t divided by total assets at t-1 minus one. FINCR equals 1 if the year is 2007-2009, otherwise 0.

	OLS			Fixed Effects		
	1 (Base)	2	3	4 (Base)	5	6
	CG Control Included	Staggered Board incl.	Financial Crisis incl.	CG Control Included	Staggered Board incl.	Financial Crisis incl.
Variables	*Dependent Variable: ROA*					
BOARDSIZE	0.00011	0.00040	0.00024	0.00116*	0.00175**	0.00141**
	(0.00078)	(0.00084)	(0.00076)	(0.00059)	(0.00080)	(0.00058)
BOARDSIZE SQ	-0.00001	-0.00001	-0.00001	-0.00004*	-0.00006**	-0.00005**
	(0.00002)	(0.00003)	(0.00002)	(0.00002)	(0.00003)	(0.00002)
INDDIR	0.00002	0.00003	0.00002	0.00003	0.00003	0.00002
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
GENDIV	0.00012**	0.00012**	0.00012***	0.00003	0.00001	0.00004
	(0.00005)	(0.00005)	(0.00004)	(0.00005)	(0.00004)	(0.00004)
STAGG		-0.00024			0.00069	
		(0.00137)			(0.00115)	
CGCOMM	0.00225	0.00212	0.00237	-0.00079	-0.00103	-0.00072
	(0.00174)	(0.00193)	(0.00170)	(0.00099)	(0.00131)	(0.00082)
BLOCK	-0.00010	-0.00025	-0.00018	0.00059	0.00070	0.00041
	(0.00111)	(0.00122)	(0.00114)	(0.00138)	(0.00138)	(0.00138)
BOARDMEET	-0.00031***	-0.00032***	-0.00033***	-0.00034***	-0.00034***	-0.00041***
	(0.00009)	(0.00009)	(0.00009)	(0.00007)	(0.00007)	(0.00007)
BOARDATT	-0.00002	-0.00003	-0.00003	-0.00023	-0.00017	-0.00028*
	(0.00005)	(0.00005)	(0.00005)	(0.00015)	(0.00016)	(0.00016)
DUALBOARD	-0.00028	-0.00022	-0.00041	0.01229	0.01374	0.01250
	(0.00213)	(0.00218)	(0.00205)	(0.00994)	(0.01016)	(0.01035)
BOARDTEN	0.00051**	0.00060***	0.00050***	0.00045*	0.00051**	0.00044*
	(0.00019)	(0.00018)	(0.00018)	(0.00024)	(0.00023)	(0.00025)
BANKSIZE	-0.00136	-0.00154	-0.00135	-0.00287**	-0.00263*	-0.00372***
	(0.00128)	(0.00130)	(0.00126)	(0.00138)	(0.00153)	(0.00136)
TIER1	0.02102	0.01766	0.02310	0.06439***	0.06511***	0.06437***
	(0.02005)	(0.02197)	(0.01803)	(0.01180)	(0.01305)	(0.01082)
LOANSTA	0.00115	0.00111	0.00199	0.01456**	0.01717**	0.01727***
	(0.00473)	(0.00540)	(0.00468)	(0.00668)	(0.00689)	(0.00585)
CHGTA	0.18179***	0.18805***	0.18755***	0.14472***	0.14578***	0.17052***
	(0.05376)	(0.05250)	(0.04632)	(0.03364)	(0.03650)	(0.03399)
FINCR			0.00326**			0.00274***
			(0.00132)			(0.00084)
Constant	0.02029	0.02018	0.01394	0.03316*	0.01857	0.04034**
	(0.01861)	(0.01926)	(0.01747)	(0.01852)	(0.02155)	(0.01950)
Observations	287	270	287	287	270	287
R-squared	0.37136	0.38627	0.34047	0.42022	0.44290	0.35786
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
Number of Banks	45	44	45	45	44	45

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

estimator. Model 2 and 3 shows the results of the robustness test for the OLS estimator and Model 5 and 6 shows the results of the robustness tests for the fixed effects estimator.

OLS results regarding performance - Robustness test 1

In Table 8, Model 1 shows the baseline model results of the OLS, Model 2 shows the robustness results including staggered board and Model 3 shows the robustness results when including a financial crisis dummy to control for the financial crisis. Overall, the OLS results found in the baseline OLS model are robust to the model specifications in Model 2 and 3. Hence, the positive coefficients on board size (BOARDSIZE) in Model 1 are also positive in Model 2 and 3. Likewise, the coefficients on board Independence (INDDIR) are also positive in Model 2 and 3 which supports the result in Model 1. The coefficient on gender diversity is positive and significant at the 5% level in Model 2, and on the 1% level in Model 3. Thus, the positive effect of gender diversity on performance, which was indicated by the baseline OLS model, remain present when respectively accounting for the presence of a staggered board and the financial crisis. Furthermore, the coefficients on board meetings (BOARDMEET) are negative and significant at the 1% level in Model 2 and 3. The coefficients on board tenure (BOARDTEN) are positive and significant at the 1% level in Model 2 and 3.

Interestingly, the coefficient on the financial crisis dummy is positive and statistically significant at the 5% level in Model 3. In Section 4.3, Table 6 shows that ROA is high in 2007 relative to 2008 where the ROA has fallen drastically. However, the overall level of ROA is higher in the period between 2007 to 2009 compared to the rest of the sample period. The higher level of ROA from 2007 to 2009, might explain the positive coefficient on the financial crisis dummy.

In addition to testing the robustness of the OLS using other corporate governance variables, we have run a robustness test on the OLS results where the standard errors have been clustered on countries instead of firms. We found that the OLS results are robust when clustering the standard errors on countries. For simplification purposes, we have chosen not to include these results in the tables.

Fixed effects results regarding performance - Robustness test 1

In Table 8, Model 4 shows the baseline model results of using fixed effects, Model 5 shows the

robustness results including staggered board and Model 6 shows the robustness results when including a financial crisis dummy to control for the financial crisis. Overall, the fixed effects results are robust to these model specifications in Model 5 and 6.

The coefficients on board size (BOARDSIZE) are positive and significant at the 5% level in Model 5 and 6. The level of statistical significance increases from 10% to 5% on the board size variable and the board size squared variable when including staggered board in Model 5. Hence, the results on board size and ROA are robust to the model specifications in Model 5 and 6. The coefficients on independent directors (INDDIR) are positive in Model 5 and 6 similar to Model 4, which is the baseline result on ROA. Hence, the sign of the coefficients are consistent across Model 4-6. Likewise, the positive coefficient on gender diversity (GENDIV) in Model 4 are also positive in Model 5 and 6. The coefficients on board meetings (BOARDMEET) are negative and statistically significant at the 1% level similar to Model 4. Furthermore, the coefficients on board tenure (BOARDTEN) are positive and statistically significant at the 1% level in Model 5 and 6, consistent with the result in Model 4.

Additionally, in Model 6, board attendance (BOARDATT) becomes statistically significant at the 10% level when including a financial crisis dummy. Similarly to the effect of board meetings, the coefficient on board attendance is negative. This might be due to reverse causality, as board members might attend more board meetings when a bank has poor performance. Moreover, similar to the OLS results, the financial crisis dummy is positive and significant at the 1% level, which supports the fact that banks in our sample had a higher ROA before and during the financial crisis. This is because the ROA in 2007 is much higher than the rest of the sample period, which can be seen in Table 6, in Section 4.3.

As explained in Section 4.2.3, the presence of a staggered board is generally a proxy for bad governance in a firm as it protects incumbent management from being replaced (Bebchuk & Cohen, 2005). This is because a staggered board decreases the threat of a hostile takeover, which is a corporate governance mechanism that disciplines managers to act in the interests of shareholders. Thus, the increased significance of the coefficients on the board size variables in Model 5, illustrates that the presence of governance structures in banks that protects incumbent management, affect the impact on performance of other governance parameters. This is in line with the results of

Zagorchev and Gao (2015) who find that the presence of a staggered board affects the impact of other governance parameters. More specifically, when controlling for staggered boards in Model 5, the coefficients of the board size variable not only increase in degree of significance, but also in magnitude.

Finally, for the fixed effects regressions we have run additional robustness test by excluding year fixed effects. Our results are not robust to removing year fixed effects. For simplification purposes, we have chosen not to include these results in the tables.

5.1.3 Robustness test 2: Tobin's Q

In Table 9, Tobin's Q is used as dependent variable in order to investigate whether our results found by using ROA as dependent variable, are robust to using another proxy for performance. Model 1 shows the baseline performance model using the OLS estimator and Model 4 shows the baseline model using the fixed effects estimator. Model 2 and 3 shows the results of the robustness test for the OLS estimator and Model 5 and 6 shows the results of the robustness tests for the fixed effects estimator. It should be noted that EBTPTA is now included as a financial control variable.

OLS results regarding performance - Robustness test 2

Initially board size squared is excluded in Model 2, to investigate if there is a linear relation between board size and performance measured by Tobin's Q. As the coefficient on board size is statistically insignificant, such a relation does not seem to be present.

In Table 9, Model 2 and 3 shows that the OLS baseline results found by using ROA as a proxy for bank performance, are not robust using Tobin's Q as dependent variable. The coefficients on board size (BOARDSIZE) are negative but insignificant in Model 2 and 3 using OLS. The sign of the coefficients on board size in Model 2 and 3 using Tobin's Q differs from the sign of the coefficients on board size using ROA in Model 1. Thus, using the OLS estimator and Tobin's Q as proxy for performance, there is no support for H_1, where we proposed an inverted U-shaped relationship between board size and performance.

The coefficients on board independence (INDDIR) are negative in Model 2 and 3, however the

Table 9: Robustness test 2 on bank performance. This table reports the OLS and fixed effects regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. ROA is return on assets, i.e. net income before tax divided by total assets. Tobin's Q is the sum of the book value of total assets plus market capitalization minus book value of equity. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy variable that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET measures number of board meetings in a year. BOARDATT measures the average attendance of the directors on the board. BOARDSKILLS measures the proportion of directors with bank specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN measures the average tenure of the director on the board. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital ratio calculated as the tier 1 capital divided by risk-weighted assets. LOANSTA is the total loans divided by the total assets. CHGTA is the total assets a time t divided by total assets at t-1 minus one. EBTPTA is the earnings before taxes and loan loss provisions divided by total assets.

