UNIVERSIDADE D
COIMBRA

Catarina Alexandra Neves Proença

Essays on the Eurozone banking performance: profitability, risk, remuneration and efficiency

Tese no âmbito do Doutoramento em Gestão de Empresas, orientada pelo Professor Doutor Mário António Gomes Augusto e pelo Professor Doutor José Maria Ruas Murteira e apresentada à Faculdade de Economia da Universidade de Coimbra.

Dezembro de 2020

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FEUC FACULDADE DE ECONOMIA
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ESSAYS ON THE EUROZONE

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Agradecimentos

Os caminhos nunca se percorrem sozinhos. Os nossos passos são sempre acompanhados por outros e é essencial agradecer a todos os que me ajudaram a caminhar e chegar a esta etapa. Assim, expresso aqui o meu agradecimento.

Aos meus orientadores, Professor Doutor Mário António Gomes Augusto e Professor Doutor José Maria Ruas Murteira, pela sabedoria, exigência, disponibilidade, rigor, conhecimento científico e compreensão fundamentais para a realização desta Tese. Pela confiança em mim depositada mesmo quando não consegui estar à altura do expectável. Obrigada por me ajudarem a crescer científica e humanamente.

À coordenação do Doutoramento em Gestão de Empresas, Professor Doutor Carlos Alberto Esteves Ferreira Gomes e Professor Doutor Filipe Jorge Fernandes Coelho, pelo empenho no sucesso dos alunos e pela pertinência das suas sugestões e comentários aos trabalhos que fui apresentando.

Aos restantes Professores do Doutoramento em Gestão de Empresas, Professor Doutor Arnaldo Fernandes Matos Coelho, Professor Doutor Elias Soukiazis, Professora Doutora Patrícia Helena Ferreira Lopes de Moura e Sá, Professor Doutor Paulo Miguel Marques Gama Gonçalves e Professor Doutor Víctor Manuel dos Reis Raposo pelos ensinamentos transmitidos. Também ao Professor Doutor Luís Rodrigues da Escola Superior de Tecnologia e Gestão de Viseu pela ajuda no método GMM.

Aos meus colegas do Doutoramento, Aline, Ana Moxotó, Ana Pedro, António, Augusto, Bruno, Cris, Fabrício, Murilo, Samuel, Sanaz, Sandra e William pela amizade, camaradagem e partilha de conhecimentos. São muitos os bons momentos que guardo deste caminho.

À Caixa de Crédito Agrícola Mútuo de Coimbra, C.R.L., à Destilatum – Destilaria Portuguesa, S.A., na figura da Dra. Sónia Oliva, e ao Instituto Politécnico de Coimbra, em particular ao Instituto Superior de Contabilidade e Administração de Coimbra, por me terem proporcionado condições para realizar e concluir o Doutoramento.

Aos meus pais, Deolinda e Jorge, por me terem educado com amor, valores e sentido de responsabilidade. Foram sempre norteadores nas minhas escolhas, na minha persistência e resiliência. Obrigada pelos sacrifícios que fizeram em nome da nossa felicidade.

À minha irmã Carolina pelo amor, pelos sonhos, pela capacidade de liderança e motivação. Nós somos tudo o que quisermos.

Ao meu irmão Diogo pelo exemplo e união e à Rita, Sara e Tiago por me fazerem viver além do computador.

Ao Filipe por nunca desistir deste caminho, por me ajudar nos perfecionismos e pela partilha de vida com tantas surpresas ainda para descobrir.

À D. Fátima, Sr. Manuel, Ana Sofia, Hugo, Maria João e Manuel por também me fazerem viver além do computador.

À amiga e Professora Doutora Elisabete Neves pela amizade, incentivo, por me ter dado a oportunidade de participar em vários projetos científicos, por me potenciar e querer o melhor para mim desde o primeiro momento.

Às minhas amigas Alexandra, Carolina, Joana, Margarida, Sónia e Sara pelos nossos projetos e por não desistirmos de querer ter um mundo melhor, mais justo e mais feliz. À minha amiga Joana Tavares pelas melodias que me deram ânimo na escrita. A todos os meus amigos pelos momentos vividos, memórias partilhadas e passos invisíveis.

Obrigada! O caminho assim foi mais bonito!

Resumo

A presente Tese aborda a *performance* bancária sobre diversas perspetivas, um objetivo geral que, em grande medida, foi motivado pelos vários fatores que conduziram à crise financeira global de 2007/2008. Em particular, a baixa eficácia dos Conselhos de Administração, políticas de remuneração com componentes elevadas de risco e a gestão de resultados podem ser consideradas como as causas mais relevantes desta crise. Neste sentido, e para prosseguir este objetivo, dividiu-se o estudo em três capítulos centrais, para além da Introdução e de uma secção final com a Conclusão. Cada um desses capítulos volta-se para uma daquelas temáticas, tendo sempre como referencial os bancos da Zona Euro supervisionados diretamente pelo Banco Central Europeu (BCE) e as alterações regulatórias resultantes da Diretiva 2013/36/EU (CRD IV), da imposição de uma quota de género no BCE e da implementação da *International Financial Reporting Standard 9*.

O Capítulo 2 investiga a influência da diversidade de género no impacto das conexões políticas na rendibilidade e no risco bancário. Os resultados mostram que quando a diversidade de género é elevada, a relação entre conexões políticas e, respetivamente, rendibilidade e risco, é em forma de *U* e em forma de *U* invertido. Tal sugere que as caraterísticas diferenciadoras das mulheres, como o facto de serem mais éticas e mais avessas ao risco, ajudam a mitigar os efeitos negativos das conexões políticas, salvaguardando os interesses das instituições dos efeitos adversos das agendas pessoais dos seus administradores.

O Capítulo 3 aborda o efeito das conexões políticas dos elementos dos Conselhos de Administração dos bancos na sua remuneração, assim como a influência da diversidade de género nesse efeito. A evidência estatística sugere que as conexões

políticas têm um impacto negativo nas remunerações, sendo indicativo que os administradores com conexões políticas podem preferir outros tipos de benefícios, ao invés de remunerações, pois no futuro podem aspirar a novos cargos políticos, não querendo estar associados a remunerações elevadas. A diversidade de género atenua esse efeito negativo, resultado este que está associado ao facto de as mulheres geralmente apresentarem maiores preocupações éticas, promovendo políticas de remuneração mais adequadas.

O capítulo 4 aborda o impacto da gestão de resultados na eficiência dos bancos da Zona Euro, analisando a sua evolução até à implementação da *International Financial Reporting Standard 9*. Os resultados empíricos sugerem que a eficiência é negativamente afetada pela gestão de resultados, medida pelas provisões discricionárias. Além disso, quando se considera as provisões totais como *proxy* da gestão de resultados, os resultados indicam um impacto positivo das provisões na eficiência de afetação, contrariamente ao efeito negativo das provisões discricionárias. Este resultado mostra a importância de definir a gestão de resultados pelas provisões discricionárias, para uma análise apropriada do seu efeito na eficiência bancária.

Palavras-chave: Conexões Políticas, Diversidade de Género, Gestão de Resultados, *Performance* Bancária, Remuneração, Eficiência Bancária, BCE, GMM, DEA

Abstract

The present dissertation addresses banking performance from several different perspectives, a general purpose that, to a large extent, was motivated by the various factors that led to the 2007/2008 global financial crisis. In particular, the low effectiveness of directors' boards, remuneration policies with high-risk components, and earnings management can be considered amongst the most relevant drivers of this crisis. Accordingly, in order to pursue its general objective, the text is organized into three central chapters, in addition to the Introduction and final concluding section. Each chapter addresses one of the above three themes, using data on Eurozone banks directly supervised by the European Central Bank (ECB), considering the regulatory changes resulting from Directive 2013/36/EU (CRD IV), the imposition of a gender quota in the ECB and the implementation of the International Financial Reporting Standard 9.

Chapter 2 investigates the influence of gender diversity upon the impact of board members' political connections banks' profitability and risk. Empirical results indicate that for high gender diversity the relationship between political connections and, respectively, profitability and risk, is *U*-shaped and inverted *U*-shaped. Empirical evidence also suggests that women's greater ethical concern and risk aversion help mitigate the negative effects of political connections, shielding institutions' interests from personal agendas' adverse effects.