	OLS			Fixed Effects		
	1 (Base)	2	3	4 (Base)	5	6
Variables	ROA	Tobin's Q		ROA	Tobin's Q	
BOARDSIZE	0.00011	-0.00075	-0.00240	0.00116*	0.00038	-0.00332
	(0.00078)	(0.00053)	(0.00294)	(0.00059)	(0.00089)	(0.00254)
BOARDSIZE SQ	-0.00001		0.00005	-0.00004*		0.00012
	(0.00002)		(0.00009)	(0.00002)		(0.00008)
INDDIR	0.00002	-0.00009	-0.00008	0.00003	0.00013*	0.00013*
	(0.00002)	(0.00007)	(0.00006)	(0.00002)	(0.00007)	(0.00007)
GENDIV	0.00012**	0.00004	0.00005	0.00003	0.00035	0.00036
	(0.00005)	(0.00021)	(0.00020)	(0.00005)	(0.00035)	(0.00035)
CGCOMM	0.00225	0.00102	0.00027	-0.00079	-0.00582	-0.00734
	(0.00174)	(0.00377)	(0.00412)	(0.00099)	(0.00649)	(0.00680)
BLOCK	-0.00010	0.00080	0.00088	0.00059	-0.01038	-0.01081
	(0.00111)	(0.00390)	(0.00391)	(0.00138)	(0.00695)	(0.00710)
BOARDMEET	-0.00031***	-0.00008	-0.00006	-0.00034***	0.00052	0.00060
	(0.00009)	(0.00036)	(0.00036)	(0.00007)	(0.00043)	(0.00043)
BOARDATT	-0.00002	0.00076***	0.00075***	-0.00023	0.00051	0.00058
	(0.00005)	(0.00014)	(0.00014)	(0.00015)	(0.00040)	(0.00040)
DUALBOARD	-0.00028	0.00131	0.00083	0.01229	-0.01831***	-0.02118***
	(0.00213)	(0.00516)	(0.00518)	(0.00994)	(0.00656)	(0.00764)
BOARDTEN	0.00051**	-0.00009	-0.00002	0.00045*	0.00131	0.00172
	(0.00019)	(0.00052)	(0.00054)	(0.00024)	(0.00112)	(0.00110)
BANKSIZE	-0.00136	-0.00386*	-0.00357*	-0.00287**	-0.00502	-0.00386
	(0.00128)	(0.00206)	(0.00211)	(0.00138)	(0.00956)	(0.00985)
TIER1	0.02102	0.18952**	0.18629**	0.06439***	0.21311**	0.21115**
	(0.02005)	(0.08687)	(0.08447)	(0.01180)	(0.09767)	(0.09383)
LOANSTA	0.00115	-0.01988	-0.02215	0.01456**	0.10130*	0.09591*
	(0.00473)	(0.01360)	(0.01495)	(0.00668)	(0.05061)	(0.05072)
CHGTA	0.18179***	0.27679*	0.28099*	0.14472***	0.14646	0.15038
	(0.05376)	(0.14404)	(0.14601)	(0.03364)	(0.14833)	(0.15156)
EBTPTA		2.00967***	2.01850***		0.60282	0.57986
		(0.33581)	(0.33905)		(0.54073)	(0.56634)
Constant	0.02029	0.99420***	1.00330***	0.03316*	0.94811***	0.95461***
	(0.01861)	(0.03569)	(0.04086)	(0.01852)	(0.11504)	(0.11498)
Observations	287	286	286	287	286	286
R-squared	0.37136	0.55282	0.55392	0.42022	0.43126	0.43751
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Banks	45	45	45	45	45	45

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

coefficients are insignificant. The negative coefficients on board independence in Model 2 and 3 using Tobin's Q differs from the positive coefficient on board independence in Model 1 using ROA. Hence, using the OLS estimator and Tobin's Q as proxy for performance, the negative coefficients on board independence are in line with H_3, where we proposed an negative relationship between board size and performance. However, the negative coefficients on board independence are not significant at the 10% level.

The coefficients on gender diversity on the board (GENDIV) are positive in Model 2 and 3. This is similar to the findings in Model 1 with OLS and ROA as proxy for performance. However, the positive coefficients on gender diversity on the board in Model 2 and 3 are not significant. Using the OLS estimator and Tobin's Q as proxy for performance, the positive coefficients are in line with H_5, where we proposed that there is a positive relationship between gender diversity on the board and performance. However, it should be noted that the positive coefficients in Model 2 and 3 are insignificant. Conclusively, the significant positive relationship between gender diversity on the board and performance measured by ROA in Model 1 is not robust when using Tobin's Q as a performance measure in Model 2 and 3.

Furthermore, the coefficient on board attendance (BOARDATT) is positive and statistically significant at the 1% level. Hence, the higher board attendance of board members increases Tobin's Q and thereby performance. Finally, it can be seen that the coefficient on earnings before loan loss provisions over total assets (EBTPTA), is positive and highly significant. Hence, EBTPTA positively affects Tobin's Q.

Fixed effects results regarding performance - Robustness test 2

In Table 9, Model 5 and 6 shows that the results found in the baseline model using ROA as a measure for performance, are not robust using Tobin's Q as performance measure. In Model 5 the coefficient on board size (BOARDSIZE) is positive but insignificant. In Model 6, when including board size squared, the coefficient on board size is negative but insignificant. Hence, the empirical results of an inverted U-shaped relationship in Model 4 using ROA is not robust when using Tobin's Q. Using the fixed effects estimator and Tobin's Q as proxy for performance, the results are not in line with H_5, where we proposed an inverted U-shaped relationship between board size and

performance.

In relation to the proportion of independent directors on the board (INDDIR), the coefficients are positive and statistically significant at the 10% level in Model 5 and 6. This indicates that independent directors add value on the board. The finding contradicts our hypothesis, H_3, where we proposed that a higher proportion of independent directors is negatively related to bank performance. The positive effect of board independence on Tobin's Q indicates that a continuously increasing proportion of independent directors increases the performance of banks. In the context of banks this result is unanticipated, as we argued that a bank board would need bank-specific expertise to improve the decision-making because of the high complexity of the banking business. However, the positive association between independent directors and performance is in line with the theoretical arguments put forward by Jensen and Meckling (1976), who argue that independent directors are more effective monitors of management. Thus, our findings suggests that the monitoring of management by independent directors adds value in terms of a higher Tobin's Q. Our findings are also in line with some previous literature on bank performance. E.g. both Zagorchev and Gao (2015) and Liang et al. (2013), find that board independence is positively related to bank performance.

Our findings using Tobin's Q are not in line with the results found when using ROA as a proxy for performance, both in regard to independent directors and board size. An explanation for the differing results in regard to independent directors, could be that the value created by independent directors through better monitoring of management is not reflected in ROA. Another general explanation for the varying results could be that simultaneity issues might occur when using Tobin's Q, as argued in Section 4.2.1. As Tobin's Q is a market measure, board size and proportion of independent directors might not be exogenously determined. This might be the case if shareholders determine board composition and board size in expectation that it will increase performance. Thus, if a firm chooses its board structure based on the anticipation of higher performance, the causality is blurred as the level of performance is chosen simultaneously with the corporate governance structure. Therefore, this can lead to endogeneity problems which disturb the econometric results found when using a market measure as proxy for performance, such as Tobin's Q (Wooldridge, 2015; Wintoki et al., 2012).

The coefficients on gender diversity on the board (GENDIV) are positive in Model 5 and 6 using Tobin's Q. This is similar to the positive coefficients on gender diversity in Model 4. Using the fixed effect estimator and Tobin's Q as proxy for performance the positive coefficients are in line with H_5, where we proposed that there is a positive relationship between gender diversity on the board and performance. However, it should be noted that the positive coefficients in Model 5 and 6 are insignificant

The coefficients on the presence of a dual-board (DUALBOARD) are negative and highly significant at the 1% level in Model 5 and 6. This suggests that a two-tier board structure is negatively related to firm performance measured by Tobin's Q. This finding could be explained by the larger information asymmetries which might exist when the board of directors and management board are separated in a two-tier board structure. The larger information asymmetry of two-tier board could be reflected in worse performance. As a consequence of the information asymmetry, the directors in a two-tier board structure might not be able to create as much value as the directors sitting on a unitary board where parts of top management in the bank is also represented. This suggests that a unitary board narrows the information asymmetry gap by increasing information sharing between management and the directors of the board. However, it should be noted that the within firm variation of the dual-board variable in our sample is not large. This limits the strength of result regarding dual-board, as there needs to be an adequate level of within firm variation before the results of the fixed effects estimator are valid. Therefore, this result should be interpreted with caution.

5.2 Discussion of the hypotheses related to performance

In this section, the proposed hypotheses are discussed and concluded upon based on the empirical results for bank performance. Table 10 summarizes the empirical results on board size, board independence and gender diversity in relation to bank performance. Furthermore the expected relationship of the hypotheses related to bank performance, H_1,H_3 and H_5 are included in the table.

Table 10: *Empirical results on bank performance*

Hypothesis	Expected relation	OLS		Fixed effects	
		ROA	*Tobin's Q*	*ROA*	*Tobin's Q*
H_1	Inverted U-shape	Positive	Negative	Inverted U-shape (*)	Positive
H_3	Negative	Positive	Negative	Positive	Positive (*)
H_5	Positive	Positive (**)	Positive	Positive	Positive

Note: H_1 is related to board size and bank performance, H_3 is related to board independence and bank performance and H_5 is related to gender diversity on the board and bank performance.*** p<0.01, ** p<0.05, * p<0.1

5.2.1 Hypothesis 1: Board size and performance

For hypothesis 1, we proposed an inverted U-shaped relationship between performance and board size. Using the fixed effect estimator and ROA as performance proxy, we find an indication of an inverted U-shaped relationship, which is significant at the 10% level. Additionally, when controlling for staggered boards and the financial crisis period, this result is significant at the 5% level. However, when using OLS we find no association between board size and performance. The difference in the results between the OLS results and the fixed effects results using ROA, might be due to the OLS estimator not accounting for unobserved heterogeneity which the fixed effects estimator accounts for. When using Tobin's Q as the performance measure instead of ROA, we find no significant results between board size and Tobin's Q. As argued by Wintoki et al. (2012), Tobin's Q might bias the results due to endogeneity issues. This might explain the difference in the results on board size. Hence, as we argued earlier, we use ROA as the main preferred performance measure.

Conclusively, we find partial support for H_1, as the fixed effects results on board size and ROA are significant at the 10% level. The inverted U-shaped relationship indicates that as the board size increase beyond what is optimal, the costs of free-riding and coordination problems outweigh the benefits of better advising and monitoring capabilities on the board. Therefore, as the board size becomes larger, the increased expertise on the board improves the board's ability to advice and monitor management, thus increasing bank performance up until a certain board size. Thereafter, free-riding and coordination problems occur as the board becomes larger, thus decreasing bank performance.

5.2.2 Hypothesis 3: Board independence and performance

For hypothesis 3, we proposed a negative relationship between the proportion of independent directors on the board and bank performance. We find no association between board independence and bank performance using ROA. This result is consistent when running the robustness tests using staggered boards and the financial crisis dummy. However, using Tobin's Q as a performance measure instead of ROA, we find a significant positive relationship between board independence and performance. Opposite to our hypothesis, this finding indicates that independent directors increase the performance of banks. However, as argued in the previous section, the regressions using Tobin's Q might be subject to an endogeneity bias, i.e. simultaneity. Consequently, this might explain the difference in the results. Another explanation for the difference in the results might be that ROA is a backward looking accounting measure whereas Tobin's Q is a forward looking market value measure. Hence, these two variables are not one to one substitutes for measuring performance. Conclusively, we find no support for H_3.

5.2.3 Hypothesis 5: Gender diversity and performance

With regard to hypothesis 5, we proposed that a higher proportion of female directors on the board is positively associated with bank performance. Using ROA and Tobin's Q as performance proxies and the fixed effects estimator, we find a positive but insignificant relationship between gender diversity on the board and bank performance. Thus, when we control for unobserved heterogeneity using fixed effects, we do not find that a higher proportion of female directors on the board affects bank performance positively. However, using the OLS estimator, we find a positive relationship between the proportion of female directors directors on the board, at a 5% significance level. This indicates that a higher proportion of female directors on the board increases bank performance measured by ROA. This result is robust when controlling for the financial crisis and the presence of a staggered board. Though, the result is not robust when using Tobin's Q as a proxy for performance. However, as argued in Section 5.2.1, the OLS results might be biased as OLS does not account for unobserved heterogeneity. Therefore, we find limited support for H_5, as only the OLS results on gender diversity and ROA are significant at the 5% level and not the fixed effects

results.

5.2.4 Conclusion to hypotheses related to performance

In order to answer the research question we answer the second sub-question of the research question. This sub-question is the following:

"Does board size, board independence and gender diversity on boards affect the performance of Western European banks in the period of 2007-2016, and if so, how?"

In regard to this sub-question, we find evidence that board size affects the performance of Western European banks in the period of 2007-2016. More specifically, we find an indication of an inverted U-shaped relationship between board size and performance, measured by ROA. Moreover, we find limited support that board independence affects bank performance, as we do not find a significant association between board independence and ROA. Instead, we find that there might be a positive relationship between board independence and bank performance measured by Tobin's Q. Finally, the OLS results indicate that a higher proportion of female directors on the board increases the performance measured by ROA.

5.3 Empirical results - Risk-taking

In Subsection 5.3.1, the baseline results on the relationship between board related corporate governance mechanisms and bank risk-taking are presented and analyzed. Subsection 5.3.2, reports the results of the robustness test using a staggered board variable and a financial crisis dummy. Subsection 5.3.3, reports the results of the robustness tests using the z-score as the dependent variable for risk-taking. The results of the robustness tests are compared to the baseline results of Subsection 5.3.1.

5.3.1 Main table related to risk-taking

In Table 11, Model 1-3 shows the regression results using the OLS estimator. Model 1 shows the relationship between the key explanatory and control corporate governance variables and non-

Table 11: Main table on bank risk-taking. This table reports the OLS and fixed effects regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. NPATA is the non-performing assets divided by total assets. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy variable that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET measures number of board meetings in a year. BOARDATT measures the average attendance of the directors on the board. BOARDSKILLS measures the proportion of directors with industry specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN measures the average tenure of the director on the board. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital ratio calculated as the tier 1 capital divided by risk-weighted assets. LOANSTA is the total loans divided by the total assets. CHGTA is the total assets a time t divided by total assets at t-1 minus one. EBTPTA is the earnings before taxes and loan loss provisions divided by total assets.

	OLS			Fixed Effects		
	1	2	3 (Base)	4	5	6 (Base)
	No squared terms	Squared board size	Squared ind. dir.	No squared terms	Squared board size	Squared ind. dir.
Variables	*Dependent Variable: NPATA*					
BOARDSIZE	0.00123	0.00307	0.00176	0.00021	-0.00480	-0.00820**
	(0.00088)	(0.00579)	(0.00538)	(0.00089)	(0.00294)	(0.00346)
BOARDSIZE SQ		-0.00006	-0.00002		0.00017	0.00027**
		(0.00019)	(0.00018)		(0.00010)	(0.00012)
INDDIR	0.00034	0.00033	0.00075	-0.00001	-0.00001	0.00120**
	(0.00021)	(0.00022)	(0.00052)	(0.00013)	(0.00013)	(0.00056)
INDDIR SQ			-0.00000			-0.00001**
			(0.00001)			(0.00001)
GENDIV	-0.00035	-0.00035	-0.00037	-0.00039	-0.00037	-0.00034
	(0.00034)	(0.00035)	(0.00035)	(0.00028)	(0.00026)	(0.00027)
CGCOMM	-0.00933	-0.00855	-0.00813	-0.00375	-0.00561	-0.00699
	(0.00813)	(0.00964)	(0.00973)	(0.00506)	(0.00507)	(0.00549)
BLOCK	0.00288	0.00281	0.00083	0.01560*	0.01486*	0.01453
	(0.00664)	(0.00668)	(0.00687)	(0.00903)	(0.00860)	(0.00868)
BOARDMEET	0.00225***	0.00222***	0.00222***	0.00168***	0.00177***	0.00166***
	(0.00076)	(0.00079)	(0.00078)	(0.00050)	(0.00052)	(0.00052)
BOARDATT	-0.00112***	-0.00112**	-0.00119**	0.00121	0.00129	0.00129*
	(0.00041)	(0.00042)	(0.00045)	(0.00079)	(0.00082)	(0.00076)
BOARDSKILLS	-0.00026**	-0.00026**	-0.00026**	-0.00011	-0.00012	-0.00011
	(0.00012)	(0.00012)	(0.00012)	(0.00008)	(0.00009)	(0.00008)
DUALBOARD	-0.03146*	-0.03090*	-0.02891	-0.06163	-0.06504	-0.05802
	(0.01629)	(0.01745)	(0.01752)	(0.04019)	(0.03938)	(0.03693)
BOARDTEN	-0.00211**	-0.00219**	-0.00229**	-0.00078	-0.00027	0.00017
	(0.00095)	(0.00097)	(0.00103)	(0.00127)	(0.00123)	(0.00118)
BANKSIZE	-0.00543	-0.00573	-0.00552	-0.01504	-0.01347	-0.00895
	(0.00534)	(0.00472)	(0.00476)	(0.01430)	(0.01384)	(0.01306)
TIER1	-0.07812	-0.07513	-0.07791	-0.31443**	-0.31787**	-0.31785***
	(0.11066)	(0.10838)	(0.10904)	(0.12725)	(0.12249)	(0.10996)
LOANSTA	0.03543*	0.03778*	0.03786*	-0.00548	-0.01139	0.01075
	(0.01913)	(0.02007)	(0.02029)	(0.02875)	(0.02696)	(0.03151)
EBTPTA	0.15555	0.15208	0.09921	0.53454	0.50412	0.34717
	(1.04770)	(1.04318)	(1.05242)	(0.73491)	(0.74381)	(0.80333)
CHGTA	-0.57476	-0.57992	-0.58012	-0.07451	-0.06785	-0.11732
	(0.36085)	(0.35726)	(0.36012)	(0.16553)	(0.16192)	(0.17404)
Constant	0.15981*	0.14919	0.15636	0.13674	0.14684	0.07731
	(0.09376)	(0.11928)	(0.12013)	(0.18042)	(0.18020)	(0.17652)
Observations	279	279	279	279	279	279
R-squared	0.39042	0.39097	0.39370	0.39530	0.40311	0.44531
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Banks	44	44	44	44	44	44

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

performing assets over total assets (NPATA), as the dependent variable. In Model 2, board size squared (BOARDSIZE SQ) is included to investigate whether there is a non-linear relationship between board size and bank risk-taking. In Model 3 independent directors squared (INDDIR SQ) is included to investigate whether there is a non-linear relationship between board independence and bank risk-taking.

OLS results regarding risk-taking

Model 1-3 in Table 11 shows the results of the OLS regressions. The coefficients on board size (BOARDSIZE) are positive in Model 1-3, however the coefficients are insignificant. Thus, using the OLS estimator and non-performing assets over total assets (NPATA) as a measure for bank risk-taking, there is no support for H_2, where we proposed a negative relationship between board size and bank risk-taking.

The coefficients on board independence (INDDIR) are positive and insignificant in Model 1-3. Hence, the OLS results with NPATA as proxy for bank risk-taking, does not support H_4, where we proposed a negative relationship between board independence and bank risk-taking.

The coefficients on gender diversity on the board (GENDIV) are negative and insignificant in Model 1-3. Thus, similar to hypothesis 2 and 4, we do not find support for H_6, where we proposed a positive relationship between the proportion of female directors on the board and bank risk-taking. Overall, in Model 1-3 we do not find any evidence in relation to hypotheses 2, 4 and 6 using the OLS estimator and NPATA as measure for bank risk-taking.

Throughout Model 1-3, we find that the coefficients on board meetings (BOARDMEET) are positive and significant at the 1% level, indicating that more board meetings is positively associated with bank risk-taking. However, it must be noted that the positive relationship could be due to reverse causality as the board in riskier banks might need to meet more often, in order to discuss the risk-taking by the bank. Unfortunately, the empirical setting of this study does not allow us to address this issue more in detail.

The coefficients on board attendance (BOARDATT) are negative and statistically significant at the 1% level in Model 1, and at the 5% level in Model 2 and 3, suggesting that the higher board attendance reduces bank risk-taking. Furthermore, the coefficients on board skills (BOARDSKILLS)

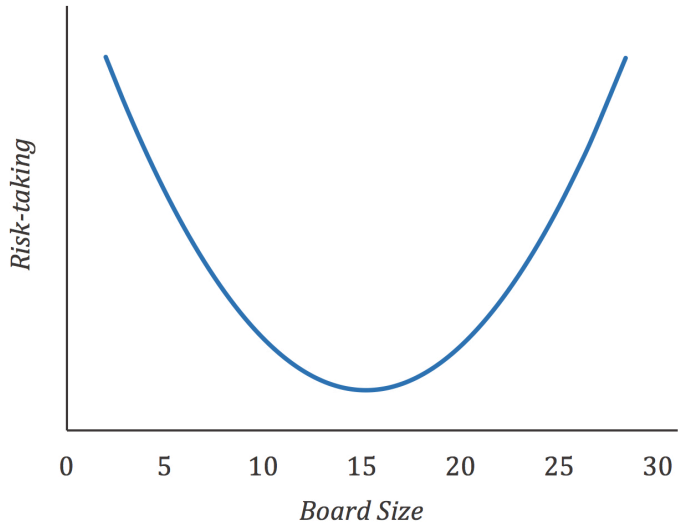
and board tenure (BOARDTEN) are negative and significant at the 5% level through Model 1-3. This indicates that a board with higher attendance, more bank-specific skills and higher director tenure, decreases bank risk-taking. While this is in line with theoretical expectations, the results are not confirmed when adding bank fixed effects, thus suggesting that the OLS estimator might be biased. Overall, we thus conclude that board tenure, skills and director tenure have no significant relationship to bank risk-taking.

The estimated coefficients on the presence of a two-tier board structure (DUALBOARD), are negative and statistically significant at the 10% level in Model 1 and 2. This indicates that the presence of a two-tier board structure in a bank leads to lower bank risk-taking. The differences in risk-taking by banks with different board structures is also found by Farag and Mallin (2017) who find that banks with one-tier boards are more risky.