Chapter 3 addresses the impact of political connections of banks' Directors on the boards' remuneration policies, as well as the influence of gender diversity on this impact. Statistical evidence suggests that political connections have a negative impact on remunerations, a hint that directors with political connections may prefer other types of benefits, rather than remunerations, as they may aim at future political positions and do

not want to be associated with high remunerations. Gender diversity seemingly attenuates this negative effect, a finding that may be associated with the fact that women usually have greater ethical concerns, thereby promoting a more adequate remuneration policy.

Chapter 4 addresses the impact of earnings management on Eurozone banks' efficiency, examining its chronological evolution until the implementation of International Financial Reporting Standard 9. Empirical results suggest that efficiency is negatively affected by earnings management, as measured by discretionary loan loss provisions. Meanwhile, when total provisions are considered as earnings management proxy, results indicate a positive impact of loan provisions on allocative efficiency, contrarily to a negative effect of discretionary provisions. This finding helps stress the importance of defining earnings management as discretionary loan provisions, for the appropriate analysis of the former's effect on banking efficiency.

Keywords: Political Connections, Gender Diversity, Earnings Management, Bank Performance, Remuneration, Bank Efficiency, ECB, GMM, DEA

As I have said many times, if it had been Lehman Sisters rather than Lehman Brothers, the world might well look a lot different today.

Christine Lagarde

Contents

List of Tables

Chapter 2

Chapter 3

Chapter 4

List of figures

Chapter 2

List of appendices

Chapter 2 – Appendix A

Chapter 3 – Appendix B

Acronyms

APE - Average Partial Effects

BCC - Banker, Charnes and Cooper

BCE - Banco Central Europeu

CCR - Charnes, Cooper and Rhodes

CEO - Chief Executive Officer

DEA - Data Envelopment Analysis

DMU - Decision Making Unit

EBA - European Banking Authority

ECB - European Central Bank

EU - European Union

GDP - Gross Domestic Product

GMM - Generalized Moment Method

IAS 39 - International Accounting Standard 39

IASB - International Accounting Standards Board

IFRS 9 - International Financial Reporting Standard 9

LLP - Loan Loss Provisions

NPL - Non-Performing Loans

SFA - Stochastic Frontier Analysis

US - United States of America

VRS - Variable Returns to Scale

1

Chapter 1 – General Introduction

The financial crisis of 2007/2008 and the subsequent European debt crisis have exposed the banking sector's weaknesses concerning management and risk control (Ayadi et al., 2019). The lack of effectiveness of the Board of Directors, excessive risks inherent in remuneration policies and less transparent practice of earnings management have been identified as some of the causes of that crisis.

Since then, regulatory documents have been issued by the competent European authorities aiming at strengthening banks at different levels and improve their performance. Among these, we highlight the importance of the Basel III Agreement, issued in 2010 and revised in 2011 (Basel Committee On Banking Supervision, 2011). Subsequently, the European Union approved in 2013 the Directive 2013/36/EU (CRD IV), which defines the principles of corporate governance that banks must respect, including the promotion of gender diversity in their Board of Directors, the practice of remuneration policies with lower associated risk and effective institution systems for the management and control of credit portfolios and exposures (European Parliament and European Council, 2013a). As of this same year, and in line with this policy, the European Central Bank (ECB) has required a gender quota of 35%, to be achieved by 2019 (European Central Bank, 2018a). The following year, in 2014, the ECB began to exercise direct supervision over some banks, designated "significant banks", evaluating the suitability of candidates proposed for their Boards (European Central Bank, 2017a). In 2014 the International Accounting Standards Board (IASB) issued IFRS 9, mandatory as of 2018, replacing the previous model of losses incurred (under IAS 39) with the model of expected losses.

Considering these changes in the banking sector regulatory framework, several aspects have deserved particular attention in the recent literature dedicated to this sector, namely in relation with the above mentioned drivers of the global financial crisis. With

regard to the Board of Directors, some studies examine the presence of elements with present and past political links, designated as elements with political connections (e.g., Cheng et al., 2018; Wong and Hooy, 2018) while others have addressed gender diversity (e.g., García-Meca et al., 2018; Owen and Temesvary, 2018). These two aspects have been studied as explanatory factors for banks' profitability and risk and Boards' remuneration. As regards their effect on profitability and risk, some part of the literature has argued that political connections can lead to better returns and lower risk, as they allow a sales growth, facilitate market access credit, reduced interest rates (Su and Fung, 2013) and constitute an informal protection mechanism in an imperfect capital market (Song et al., 2016). However, a different strand of the literature suggests an opposite relationship, i.e., a negative effect of connections on profitability and a positive one on risk, since directors with political connections can use this situation to achieve their personal goals to the detriment of the goals of the institution and its shareholders (Bebchuk and Fried, 2004; Saeed et al., 2016).