Fixed effects results regarding risk-taking

Model 4-6 in Table 11 shows the results using fixed effects in relation to bank risk-taking. Model 6 in Table 11 shows that the coefficient of board size (BOARDSIZE) is negative and statistically significant at the 5% level. Additionally, the coefficient of board size squared (BOARDSIZE SQ) is positive and statistically significant at the 5% level. This indicates that there is a U-shaped relationship between board size and bank risk-taking measured by NPATA. The U-shaped relationship between board size and bank risk-taking is illustrated in Figure 7. In Figure 7 it can be seen that risk-taking is minimized with a board size of 15. Hence, when the board size of a bank is between 0 and 15, adding one more board member decreases risk-taking in a bank. Conversely, when the board size is larger than 15 board members, adding one more board member increases the risk-taking in a bank.

Figure 7: *U-shaped relationship between board size and bank risk-taking*



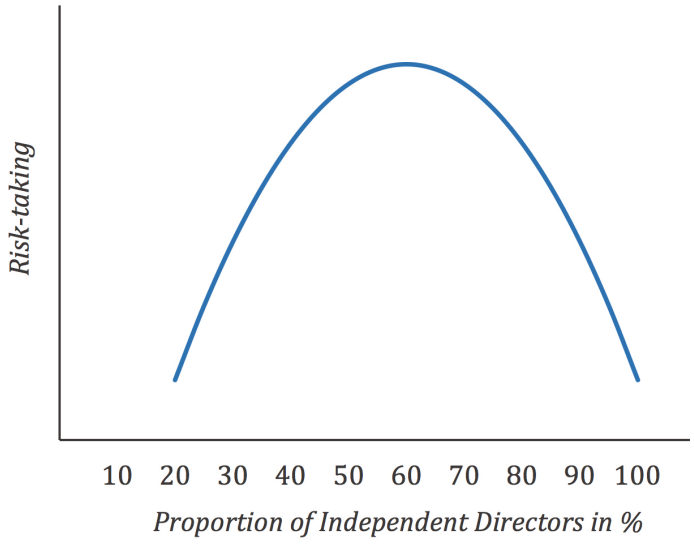
Note: Risk-taking on the y-axis is measured by non-performing assets over total assets (NPATA)

This finding of a U-shaped relationship is not in line with hypothesis H_2, where we proposed that there is a negative relationship between board size and bank risk-taking, meaning that a larger board decrease risk-taking. Consequently, this finding is not in line with Pathan (2009), who reports a linear negative relationship between board size and risk-taking. Our results suggest that the association between board size and risk-taking might be more complex than first hypothesized. In Section 3.3 it was argued that the increased monitoring capabilities in smaller boards would increase the alignment between managers and shareholders. As shareholders are incentivized to take risk, the increased alignment between a manager and shareholders might increase bank risk-taking. Hence, a small board would lead to more risk-taking relative to a larger board. However, our results suggest a different explanation. Specifically, rather than capturing the intensity of the alignment between management and shareholders, the impact of board size on the level of risk-taking in banks might be explained by the quality of decision-making on the board. Specifically, adding new members to the board might improve the pool of knowledge on the board, thus improving both the advisory and monitoring function of the board. This increased knowledge helps the banks avoid poor investment decisions, i.e. avoiding investments which would increase the non-performing assets ratio. Thus, the better advising and monitoring capabilities of the board might explain why

the risk-taking in banks decrease when the board size increases, until a certain point. Hereafter, the free-riding and coordination problems might reduce the quality of decision-making of the board. This effect outweighs the benefits of better advice when the board size is larger than 15. Thus, at smaller board sizes, the knowledge effect might be dominant, i.e. a larger board helps prevent management from making poor investment decisions. As board size exceeds a specific threshold, the free-riding and coordination problems become dominant, the board's decision-making worsens and the board's ability to help and prevent management from making poor investment decisions is affected negatively, increasing the non-performing asset ratio.

In relation to board independence, the estimated coefficient on the proportion of independent directors (INDDIR) is positive and statistically significant at the 5% level in Model 6. Furthermore, the coefficient on the independent directors squared (INDDIR SQ), is negative and statistically significant at the 5% level. Thus, we find an inverted U-shaped relationship between board independence and bank risk-taking. The inverted U-shaped relationship between board independence and risk-taking is shown in Figure 8.

Figure 8: *Inverted u-Shaped relationship between the proportion of independent directors and bank risk-taking*



Note: Risk-taking on the y-axis is measured by non-performing assets over total assets (NPATA)

The inverted U-shaped relationship illustrated in Figure 8 indicates that bank risk-taking is maximized when the proportion of independent directors is approximately 60%. This suggests that adding more independent directors to the board will increase risk-taking when the proportion of independent directors is below 60%. Oppositely, risk-taking will decrease as a consequence of adding more independent directors to the board when the proportion of independent directors is above 60%. The findings for board independence are not in line with our hypothesis, H_4, where we proposed that a higher degree of independent directors on the board is negatively related to bank risk-taking. We hypothesized a linear negative relationship whereas we found an inverted U-shaped relationship between the proportion of independent directors and risk-taking.

To the best of our knowledge there is limited evidence regarding an inverted U-shaped relationship between board independence and risk-taking. However, according to Fama and Jensen (1983), independent directors value their reputation in the directorship market. Therefore, independent director's aim is to ensure that managers act in the interests of shareholders, in order to maintain a good reputation as an independent director. Thus, in order to comply with owners' expectations, independent directors might push management to take more risk. This could be a possible explanation for the positive association between risk-taking and independent directors which is present when the proportion of independent directors is below 60%. It might also be, that independent directors lack bank-specific knowledge. Thus, a higher proportion of independent directors might reduce the board's ability to assess risk-taking in banks, leading to increased bank risk-taking. However, in boards with predominantly independent directors, this might actually create a culture of risk aversity on the board. That is, when most of the board members do not have bank-specific knowledge, they might commonly agree not to pursue risky policies. The risk averse culture on the board would thus be driven by the combination of lower bank-specific business expertise, and the independent directors' fear of reputational damage which would occur if the bank defaults.

Conclusively, the identified inverted U-shaped relationship might combine different effects that independent directors have on bank risk-taking. First, the inverted U-shaped relationship captures the positive effect that independent directors have on risk-taking, which is driven by a stronger alignment between management and bank shareholders. Secondly, the negative effect of independent directors on bank risk-taking after a certain proportion of independent directors on the board,

might reflect a risk-averse culture in the boardroom, which is driven by significant information asymmetries between directors and management. The negative effect occurs when independent directors influence management to take less risk because they want to avoid reputational damage as a consequence of default. This relationship is also found by Zagorchev and Gao (2015), Pathan (2009) and indicated by Erkens et al. (2012).

In relation to the association between gender diversity (GENDIV) and bank risk-taking, the coefficients on gender diversity are negative and insignificant in Model 3-6. Thus, using the fixed effects estimator and NPATA as measure for bank risk-taking, we do not find support for H_6, where we proposed a positive relationship between the proportion of female directors on the board and bank risk-taking. Consequently, unlike Farag and Mallin (2017), we do not find evidence that a higher proportion of female directors on the board affect the bank risk-taking measured by non-performing assets to total assets.

Model 4-6 in Table 11, show that the coefficients for board meetings (BOARDMEET), are positive and statistically significant at the 1% level. This is similar to our OLS findings. As argued earlier, this might be due to reverse causality as the board in riskier banks might need to meet more often in order to discuss the risk-taking by the bank. In Model 6, the coefficient on board attendance (BOARDATT) is positive and significant at the 10% level. This indicates that bank risk-taking increase as more directors participate in the board meetings. Similar to the findings on board meetings, this relation could be due to reverse causality. Hence, as a bank gets closer to default, i.e. take more risk, more board members will attend the board meetings to advice management on how to avoid default of the bank.

5.3.2 Robustness test 1: Staggered board and financial crisis

In order to check the validity of our results regarding risk, we conduct robustness tests. Table 12 illustrates the results of the robustness tests, using a staggered board variable and a financial crisis dummy for both the OLS and fixed effect estimators. We control for the impact of staggered boards following the approach of Zagorchev and Gao (2015) and the financial crisis, following the approach of Mamatzakis and Bermpei (2015). The baseline models in Table 11, have been included

Table 12: Robustness test 1 on bank risk-taking. This table reports the OLS and fixed effects regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. NPATA is the non-performing assets divided by total assets. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. STAGG is a dummy which equals 1 if the bank has a staggered board, otherwise 0. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET is the number of board meetings in a year. BOARDATT is the average attendance of the directors on the board. BOARDSKILLS is the proportion of directors with bank specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN is the average tenure of the director on the board. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital divided by risk-weighted assets. LOANSTA is total loans divided by the total assets. CHGTA is total assets a time t divided by total assets at t-1 minus one. EBTPTA is the earnings before taxes and loan loss provisions divided by total assets. FINCR equals 1 if the year is 2007-2009, otherwise 0.

	OLS			Fixed Effects		
	1 (Base)	2	3	4 (Base)	5	6
	CG Control Included	Staggered Board incl.	Financial Crisis incl.	CG Control Included	Staggered Board incl.	Financial Crisis incl.
Variables	*Dependent Variable: NPATA*					
BOARDSIZE	0.00176	0.00210	0.00196	-0.00820**	-0.01053**	-0.00793**
	(0.00538)	(0.00487)	(0.00545)	(0.00346)	(0.00402)	(0.00339)
BOARDSIZE SQ	-0.00002	-0.00004	-0.00002	0.00027**	0.00037**	0.00027**
	(0.00018)	(0.00017)	(0.00018)	(0.00012)	(0.00015)	(0.00012)
INDDIR	0.00075	0.00065	0.00063	0.00120**	0.00100*	0.00114**
	(0.00052)	(0.00052)	(0.00049)	(0.00056)	(0.00053)	(0.00056)
INDDIR SQ	-0.00000	-0.00000	-0.00000	-0.00001**	-0.00001**	-0.00001**
	(0.00001)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
GENDIV	-0.00037	-0.00036	-0.00032	-0.00034	-0.00029	-0.00023
	(0.00035)	(0.00035)	(0.00031)	(0.00027)	(0.00025)	(0.00016)
STAGG		0.00941			0.01189*	
		(0.00884)			(0.00664)	
CGCOMM	-0.00813	-0.00386	-0.00729	-0.00699	-0.00296	-0.00432
	(0.00973)	(0.00934)	(0.01001)	(0.00549)	(0.00633)	(0.00729)
BLOCK	0.00083	0.00281	0.00063	0.01453	0.01193	0.01288
	(0.00687)	(0.00751)	(0.00669)	(0.00868)	(0.00737)	(0.00821)
BOARDMEET	0.00222***	0.00234***	0.00218***	0.00166***	0.00162***	0.00190***
	(0.00078)	(0.00079)	(0.00077)	(0.00052)	(0.00046)	(0.00064)
BOARDATT	-0.00119**	-0.00101**	-0.00117**	0.00129*	0.00093	0.00149**
	(0.00045)	(0.00038)	(0.00044)	(0.00076)	(0.00088)	(0.00072)
BOARDSKILLS	-0.00026**	-0.00018	-0.00029**	-0.00011	-0.00010	-0.00014**
	(0.00012)	(0.00013)	(0.00012)	(0.00008)	(0.00008)	(0.00007)
DUALBOARD	-0.02891	-0.02292	-0.02950*	-0.05802	-0.06817*	-0.05678
	(0.01752)	(0.01432)	(0.01709)	(0.03693)	(0.03693)	(0.03689)
BOARDTEN	-0.00229**	-0.00275**	-0.00236**	0.00017	0.00005	-0.00041
	(0.00103)	(0.00105)	(0.00103)	(0.00118)	(0.00122)	(0.00119)
BANKSIZE	-0.00552	-0.00481	-0.00556	-0.00895	-0.01098	-0.00805
	(0.00476)	(0.00477)	(0.00458)	(0.01306)	(0.01204)	(0.01211)
TIER1	-0.07791	-0.06804	-0.05164	-0.31785***	-0.33015***	-0.23322***
	(0.10904)	(0.11372)	(0.11023)	(0.10996)	(0.09882)	(0.06788)
LOANSTA	0.03786*	0.04524**	0.04088*	0.01075	0.02813	0.02526
	(0.02029)	(0.02224)	(0.02029)	(0.03151)	(0.02686)	(0.03346)
EBTPTA	0.09921	0.20570	0.14845	0.34717	0.22818	0.35094
	(1.05242)	(1.05144)	(1.03727)	(0.80333)	(0.83639)	(0.72729)
CHGTA	-0.58012	-0.60821*	-0.56129*	-0.11732	-0.13056	-0.25970
	(0.36012)	(0.35747)	(0.32031)	(0.17404)	(0.15348)	(0.17835)
FINCR			-0.02039***			-0.02346***
			(0.00510)			(0.00682)
Constant	0.15636	0.11491	0.17671	0.07731	0.14006	0.06323
	(0.12013)	(0.09895)	(0.11518)	(0.17652)	(0.16430)	(0.15369)
Observations	279	262	279	279	262	279
R-squared	0.39370	0.39375	0.38260	0.44531	0.51079	0.39433
Firm FE	Yes	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	No
Number of Banks	44	43	44	44	43	44

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

in Table 12. These have been included to simplify the comparison between the baseline results and the robustness results. Model 1 shows the baseline risk model using the OLS estimator and Model 4 shows the baseline risk model using the fixed effects estimator. Model 2 and 3 shows the results of the robustness test for the OLS estimator and Model 5 and 6 shows the results of the robustness tests for the fixed effects estimator.

OLS results regarding risk-taking - Robustness test 1

In Table 12, Model 1 shows the baseline OLS results, Model 2 shows the robustness results including staggered board and Model 3 shows the robustness results when including a financial crisis dummy to control for the financial crisis.

Overall, the OLS results in Model 2 and 3 are consistent with the baseline results in Model 1. Hence, the positive coefficients on board size (BOARDSIZE) in Model 1 are also positive in Model 2 and 3, however insignificant. Similarly, the coefficients on board independence (INDDIR) are positive but insignificant in Model 2 and 3 similar to Model 1. Finally, the coefficients on gender diversity on the board (GENDIV) are negative and insignificant in Model 2 and 3 in line with Model 1.

In Model 2 and 3, the coefficients on board meetings (BOARDMEET) are still positive and significant at the 1% level. Furthermore the coefficients on board attendance (BOARDATT) and board tenure (BOARDTEN) are both still negative and significant at the 5% level throughout Model 2 and 3. However, the coefficient on board skills (BOARDSKILLS) is no longer significant in Model 2 and hence it is not robust when accounting for the effects of having a staggered board. When including a dummy for the financial crisis however, the results regarding board skills is still robust and the variable is significant at the 5% level.

Interestingly, it can be seen that the financial crisis dummy (FINCR) is negative and statistically significant at the 1% level in Model 3. This means that the relative level of non-performing assets was significantly lower during the financial crisis. Looking at Figure 3 on page 45, the relative level of the non-performing assets over total assets is lower in the financial crisis years. The relatively lower level of the ratio explains the negative coefficient on the financial crisis dummy.

As for performance, we have also run a robustness test on the OLS results regarding bank risk-

taking where the standard errors have been clustered on countries instead of banks. We found that the OLS results regarding risk-taking are robust to this specification. For simplification purposes, we have chosen not to include these results in the tables.

Fixed effects results regarding risk-taking - Robustness test 1

In Table 12, Model 4 shows the baseline fixed effects results regarding bank risk-taking, Model 5 shows the robustness results including staggered board and Model 6 shows the robustness results when including a financial crisis dummy.

Overall the results regarding board size and independent directors are robust when controlling for the presence of a staggered board in Model 5 and the financial crisis. Hence, the coefficients on board size (BOARDSIZE) remain negative and significant at the 5% level and the coefficients on board size squared (BOARDSIZE SQ) remain positive at the 5% level in Model 5 and 6. The coefficients on board independence (INDDIR) remain positive and statistically significant in Model 5 and 6. Furthermore, the coefficients on board independence squared (INDDIR SQ) are negative and significant in Model 5 and 6. In relation to gender diversity on the board (GENDIV), the coefficients remain negative and insignificant in Model 5 and 6.

The estimated coefficient for the staggered board dummy variable (STAGG) is statistically significant at the 10% level in Model 5. This indicates that the presence of a staggered board is positively related to bank risk-taking. Thus, when incumbent directors are protected by a staggered board structure, the bank risk-taking is higher. The coefficients on board meetings (BOARDMEET) remain positive and significant in Model 5 and 6. The coefficient on board attendance (BOARDATT) is positive but not significant in Model 5. However, the coefficient on board attendance is significant in Model 6 at the 5% level.

When controlling for staggered boards, the coefficient on dual-board (DUALBOARD) is negative and statistically significant at the 10% level in Model 5. Hence, this indicates that dual-boards decrease risk-taking relative to a unitary board structure. The coefficient on board skills (BOARDSKILLS) in Model 6 is negative and statistically significant at the 5% level, indicating a negative relation between having more directors on the board with bank-specific skills and risk-taking. Thus, it seems that boards with more bank-specific skills is related to lower bank risk-taking.

As for the performance, we have run an additional robustness test by excluding year fixed effects for the regressions regarding bank risk-taking. Our results regarding bank risk-taking are not robust to removing year fixed effects, illustrating the importance of controlling for year fixed effects. For simplification purposes, we have chosen not to include these results in the tables.

5.3.3 Robustness test 2: Z-score

In Table 13, the z-score is used as the dependent variable in order to investigate whether our results found by using NPATA as dependent variable, are robust to using another proxy for bank risk-taking. Model 1 shows the baseline risk model using the OLS estimator and Model 4 shows the baseline model using the fixed effects estimator. Model 2 and 3 shows the results of the robustness test for the OLS estimator and Model 5 and 6 shows the results of the robustness tests for the fixed effects estimator. As described in Section 4.2.1, the z-score measures how distant a bank is from insolvency (Roy, 1952). Hence, a high z-score indicates that a bank is far from default, whereas a low z-score indicates that a bank is close to default (Laeven & Levine, 2007).

The interpretation of the coefficients of the z-score models in Table 13, is that a positive coefficient on the z-score indicates a decrease in bank risk-taking, i.e the bank becomes more solvent. Conversely a negative coefficient on the z-score indicates an increase in bank risk-taking, i.e. the bank becomes less solvent. This is the opposite of the interpretation of the coefficients on non-performing assets to total assets. For non-performing assets over total assets, a positive coefficient indicates an increase in bank risk-taking and a negative coefficient indicates a decrease in bank risk-taking.

OLS results regarding risk-taking - Robustness test 2

In Table 13, the coefficients on board size (BOARDSIZE) are negative but insignificant in Model 2 and 3. Hence, using OLS and the z-score as proxy for bank risk-taking, we find no support for H_2, where we proposed a negative relationship between board size and bank risk-taking.

In Model 2 and 3, the coefficients on board independence (INDDIR) are negative and insignificant. Thus, using the OLS estimator and the z-score as measure for bank risk-taking, we find no support for H_4, where we proposed a negative relationship between board independence and bank risk-taking.

Table 13: Robustness test 2 on bank risk-taking. This table reports the OLS and fixed effects regression results. The sample consists of 55 banks in Western Europe from 2007 to 2016. NPATA is the non-performing assets divided by total assets. The Z-Score is the sum of the return on assets plus book value of equity divided by total assets divided by the standard deviation of the return on assets. BOARDSIZE is the number of directors on the board. INDDIR is the proportion of independent directors on the board. GENDIV is the proportion of female directors on the board. CGCOMM is a dummy that takes the value of 1 if a bank has a corporate governance committee, otherwise 0. BLOCK is a dummy variable that takes the value of 1 if a bank has a shareholder that owns more than 10% of the outstanding shares, otherwise 0. BOARDMEET measures number of board meetings in a year. BOARDATT measures the average attendance of the directors on the board. BOARDSKILLS measures the proportion of directors with industry specific skills. DUALBOARD is a dummy taking the value of 1 if the bank has a two-tier board, otherwise 0. BOARDTEN measures the average tenure of the director on the board. BANKSIZE is the log of total assets. TIER1 is the tier 1 capital ratio calculated as the tier 1 capital divided by risk-weighted assets. LOANSTA is the total loans divided by the total assets. CHGTA is the total assets a time t divided by total assets at t-1 minus one. EBTPTA is the earnings before taxes and loan loss provisions divided by total assets.