Studies that have examined the diversity of gender, based on Agency Theory, have shown that women, as compared to men, have greater monitoring concerns and are more diligent (Kirsch, 2018). Behavioral finance also teaches that male and female economic agents behave differently. Female elements are more conservative and risk averse and have greater ethical concerns (Ku Ismail and Abdul Manaf, 2016; Palvia et al., 2014), features that may condition possible unethical practices in the Boards and that, for this motive, cannot be ignored when we analyze the profitability and risk of banks, in their relation with boards' composition.

The effect of political connections on remuneration of members of the Board of Directors of banks has also been object of contradicting findings in the literature: while some studies suggest a positive effect, other papers point to the opposite effect. In the

first group, one frequent argument is that the privileged contacts of politically connected directors can bring added value and benefits to the organization (e.g., Ding et al., 2015; Wu et al., 2018). Nonetheless, we can also find arguments in the literature for a negative effect of political connections on remuneration: directors with political connections, and with the desire to take on new political positions in the future, do not want to be associated with high remunerations (e.g., Fung and Pecha, 2019). Meanwhile, and on the basis of the features mentioned above for the female gender, the literature has also found evidence that the presence of women in the Boards of Directors can condition higher remunerations, rendering these more just.

The financial crisis of 2007/2008 also demonstrated that only those banks that are well managed can be efficient in their financial intermediation role, allocating resources to the economy (Pathan and Faff, 2013). It is also hardly surprising that many studies have turned to the analysis of this efficiency and its explanatory factors, giving an emphasis to less transparent practices of earnings management (Alhadab and Al-Own, 2019). In this context, the literature has shown that Banks Boards have used excessive creation of loan loss provisions (LLP) reserving financial resources beyond what is reasonable to account for credit risk. However, this same literature is far from consensual with regard to the effect of these excessible provisions on banking efficiency.

To a great extent, the foregoing considerations motivate the present dissertation, which addresses several main research questions, regarding banks of the Eurozone:

1. What is the impact of political connections on banks' profitability and risk, and how does gender diversity within the Boards of Directors influence this impact?
2. What is the impact of political connections on the remuneration of the members of banks' Boards of Directors, and how does gender diversity within these Boards affect this impact?

3. How has the efficiency (economic, technical and allocative) of banks in the Eurozone evolved over time, and what is the impact of earnings management on the different efficiency measures?

Following the present introductory section, the proposed text comprises three central chapters. Chapter 2 addresses the role of gender diversity on the impact of political connections on banking performance, as measured by profitability and risk, allowing for nonlinear relationships between the variables of interest. The possibility of a nonlinear relationship is considered, since the literature has been somewhat ambiguous with regard to the impact of political connections and gender diversity on banking performance—with some studies that point to a positive relationship, other texts indicating a negative relationship, and yet others that find no effect. Thus, the present text contributes to the existing literature as, to the best of our knowledge, this aspect has not been clarified.

Chapter 3 studies the impact of political connections of members of Board of Directors in their remuneration and how does gender diversity affect that relationship. In this chapter, the impact of the regulatory measures previously mentioned is also taken into account.

Chapter 4 focuses on the study of the evolution of the efficiency of significant Eurozone banks and the determinants of that efficiency. Using a sample of 70 significant banks observed in 2013 through 2017, we estimate their efficiency in its different dimensions—economic, technical and allocative—using the non-parametric DEA method, and analyze its evolution over the period considered. In a second stage the determinants of bank efficiency are analyzed, with a special focus on earnings management, as measured alternatively by the discretionary component of LLP's and by total LLP.