	OLS			Fixed Effects		
	1 (Base)	2	3	4 (Base)	5	6
Variables	NPATA	Z-Score		NPATA	Z-Score	
BOARDSIZE	0.00176	-0.10951	-0.08906	-0.00820**	0.02580	0.03481
	(0.00538)	(0.07677)	(0.07354)	(0.00346)	(0.02532)	(0.02633)
BOARDSIZE SQ	-0.00002	0.00222	0.00156	0.00027**	-0.00114	-0.00141
	(0.00018)	(0.00263)	(0.00251)	(0.00012)	(0.00088)	(0.00087)
INDDIR	0.00075	-0.00039	-0.00718	0.00120**	0.00273***	-0.00043
	(0.00052)	(0.00305)	(0.01058)	(0.00056)	(0.00098)	(0.00533)
INDDIR SQ	-0.00000		0.00007	-0.00001**		0.00003
	(0.00001)		(0.00010)	(0.00001)		(0.00005)
GENDIV	-0.00037	0.01615**	0.01647**	-0.00034	-0.00432**	-0.00439**
	(0.00035)	(0.00754)	(0.00756)	(0.00027)	(0.00189)	(0.00187)
CGCOMM	-0.00813	0.07169	0.06433	-0.00699	0.10160	0.10525
	(0.00973)	(0.16239)	(0.15782)	(0.00549)	(0.06615)	(0.06544)
BLOCK	0.00083	0.12884	0.16028	0.01453	0.11440	0.11628
	(0.00687)	(0.18316)	(0.17329)	(0.00868)	(0.06920)	(0.07104)
BOARDMEET	0.00222***	-0.03489**	-0.03492**	0.00166***	-0.02013**	-0.01986**
	(0.00078)	(0.01404)	(0.01363)	(0.00052)	(0.00930)	(0.00927)
BOARDATT	-0.00119**	0.01375**	0.01489**	0.00129*	-0.01816**	-0.01823**
	(0.00045)	(0.00585)	(0.00647)	(0.00076)	(0.00848)	(0.00839)
BOARDSKILLS	-0.00026**	-0.00471*	-0.00459*	-0.00011	-0.00102	-0.00104
	(0.00012)	(0.00279)	(0.00271)	(0.00008)	(0.00123)	(0.00123)
DUALBOARD	-0.02891	0.10451	0.07121	-0.05802	-0.16431	-0.17578
	(0.01752)	(0.23022)	(0.22376)	(0.03693)	(0.12275)	(0.13118)
BOARDTEN	-0.00229**	0.05444*	0.05626**	0.00017	-0.01448	-0.01559
	(0.00103)	(0.02721)	(0.02715)	(0.00118)	(0.01343)	(0.01348)
BANKSIZE	-0.00552	0.22699**	0.22358**	-0.00895	-0.29973***	-0.31168***
	(0.00476)	(0.08601)	(0.08660)	(0.01306)	(0.08719)	(0.09269)
TIER1	-0.07791	-0.38212	-0.32586	-0.31785***	0.52344	0.52385
	(0.10904)	(3.11196)	(3.13152)	(0.10996)	(1.06841)	(1.07821)
LOANSTA	0.03786*	0.93638	0.93721	0.01075	0.37827	0.32007
	(0.02029)	(0.68950)	(0.68584)	(0.03151)	(0.37595)	(0.35773)
EBTPTA	0.09921	45.25443***	46.06273***	0.34717	24.13381***	24.57420***
	(1.05242)	(14.73809)	(14.58798)	(0.80333)	(7.51147)	(7.56819)
CHGTA	-0.58012	6.34042	6.39245	-0.11732	3.47674**	3.61860**
	(0.36012)	(4.04576)	(3.94911)	(0.17404)	(1.45029)	(1.52390)
Constant	0.15636	-1.60491	-1.71595	0.07731	7.60213***	7.78642***
	(0.12013)	(1.77979)	(1.77403)	(0.17652)	(1.15663)	(1.28434)
Observations	279	279	279	279	279	279
R-squared	0.39370	0.46543	0.46762	0.44531	0.49643	0.49839
Firm FE	No	No	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Banks	44	45	45	44	45	45

Firm clustered standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The coefficients on gender diversity on the board (GENDIV) are positive and significant at the 5% level in Model 2 and 3. Hence, the higher proportion of female directors on the board is negatively associated with bank risk-taking measured by the z-score. This finding indicates that more female directors on the board reduces bank risk-taking which contradicts hypothesis 6. Thus, using the OLS estimator and the z-score, we find no support for H_6, where we proposed a positive relationship between gender diversity on the board and bank risk-taking.

Furthermore, the results in Model 1 regarding board meetings (BOARDMEET), board attendance (BOARDATT) and board tenure (BOARDTEN), are robust when using z-score as dependent variable in Model 2 and 3. Hence, board meetings is negatively related to z-score and therefore positively related to bank risk-taking. Furthermore board attendance and board tenure is positively related to z-score and therefore negatively related to bank risk-taking. However, for board skills, the results are not robust. In Model 1, using NPATA as a measure for bank risk-taking, we find that board skills is negatively related to risk-taking. Conversely, in Model 2 and 3, we find that board skills is negatively related to the z-score and thus positively related to risk-taking.

Fixed effects results regarding risk-taking - Robustness test 2

Model 5 and 6 in table 13 reports the fixed effects results of the robustness tests conducted using z-score as a proxy for risk-taking. In Model 5 and 6, the coefficients on board size (BOARDSIZE) and board size squared (BOARDSIZE SQ) are insignificant. Hence, the U-shaped relationship between board size and risk-taking using NPATA as the measure for bank risk-taking, is not robust when using the z-score as the dependent variable. Additionally, we have also run a regression using z-score as the dependent variable, but excluding board size squared to investigate if a linear effects i present between board size and z-score. However, when doing this we find no support for H_2, where we proposed a negative relationship between board size and bank risk-taking.

In Model 5, when the variable for independent directors squared (INDDIR SQ) is excluded, the coefficient on independent directors (INDDIR) is positive and statistically significant at the 1% level. This indicates that board independence is positively related to z-score and thus negatively related to risk-taking. Hence, when using the z-score, we find support for our hypothesis, H_4, where we proposed that a higher proportion of independent directors is negatively related to bank

risk-taking. Our findings are in line with Erkens et al. (2012) who finds that independent directors reduced risk-taking in banks during the financial crisis to avoid default. Consequently, the possible reason why independent directors negatively affect risk-taking, might be that a bank default would inflict damage on the reputation of the independent director. This result from Model 5 is not in line with the findings in Model 4, where we found an inverted U-shaped relationship between board independence and risk-taking when using NPATA. Hence, the results in Model 4 are not robust to using the z-score as a measure for risk-taking. This is evident when the squared term of independent directors is included in Model 6, as neither the coefficients on independent directors or independent directors squared are significant. This suggests that when investigating board independence in relation to the z-score, a linear relationship is present, as board independence is significant in Model 5. Conversely when investigating board independence in relation to NPATA, a non-linear relationship is present, as the coefficients on both bard independence (INDDIR) and the squared term of board independence (INDDIR SQ) are significant in Model 4.

In Model 5 and 6, the coefficient on gender diversity (GENDIV) is negative and statistically significant at the 5% level. Hence, we find support for our hypothesis, H_6, where we proposed that a higher proportion of female directors on the board is positively related to bank risk-taking. More specifically, the results indicate that a higher proportion of female directors on the board decreases the z-score, and thus decreases the bank's distance to insolvency. This means that the bank is closer to default. This result is in line with the findings of Adams and Funk (2012) who find that female directors are less risk averse than male directors. Moreover, this result is in line with the findings of Berger et al. (2014) who find that increasing the proportion of female directors on the board positively affects risk-taking in banks. Hence, our findings goes against the common prejudice that female directors are more risk-averse than males directors (Schubert et al., 1999). Additionally, our finding might be an indication that female directors who have broken through the glass ceiling, must demonstrate that they are able to take more risk than male directors in order to overcome this prejudice. Our findings regarding gender diversity found when using the z-score are not in line with the results found when using NPATA. Using NPATA we found no indication that a the proportion of female directors on the board were associated with risk-taking. Furthermore, the results regarding gender diversity from fixed effects in Model 5 and 6 also contradicts the gender

diversity results from Model 2 and 3 using OLS. Conclusively, the overall findings regarding gender diversity on the board are therefore not consistent.

In Model 5 and 6, the coefficients on board meetings (BOARDMEET) and board attendance (BOARDATT) are negative and statistically significant at the 5% level. This indicates that more board meetings and higher board attendance are related to a decrease in z-score, and an increase in risk-taking. However, as earlier argued, the positive relationship between board meetings and board attendance could be due to reverse causality.

The coefficients on bank size (BANKSIZE) are negative and significant at the 1% level using the z-score as a measure for risk in Model 5 and 6. Additionally, the direction of the coefficient change, compared to model 4. The directional change of the effect of banks size could be due to the differences in the dependent variables. Nonetheless, the negative coefficient on bank size indicates that larger banks have been closer to default over the sample period. This effect is reflected through a lower z-score. This could indicate that large banks which are "Too big to fail" have engaged in more risk-taking due to the expectation that a large bank would be bailed out by the regulators in case of default.

The coefficient on earnings before taxes and loan loss provisions over total assets (EBTPTA) is positive and statistically significant at the 1% level in Model 5 and 6. Moreover, it is very large in magnitude compared to the other coefficients on the other variables. However, as the coefficient reflects a 1% point change in EBTPTA, this reflects an actual doubling of EBTPTA. This is because the mean of EBTPTA is only 0.96%, as seen in Table 4 on page 41. As EBTPTA reflects earnings, a doubling of EBTPTA would mean that the z-score would increase by more than 24% because the distance to default is based on the volatility of the earnings level. Thus, if the earnings double (EBTPTA increase by 1% point), the riskiness of the bank will therefore decrease notably. Consequently, the coefficient on EBTPTA is large.

5.4 Discussion of the hypotheses related to risk-taking

In this section, the proposed hypotheses are discussed and concluded upon based on the empirical results for bank risk-taking. Table 14 summarizes the empirical results on board size, board

independence and gender diversity in relation to bank risk-taking. Furthermore the expected relationship of the hypotheses related to bank risk-taking, H_2, H_4 and H_6 are included in the table.

Table 14: *Empirical results on bank risk-taking*

Hypothesis	**Expected relation**	**OLS**		**Fixed effects**	
		ROA	*Tobin's Q*	*ROA*	*Tobin's Q*
H_2	Negative	Positive	Positive	U-shaped (**)	Negative
H_4	Negative	Positive	Positive	Inverted U-shape (**)	Negative (**)
H_6	Positive	Negative	Negative (**)	Negative	Positive (**)

Note: H_2 is related to board size and bank risk-taking, H_4 is related to board independence and bank risk-taking and H_6 is related to gender diversity on the board and bank risk-taking. *** p<0.01, ** p<0.05, * p<0.1

5.4.1 Hypothesis 2: Board size and risk-taking

For hypothesis 2, we proposed a negative relationship between board size and bank risk-taking. Using the fixed effects estimator and the non-performing assets ratio (NPATA) as risk-taking proxy, we do not find a negative relationship between board size and bank risk-taking. Moreover, when using OLS and the non-performing asset ratio we find no significant relationship between board size and risk-taking. Using the z-score as risk-taking proxy instead of the non-performing assets ratio, we find no significant relationship between board size and risk-taking for both the OLS and fixed effect regression models. Conclusively, we find no support for H_2, as we do not find a negative relationship between board size and bank risk-taking.

Although we do not find a negative relationship between board size and bank risk-taking, we do find an indication of a U-shaped relationship, which is significant at the 5% level in the fixed effects regression models. This result is robust when controlling for staggered boards and the financial crisis. However, we do not find this results using the z-score. The difference in results might be due to the fact that the non-performing assets ratio and the z-score are not one to one substitutes for measuring risk-taking. Thus, as argued earlier we use the non-performing assets ratio as the main proxy for risk-taking, as it is widely regarded by credit agencies to be a good proxy for bank risk-taking. Additionally, the non-performing assets ratio is the most commonly used measure for bank risk-taking in the literature. The U-shaped relationship between board size and risk-taking indicates that the impact of board size on the level of risk-taking in banks might be explained by the

quality of decision-making on the board. Thus, at smaller board sizes, the knowledge effect might be dominant, i.e. a larger board helps prevent management from making poor investment decisions by providing better advice. However, as board size exceeds a specific threshold, the free-riding and coordination problems become dominant. Hereafter, the board's decision-making worsens and the board's ability to help and prevent management from making poor investment decisions is affected negatively, increasing the non-performing assets ratio.