In our view, the present text, suggests useful theoretical and practical contributions to investors, managers and regulators. Firstly, the study focuses on the banking sector, which is crucial for economic development (Condosta, 2012) and for macroeconomic stability (Bhatia et al., 2018), given its role as a financial intermediary (Ebrahimnejad et al., 2014), its contribution to the payment system (Fama, 1985) and for being a channel for the transmission of monetary policy (Dimitras et al., 2018). This sector features distinctive characteristics, such as asymmetric information to which it is subject, leading to political motivations in loans (Dinc, 2005). It is also a regulated sector that influences efficiency, risk management, profitability and board composition. Secondly, the present Thesis can be useful for Regulatory Authorities in that its conclusions may help the assessment of the impact of their policies on bank profitability, risk and efficiency.

In conclusion, it should be noted that the preparation of the present Thesis was always concerned with subjecting the present work to public scrutiny. Thus, each of the main chapters corresponds to a scientific paper submitted for publication in an international journal recognized by the scientific community. Each of the papers is in the following stage: i. Chapter 2 is published (Proença, C., Augusto M. and Murteira, J. 2020. "Political connections and banking performance: the moderating effect of gender diversity", *Corporate Governance*, Vol. 20, No. 6, pp. 1001-1028. https://doi.org/10.1108/CG-01-2020-0018); ii. Chapter 3 corresponds to a paper resubmitted to the European Journal of Finance, after having received a first "Major revision" notation from the journal's Editor ("Political connections and remuneration of bank board's members: moderating effect of gender diversity", *European Journal of Finance*, ID REJF-2020-0207); iii. Chapter 4 corresponds to a paper that is in its final

preparation stage with a view to submission (“The Effect of Earnings Management on Bank Efficiency: Evidence from ECB- supervised Banks”).

2

Chapter 2 – Political Connections and Banking Performance: The Moderating Effect of Gender Diversity

2.1. Introduction

The composition of corporate Boards of Directors has received increasing attention from both investors and shareholders (Tanaka, 2019; Wang et al., 2018). This issue has received particular notice following the financial scandals of recent decades (namely, WorldCom bankruptcy and 2008 financial crisis) being also driven by the need to improve the effectiveness of these boards (Nyamongo and Temesgen, 2013; Reguera-Alvarado et al., 2017). Boards are composed of elements with diverse attributes, characteristics and knowledge, which contribute to the group as a whole (Walt and Ingley, 2003). Two of these characteristics have received particular attention in the recent literature: i. The presence of politicians or former politicians in company boards (e.g., Chen et al., 2018; Lin et al., 2015; Wong and Hooy, 2018), leading to political connections of board members; ii. The adoption of policies and practices that seek to include people, considered different from traditional ones, in organizations, creating an inclusive culture (Herring, 2009) with emphasis on gender diversity (e.g., Adusei et al., 2017; García-Meca et al., 2018; Owen and Temesvary, 2018; Rodríguez-Ruiz et al., 2016).

Literature has shown that political connections can impact both positively and negatively companies' performance. Indeed, political connections can lead to an increase in sales, facilitate access to the credit market, with lower interest rates (Su and Fung, 2013), often providing an informal protection mechanism that affords both a reduction in their operational risk and an increase in their performance level (Song et al., 2016). However, firms can use political connections to overinvest because they have easier access to long-term financing (Ling et al., 2016) and managers with such connections

take advantage of these relationships, in detriment of the collective good (Saeed et al., 2016) and of shareholders' interests (Bebchuk and Fried, 2004).

Furthermore, the literature has not yet studied the impact of gender diversity on the relationship between political connections and performance. On the basis of Agency Theory, women, when compared to men, are more likely to monitor management and more diligent (Kirsch, 2018). Moreover, women are more conservative, more averse to excessive risk-taking (Palvia et al., 2014) and have more significant ethical concerns (Ku Ismail and Abdul Manaf, 2016) than men. Thus, the presence of women on the Boards of Directors conditions unethical practices, affecting the profitability of banks and the quality of their assets.

The present paper studies the effect of gender diversity on the relationship between political connections and banking performance, allowing for possible linear and nonlinear relationships between these variables. So far, to the best of our knowledge, this relationship has not been studied. Some studies use moderating effects to explain the relationship between performance and gender diversity such as the culture or presence of women in management positions (e.g., Adusei et al., 2017; García-Meca et al., 2018). Our research, in addition, also takes into account the possible simultaneity of the two characteristics of corporate governance (gender diversity and political connections) and banking performance.