5.4.2 Hypothesis 4: Board independence and risk-taking

For hypothesis 4, we proposed that a higher proportion of independent directors is negatively related to bank risk-taking. Using the fixed effects estimator and the non-performing assets ratio (NPATA) as risk-taking proxy, we do not find a negative relationship between board independence and bank risk-taking. Additionally, we do not find any significant negative association using the OLS estimator. For the z-score, we find a negative association between board independence and bank risk-taking, which is significant at the 1% level. Though, as we find this for the z-score we are cautious about the result. This is because the z-score is only used as a robustness check and as we use the non-performing assets ratio as the main proxy for bank risk-taking. Conclusively, we only find limited support for H_4.

Although we do not find support for hypothesis 4 using non-performing assets ratio and fixed effects, we find an inverted U-shaped relationship between board independence and bank risk-taking, which is significant at the 5% level. The result is consistent with the robustness tests controlling for staggered board and the financial crisis. The identified inverted U-shaped relationship might combine different effects that independent directors have on risk-taking. First, the inverted U-shaped relationship captures the positive effect that independent directors have on risk-taking, which is driven by a stronger alignment between managers and bank shareholders. Secondly, the negative effect of independent directors on bank risk-taking could be explained by increasing information asymmetries and that independent directors fear the potential negative consequences that a bank default could have on their reputation.

5.4.3 Hypothesis 6: Gender diversity and risk-taking

For hypothesis 6, we proposed that a higher degree of female directors is positively related to bank risk-taking. Using the non-performing assets ratio, we find no significant association between gender diversity on the board and bank risk-taking. Using z-score as risk-taking proxy and the OLS estimator, we find a negative association between gender diversity on the board and bank risk-taking, which is significant at the 5% level. However, in the fixed effects regression on the z-score, we find a positive association between gender diversity on the board and bank risk-taking. This relation is significant at the 5% level. As the results are not consistent across the estimators when using the z-score, we are cautious about concluding on the results regarding gender diversity on the board and bank risk-taking. Conclusively, we find limited support for hypothesis H_6, as the OLS and fixed effects results contradict each other.

5.4.4 Conclusion to hypotheses related to risk-taking

In order to answer the research question we answer the second sub-question of the research question. This sub-question is the following:

"Does board size, board independence and gender diversity on boards affect the risk-taking by Western European banks in the period of 2007-2016, and if so, how?"

In regard to this sub-question, we find evidence that board size affects the risk-taking of Western European banks in the period of 2007-2016. We find an indication of a U-shaped relationship between board size and risk-taking, measured by the non-performing assets ratio. Moreover, we find an indication of an inverted U-shaped relationship between board independence and risk-taking, measured by the non-performing assets ratio. We also find a negative relationship between board independence and risk-taking using the z-score. However, as argued earlier the z-score is only used for robustness purposes and thus we are cautious about this result. Finally, we find contradicting results on how gender diversity affects bank risk-taking, using z-score as risk-taking proxy.

6 Discussion

6.1 Comparing the results regarding performance and risk-taking

From an economic perspective, higher performance should follow higher risk-taking, which is commonly known as the risk-return trade-off. However, it might also be that if general decision-making processes are improved in banks, excessively risky investments might be limited, resulting in a decrease in risk-taking and an increase in performance.

Using fixed effects and ROA as proxy for performance, the empirical results indicate an inverted U-shaped relationship between board size and performance. Specifically, our findings indicate that a board size of 14 maximizes bank performance. In regard to bank risk-taking, the empirical results using fixed effects and NPATA indicate a U-shaped relationship between board size and bank risk-taking. Specifically, our findings indicate that a board size of 15 minimizes risk-taking. Comparing the inverted U-shaped relationship for bank performance with the U-shaped relationship for bank risk-taking, our findings imply that there might not necessarily be a risk-return trade-off, when the banks in our sample choose board size. For instance, if choosing a board size of 14, bank performance is maximized while risk-taking is almost minimized, according to our indicative empirical results. This might suggest that there is not necessarily a direct compromise between serving the interests of shareholders and the interests of stakeholders when choosing the board size of a bank. This is the case as the interest of bank shareholders is to increase performance whereas the interest of regulators is to decrease risk-taking in banks. Additionally, these empirical results might indicate that an optimal board size improves the overall decision-making of the board, since bank performance can be increased, while bank risk-taking can be decreased. In relation to previous literature, our findings are in line with Zagorchev and Gao (2015). Specifically, Zagorchev and Gao (2015) argue and find that good shareholder governance increases bank performance and decreases bank risk-taking. However, our results are not in line with Iqbal et al. (2015) and Pathan (2009), who find that good shareholder governance increases bank risk-taking.

In relation to comparing the results between bank performance and bank risk-taking, several caveats should be mentioned. First, the regression models we use for bank performance is not identical to

regression models we use for bank risk-taking as EBTPTA and boardskills are only included in the regressions on bank risk-taking. Secondly, these regression models should also be seen in the light of the methodological limitations of our thesis, which will be discussed in Section 6.3. Thirdly, the results found in the fixed effect regression models are not robust when using the OLS estimator or changing the dependent variable.

6.2 Relating the empirical results to theory and the view of the Basel Committee

As argued in Section 2.3 and by Macey and O'Hara (2003), bank shareholders have an incentive to take excessive risk in the presence of moral hazard. However, due to deposit insurance and as some banks are "Too big to fail", regulators have an incentive to reduce bank risk-taking as the regulators bail out the banks in case of default. Thus, a conflict of interest arise between the bank shareholders and bank stakeholders. Consequently, Macey and O'Hara (2003) argue that regulators should impose corporate governance initiatives that lower the risk-taking by banks. In relation to this, the Basel Committee argue that the key role of corporate governance in banks is to serve the interests of stakeholders and secondarily to serve the interests of the shareholders. Thus, the board of directors should protect the interests of the depositors before serving the interests of the shareholders (Basel Committee on banking supervision, 2015).

Interestingly, our findings imply that when choosing board size, there might not necessarily be a conflict of interest between bank shareholders and the regulators. Hence, it might be possible to reach an optimal balance between increasing performance and decreasing risk-taking, when choosing board size. In connection to this, Alexander (2006) argue that a balance has to be reached between shareholder wealth maximization and minimization of excessive risk-taking when ensuring proper corporate governance practices for banks. Accordingly, it is important to identify which specific corporate governance mechanisms that might make it possible to reach an optimal balance between risk-taking and performance, and which specific corporate governance mechanisms that might pose risk-return trade-offs.

6.3 Limitations

Although we find that certain corporate governance characteristics affect both the performance and risk-taking by banks, one should be aware that this thesis has several data and methodology limitations which could effect our empirical results.

First, survivorship bias might still be present in our sample. Earlier we argued that survivorship bias in our sample is limited as the banks in our sample are large, and therefore likely to be bailed out by regulators in the case of default. However, we cannot guarantee that some banks, which might otherwise have been included in the sample, defaulted during the sample period. Hence, not including theses defaulted banks in our sample, could have biased our results. Consequently, this is a limitation in relation to our results.

Secondly, we have a sample selection bias as there is limited financial and corporate governance data for smaller banks. Consequently, our sample mainly consists of relatively large banks. This decreases the randomization of the banks in our sample, and hence this does not represent the entire population of banks in Western Europe. Therefore, our results can only be interpreted upon in relation to large banks in Western Europe.

Thirdly, the limited financial and corporate governance data on banks decreases our sample size significantly. More specifically, this reduces our sample size from 120 banks to 55 banks, hence a reduction of 65 banks. Therefore, more complete data in the chosen databases could have increased the number of banks in our sample and thus strengthened our empirical results.

Another limitation of our data is the preciseness of various corporate governance variables. Thus, specific data such as education and bank-specific knowledge of directors would have enabled more analyses in relation to the performance and risk-taking impact of adding independent directors and female directors with bank-specific skills to the board.

An additional limitation is that we for some countries in our sample only have data on one or very few banks. Therefore, we are not able to control for country fixed effects throughout the analysis as there would be perfect multicollinearity between the country fixed effect and the bank fixed effect for the countries with only one bank. This means that certain country effects, which might

affect performance and risk-taking is not accounted for in the regressions models. Conclusively, not accounting for country fixed effects could potentially bias our results.

In relation to the methodology, we have used econometric methods that were within our scope, i.e. fixed effects estimator and the OLS estimator. However, as mentioned in the methodology section, these methods do have some limitations in regard to reducing possible endogeneity problems. Specifically, as mentioned earlier, the fixed effects estimator does not account for simultaneity and dynamic endogeneity. Thus, our results might be biased by endogeneity problems. It should be noted however, that the majority of the previous literature on corporate governance face problems with endogeneity which researchers try to account for by using various methods. However, it is not common that researchers are able to identify proper instrumental variables, that could account for simultaneity, although some use a system GMM approach with the aim of limiting dynamic endogeneity. Conclusively, due to possible endogeneity issues, our results should be interpreted with caution and therefore our results should be viewed as an association and not as causal relations.

6.4 Future research

We find that board specific corporate governance variables, such as board size and board independence affects performance and risk-taking by banks. However, as our thesis has several limitations, it could be interesting for future research to investigate if similar results can be found when accounting for some of the limitations in our thesis. In this regard, it could be interesting to account for the differences between countries, as there might exist different institutional pressures on banks, depending on the country. Moreover, it would be interesting to account for dynamic endogeneity by using a system GMM approach or account for simultaneity by using an instrumental variable. We also encourage future research to investigate both risk-taking and performance simultaneously, in order to shed more light how board size, and other specific corporate governance mechanisms, affect both bank performance and bank risk-taking.

Furthermore, it could be interesting for future research to investigate the effect of the guidelines provided by the Basel Committee on both the performance and risk-taking by banks. The suggested corporate governance initiatives include the presence of a risk committee, Chief Risk Officer

(CRO) and limiting the amount of over-boarded directors, i.e. directors serving on multiple boards simultaneously. The presence of a risk committee and a CRO, could be interesting to investigate because several banks have implemented this due to the recommendations of the Basel Committee (Basel Committee on banking supervision, 2015). The risk committee and the CRO would indicate whether the internal risk management processes are well functioning in a bank. Moreover, it could be interesting to investigate the effect of having over-boarded directors as these directors might not be able to provide the same level of advice or monitoring to the board compared to directors that serve on fewer boards.