In our view, the present text offers several relevant contributions to the existing literature. Firstly, the paper focuses on the banking sector, which plays an essential role in most economies at both national and local levels, by contributing to the payment and liquidity system (Fama, 1985) and by efficiently transforming investment savings (Mayur and Saravanan, 2017; Pathan and Faff, 2013). Only a stable and robust financial market allows the resources obtained by banks (deposits/savings) to be allocated to the most

productive projects, thus enabling economic development (Huang et al., 2015), evinced through subsequent growth of the Gross Domestic Product (GDP) (Jokipii and Monnin, 2013). Indeed, the development of the financial sector influences the speed and pattern of countries' economic development (Levine, 1997). Accordingly, corporate governance decisions of banks affect not only their performance but also society in general (García-Meca et al., 2018). In addition, the banking sector has particular characteristics, such as asymmetric information, that facilitates the concealment of political motivations in lending decisions, and provides more opportunities for political influence (Dinc, 2005). Moreover, the banking sector is subject to specific regulations, with significant repercussions on the composition of its boards (e.g., Booth et al., 2002) as on its capital structure (Adams and Mehran, 2012). Thus, the impact of political connections on banking performance also affect the economy and financial stability as a whole and it is important to study this relationship in the banking sector.

Secondly, this study focuses on Eurozone banks whose monetary policy emphasizes financial stability. Moreover, we investigate a sample of data on 83 banks overseen by the European Central Bank (ECB) observed over 2013-2017, a period coinciding with two important ECB measures: i. the introduction, in 2013, of gender quota targets in ECB aimed at the increase of female participation, and consequent following of this measure by banks in boards (up to 35% in 2019—European Central Bank, 2018a); and, ii. as of November 4, 2014, the ECB has overseen the appointment of members of the Boards of Directors of significant banks under its direct supervision through the assessment of candidates' fit and proper requirements (European Central Bank, 2017a).[1]

[1] To the best of our knowledge, no previous study has addressed a set of major European banks; the received literature includes Hung et al. (2017), who studied a sample of Chinese banks, and Owen and Temesvary (2018), who analysed North American banks.

Finally, the present study contributes to a better understanding of the effect of imposing such measures on banks' performance. In particular, our results provide evidence of a nonlinear *U*-shaped relationship between political connections and banking performance, which is moderated by the gender diversity of boards. When gender diversity is high, political connections reduce banking performance to a certain point, suggesting that the differentiating characteristics of women such as greater ethical concern and risk aversion, help mitigate the negative effects of political connections on banking performance; which means that institutions' interests are favoured over personal agendas, in line with the suggestions of behavioral finance.

Our findings can also provide a useful source of knowledge for the Regulator (ECB). The ECB will be able to evaluate better the impact of its policy requirements on banking performance, assessing the effectiveness of its gender quota imposition and the resilience of political connections in the boards of banks under its supervision.

The remainder of the paper is organized as follows. Section 2.2. reviews the relevant literature, emphasizing its relation with the research agenda of the present study. Section 2.3. describes the sample and methodology. Section 2.4. presents and comments on empirical results. Section 2.5. concludes the paper, stressing its main findings and suggesting future related research.

2.2. Literature Review

The links between the business world and governments are not new to the 21st century, with a continuing interference of politics and governments on business activity, even as customs barriers, deregulation and privatization fall (Hillman, 2005). These links are designated by the scientific community as political connections and correspond to a social

relationship aiming at authority or power gain (Wong and Hooy, 2018). Following the established literature, an element has political connections if he/she is an ex-government official (e.g., Carretta et al., 2012; García-Meca and García, 2015; Hung et al., 2017), i.e., someone who worked as a bureaucrat/advisor in a ministry and/or a politician who is elected an was a former minister. These connections are ubiquitous (Banerji et al., 2018) and can be considered a type of "invisible corruption" (Domadenik et al., 2016). Companies, where these political connections occur, are termed "politically connected" (Chen et al., 2018; Saeed et al., 2016). The existence of these connections can be explained by the Theory of Resource Dependence, which states that organizations need to acquire and exchange resources, leading to the dependence between companies and external units, such as governments (de Cabo et al., 2012). Such dependence creates risks and uncertainty, which can be reduced by establishing political connections (Hillman, 2005) that enable companies to obtain a stronger resource base in order to increase their value (Wong and Hooy, 2018). In addition, these links also take us to Agency Theory. According to this Theory, proposed by Jensen and Meckling (1976), the separation between shareholders and managers generates information asymmetries (agency problems), constituting an incentive for boards' members with political connections to use the their political resources for their personal interest, to the detriment of shareholders' interests, which may lead to the expropriation of the shareholders' wealth (Bebchuk and Fried, 2004).

The effects of political connections have been studied from a variety of perspectives, such as their impact on performance (e.g., Hung et al., 2017; Wong and Hooy, 2018), on financial markets (e.g., Faccio et al., 2006), fiscal policies (e.g., Adhikari et al., 2006; Lin et al., 2015) and on job creation (e.g., Menozzi et al., 2012). However,

the direction of this effect on business activity is far from consensual, with different studies showing both positive and negative effects.

Companies with political connections more easily obtain investment projects and bank loans (Wang et al., 2018) and green grants (Lin et al., 2015), face lower tax rates (Adhikari et al., 2006), higher stock prices (Faccio, 2006), as well as greater ease of entry into high barrier industries (Chen et al., 2014). In addition, it has been shown that political connections have a positive effect on employment (Menozzi et al., 2012) and are associated with a higher rescue probability of companies in times of economic hardship (Faccio, 2006; Faccio et al., 2006), which, in turn, leads to a systemic risk reduction and, consequently, a lower cost of capital (Boubakri et al., 2012). However, along with these positive effects, the literature has also shown negative effects of political connections on business activity and performance. In particular, companies with political connections have been shown to over-invest (Ling et al., 2016), to have lower productivity levels (Domadenik et al., 2016) and higher debt ratios (Faccio, 2010). Furthermore, studies focused on the impact of political connections on performance have also revealed contradictory results, hinting to a possible nonlinear relationship between the relevant variables. Indeed, political connections favour companies' performance (e.g., Hung et al., 2017; Song et al., 2016; Su and Fung, 2013; Wang et al., 2018; Wong and Hooy, 2018) as they tend to increase sales levels and lower unit costs, facilitate access to the credit market, with lower financing costs (Su and Fung, 2013). Moreover, the relationship of politically connected companies with the government can be seen as an informal protection mechanism that often affords both a reduction in their operational risk and an increase in their performance level (Song et al., 2016).

However, companies with political connections may have political and social goals (Chong et al., 2018) that can result in a lower financial performance (e.g., Carretta

et al., 2012; Chen et al., 2018; Chong et al., 2018; García-Meca and García, 2015; Jackowicz et al., 2014; Ling et al., 2016; Saeed et al., 2016). Furthermore, companies can use political connections not as a means of obtaining resources but as a protection mechanism against external shocks (Jackowicz et al., 2014). As these companies often have easier access to long-term financing, they can overinvest, thereby lowering their own financial performance (Ling et al., 2016).

One other argument that may help explain a negative impact of political connections on performance is that managers with such connections take advantage of these relationships, in detriment of the collective good (Saeed et al., 2016). According to the Theory of Resource Dependency, politically connected companies are less stable and have a weaker resource base because they are primarily connected to a single influential politician (Wong and Hooy, 2018).

Finally, the above mentioned literature notwithstanding, studies abound that suggest negligible effects of political connections on the financial performance of companies. One such example is provided by Zhang et al. (2014).

In the case of the banking sector, the literature is still scarce. Recent studies, by Hung et al. (2017) and by Chen et al. (2018), constitute important references in this literature. According to the study by Hung et al. (2017), produced in the context of Chinese banking, politically connected banks appear to be benefited in the process of granting of credit to politically connected companies, considered to be high-quality assets as they are more likely to be bailed out in case of financial difficulties. In addition, this study suggests that a politically connected bank detects and interprets relevant political signals, uses appropriate diplomatic language and takes proper measures to achieve superior performance (Hung et al., 2017).

However, using a sample of banks from 41 countries from various continents, Chen et al. (2018) conclude that political connections lead to lower performance, as a result of a relaxation in loan risk analysis, due to private agendas. For European banking, particularly in Spain and Italy, the authors find a negative relationship between performance and political connections, which is explained by the fact that members with political connections are more interested in serving their personal interests, rather than collective ones (Carretta et al., 2012) and by the approval of unprofitable projects (García-Meca and García, 2015).