The effect of independent directors with bank-specific skills could be another interesting area for further research. More specifically, it could be interesting to investigate if skilled independent directors add more value through higher performance and lower risk-taking compared to the effect of independent directors who lack bank-specific skills. As Kirkpatrick (2009) argues, the effect of independent directors with bank-specific skills might be understated. Moreover, Kirkpatrick (2009) argues that banks can have difficulties in finding properly skilled independent directors, and that banks generally have too few independent directors with bank-specific skills on the board. Unfortunately, we were not able to investigate the effect of independent directors with bank-specific skills due to data limitations.

7 Conclusion

In relation to the corporate governance in the banking sector, previous literature has mainly focused on the effect of corporate governance mechanisms on bank performance whereas few have investigated the effect of corporate governance mechanisms on bank risk-taking. However, Macey and O'Hara (2003), Alexander (2006) and Kirkpatrick (2009) argue that the interest of regulators, and thereby society, is important to consider as a key stakeholder interest when investigating corporate governance in the banking sector. Thus, Macey and O'Hara (2003) argue that there is a conflict of interest between bank shareholders and regulators. Specifically, bank shareholders have an incentive to take excessive risk due to the presence of moral hazard in the banking sector. Regulators however, have an incentive to reduce bank risk-taking because of their obligation to bail

out the banks in case of default, as the stability of the economy would otherwise be jeopardized.

Consequently, we have investigated how corporate governance mechanisms of banks affect performance and risk-taking, using the following research question:

"Do board related corporate governance mechanisms affect performance and risk-taking in Western European banks from 2007-2016, and if so, how?"

Based on relevant corporate governance theory and previous empirical corporate governance research on banks, we have investigated a sample of 55 Western European banks from 15 different countries, with data from 2007 to 2016. Thus, we have used OLS and fixed effects regressions to investigate the effect of board related corporate governance mechanisms.

First, we investigated if board size, board independence and gender diversity on the board affect bank performance. Based on our empirical results we found partial evidence that board size affect bank performance, measured by return on assets. Thus, our findings indicate that there is an inverted U-shaped relationship between board size and performance. This indicates that the costs of free-riding and coordination problems outweigh the benefits of better advising and monitoring capabilities of the board as the board size becomes larger. Additionally, we found an indication that board independence and gender diversity positively affect bank performance. However, these results should be viewed with caution and are only indicative as these results might be subject to endogeneity issues related to using Tobin's Q and the OLS estimator, respectively.

In relation to bank risk-taking, we investigated if board size, board independence and gender diversity on the board affect bank risk-taking. Based on our empirical results we found partial evidence that board size and board independence affect bank risk-taking. We found a U-shaped relationship between board size and bank risk-taking, measured by non-performing assets over total assets. This might be explained by the quality of decision-making on the board which changes as the costs of free-riding and coordination problems outweigh the benefits from improved monitoring and advising capabilities when the board size increases. In relation to board independence we found an inverted U-shaped relationship between the proportion of independent directors on the board and bank risk-taking measured by non-performing assets over total assets. The inverted U-shaped relationship might be explained by the combination of increasing information asymmetry

and the changing reputational effects of independent directors, as the proportion of independent directors on the board increases. Moreover, we found an indication that gender diversity affect bank risk-taking, however the effect is unclear as the OLS and fixed effects regression models showed contradicting results.

Overall, based on the above, we find evidence that board related corporate governance mechanisms affect both bank performance and bank risk-taking. Thus, we conclude that board related corporate governance mechanisms has an impact on the performance and risk-taking by Western European banks from 2007-2016. Finally, in relation to the arguments provided by Macey and O'Hara (2003), our findings could imply that when choosing board size, there might not necessarily be a conflict of interest between bank shareholders and the regulators. Hence, it might be possible to reach a balance between increasing performance and decreasing risk-taking, when choosing board size. However, this balance should be further investigated by future research before conclusions can be made.

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Appendices

Appendix A: Table 15, Correlation matrix for all variables

Appendix B: Functions of the Corporate Governance Committee, Banco Bilbao Vizcaya Argentaria S.A.

A *Correlation matrix for all variables*

Table 15: *Cross-correlation table all variables*

Variables	ROA	TOBINSQ	NPATA	ZSCORE	BOARD-SIZE	BOARD-SIZE SQ	INDDIR	INDDIR SQ	GENDIV	CGCOMM	BLOCK
ROA	1.000										
TOBINSQ	0.466	1.000									
NPATA	-0.458	-0.195	1.000								
ZSCORE	0.424	0.056	-0.368	1.000							
BOARDSIZE	-0.255	-0.351	0.162	-0.121	1.000						
BOARDSIZE_SQ	-0.221	-0.303	0.144	-0.126	0.979	1.000					
INDDIR	0.018	0.008	-0.009	0.056	-0.160	-0.167	1.000				
INDDIR_SQ	0.041	-0.003	-0.055	0.070	-0.152	-0.145	0.956	1.000			
GENDIV	-0.002	-0.124	-0.054	0.310	-0.060	-0.104	0.087	0.079	1.000		
CGCOMM	-0.074	-0.085	-0.066	-0.051	0.146	0.132	0.215	0.195	-0.037	1.000	
BLOCK	0.001	0.083	0.055	-0.003	-0.114	-0.105	-0.266	-0.303	0.009	-0.129	1.000
BOARDMEET	-0.298	-0.117	0.432	-0.228	0.028	0.028	0.003	-0.027	0.079	-0.027	-0.032
BOARDATT	0.045	0.192	-0.206	0.037	-0.187	-0.178	0.084	0.014	0.099	0.118	-0.217
BOARDSKILLS	0.040	-0.002	-0.227	0.004	-0.270	-0.291	0.275	0.206	-0.033	0.143	0.059
DUALBOARD	0.078	0.010	-0.137	0.088	-0.059	-0.028	0.000	0.120	0.096	-0.234	-0.011
BOARDTEN	0.114	0.051	-0.048	0.272	0.083	0.082	-0.179	-0.215	-0.058	0.055	0.035
STAGG	0.089	-0.059	-0.049	0.089	0.071	0.037	-0.016	-0.007	-0.016	-0.099	-0.185
BANKSIZE	-0.247	-0.389	-0.214	0.054	0.362	0.266	0.219	0.213	0.360	0.352	-0.204
TIER1	0.089	0.191	-0.115	0.116	-0.447	-0.420	0.051	0.072	0.311	-0.089	0.056
LOANSTA	0.034	0.118	0.303	0.109	-0.113	-0.103	0.058	0.031	-0.079	-0.241	0.146
CHGTA	0.181	0.096	-0.196	0.050	-0.042	-0.040	-0.005	0.007	-0.069	-0.068	-0.052
FINCR	0.177	0.180	-0.192	-0.087	-0.026	-0.030	0.078	0.074	-0.319	-0.044	-0.035
EBTPTA	0.721	0.369	0.124	0.229	-0.037	-0.040	0.039	-0.006	-0.171	-0.050	-0.043

Variables	BOARD-MEET	BOARD-ATT	BOARD-SKILLS	DUAL-BOARD	BOARD-TEN	STAGG	BANK-SIZE	TIER1	LOAN-STA	CHGTA	FINCR	EBTPTA
BOARDMEET	1.000											
BOARDATT	0.079	1.000										
BOARDSKILLS	-0.198	0.178	1.000									
DUALBOARD	0.045	-0.305	-0.242	1.000								
BOARDTEN	0.008	-0.034	-0.019	-0.046	1.000							
STAGG	-0.148	-0.106	-0.014	-0.261	0.041	1.000						
BANKSIZE	0.018	0.019	0.071	-0.179	-0.169	0.161	1.000					
TIER1	0.012	0.277	0.164	0.060	-0.047	-0.161	-0.071	1.000				
LOANSTA	0.166	-0.139	-0.056	0.167	0.202	-0.235	-0.505	-0.189	1.000			
CHGTA	-0.035	-0.018	-0.023	0.042	0.002	-0.031	-0.066	-0.177	0.038	1.000		
FINCR	-0.069	-0.125	0.028	0.014	-0.061	0.183	-0.035	-0.418	0.038	0.115	1.000	
EBTPTA	-0.129	-0.161	0.030	-0.115	0.247	0.068	-0.389	-0.200	0.368	0.080	0.129	1.000

B *Functions of a Corporate Governance Committee*

BBVA

Functions of the Corporate Governance Committee:

The main objective of the Corporate Governance Committee is to assist the Board of Directors on its functions of proposing and overseeing the measures of Corporate Governance taken by the Bank, as well as assist the Board of Directors on its function about appointment and remuneration of the members of the Board of Directors-

The internal regulation of the Corporate Governance Committee assigns it the following functions:

1. To ensure that the shareholders and the market in general have a complete, truthful and timely access to the information that Bank must disclose.
2. To oversee the performance of the Audit Committee.
3. To assess, on a regular basis, the compliance with the Corporate Governance Code. When necessary, to propose to the Board of Directors amendments in order to improve and execute correctly the Corporate Governance Code.
4. To oversee practices and policies of Corporate Governance.
5. To keep up to date about the best practices, new regulation and any other change on the Corporate Governance area in order to comply with the Committee´s duties and responsibilities efficiently.
6. Review and assess the way in which the Board of Directors complied with its duties throughout the term.
7. To coordinate the procedure of selection, appointment and rotation of the Board of Directors. This procedure is described on the Policy approved by the General Assembly of Shareholders.
8. To oversee the compliance with the requirements and procedures for the election of the Board of Directors (competences, inabilities and limitations, among other features).

BBVA

9. To coordinate the process of induction of the new members of the Board. To promote the training of the Board of Directors and updating in matters related to the competences of the Board.

10. When necessary, inform about the independence of the candidates to become members of the Board of Directors, so that either the Board or the shareholders directly, may propose them to the General Assembly of Shareholders.

11. To propose to the Board of Directors the remuneration policy of the members of the Board of Directors, the policy must be approved by the General Assembly of Shareholders.

12. To draft the annual report about the annual remuneration policy for the members of the Board of Directors.

13. To support the Chairman of the Board of Directors on the annual assessment of the Board, examine the results of the process and make suggestion in order to improve the performance of the Board.

14. To ensure the compliance with the remuneration policy for the members of the Board of Directors, as well as clearness and disclosure of their remuneration.

15. To review the proposals to reform the bylaws and the Corporate Governance Code related to the good governance, and to present the amendments, updates and repeals of the provision about Corporate Governance.

16. To monitor periodically the transactions of the members of the Board of Directors and managers with shares issued by the Bank or its subsidiaries

17. To reply, within ten (10) days, any complaints of shareholders and investors regarding the no compliance with the Corporate Governance policies of the Bank.

18. To know any behavior of the members of the Board of Directors that might be against the Bank´s bylaws, the Regulation of the Board of Directors and any other internal norm. To inform the Board of Directors about these behavior when the Committee deems it is necessary.

19. To oversee the operation of the Bank´s Website as well as any other tools of disclosure of information.

20. Review and provide concept about the Annual Corporate Governance Report.