In view of the above contradictory findings in the literature, the following hypothesis is formulated:

H1. Political connections in ECB-supervised banking influence its performance.

With regard to gender diversity in business leadership, two main reasons help explain a growing interest noted in the literature: i. women are under-represented on the Boards of Directors of major companies in most countries of the world (Jamali et al. 2007; Yap et al., 2017); and, ii. several European countries such as Norway, Spain, Finland, Iceland, France, Italy and Belgium, have set gender quotas in the Boards of Directors (Terjesen et al., 2015) because of the potentially positive effects of this diversity, as suggested by behavioral finance.

This branch of modern finance has observed that male and female economic agents have behavioral differences. For example, women, when compared to men, are more risk and competition averse and their preferences are more flexible (Croson and Gneezy, 2009). They also present greater ethical concerns (Ku Ismail and Abdul Manaf, 2016), propose less aggressive strategies, invest less in research and development and more in social sustainability initiatives (Apesteguia et al., 2012), take pro-social actions, which means that companies to which they belong can have higher levels of social

responsibility (Galbreath, 2018). The literature also suggests that men, rather than women, often exhibit overconfidence in decision making (e.g., Huang and Kisgen, 2013). The literature that examines the relationship between gender diversity and corporate financial performance is also somewhat inconclusive. Some studies have shown that gender diversity enhances performance (e.g., Chong et al., 2018; García-Meca et al., 2015; Pathan and Faff, 2013; Reguera-Alvarado et al., 2017; Yap et al., 2017); other studies, in turn, either suggest a contrary conclusion (e.g., Adusei et al., 2017) or claim that there is no effect of gender diversity on performance (e.g., Carter et al., 2010).

A positive relationship has been sustained by the argument that greater gender diversity in the composition of boards promotes a better understanding of markets, increases innovation and improves problem-solving through more alternatives/visions (Campbell and Mínguez-Vera, 2008). However, according to social competition theories, people categorize themselves into groups, with underlying stereotypes, which, in turn, contribute to competitive behavior and may lead to dysfunctional outcomes and worse performances (Rodríguez-Ruiz et al., 2016). In addition, if the decision to appoint female board members is motivated by social pressure for greater gender equality, this could have a negative effect on performance (Campbell and Mínguez-Vera, 2008). This is verified by Ahern and Dittmar (2012), who study the imposition of the gender quota in Norway in 2003. These authors conclude that this measure led not only to the growth of companies in size, through acquisitions but also to lower returns, due to the appointment of less experienced members to their boards.

Given this duality of results, research has also been concerned with a possible nonlinear relationship between gender diversity and banking performance. Owen and Temesvary (2018) conclude that in American banking this relationship is *U*-shaped because of a greater board interaction when the percentage of women increases. These

authors argue that the continued voluntary expansion of gender diversity in banks' Boards of Directors is likely to bring performance increases, provided banks have good management quality and are adequately capitalized. Quality management helps maximize the benefits of gender diversity, such as innovation, and minimize its costs such as potential conflicts (Owen and Temesvary, 2018). Nevertheless, Rodríguez-Ruiz et al. (2016) find, in the context of Spanish banking, a nonlinear but inverted *U*-shaped relationship and conclude that banks with moderate level of female on their boards have superior performances. This conclusion finds its main support under the cognitive resources view, which argues that problem-solving capacity increases with demographic heterogeneity growth (Rodríguez-Ruiz et al., 2016). Thus, gender diversity is synonymous with strategic capacity that drives performance.

In view of the above, studies that focus exclusively on the banking sector (e.g., Adusei et al., 2017; García-Meca et al., 2015; Hung et al., 2017; Owen and Temesvary, 2018; Pathan and Faff, 2013; Rodríguez-Ruiz et al., 2016) are becoming increasingly relevant in the literature. De Vita and Magliocco (2018) state that the banking sector, as compared to other industries, is more reluctant to accept gender diversity in decision-making positions, as cultural constraints and stereotypes still dominate finance. However, there is a growing concern with management bodies being more balanced in terms of suitability and gender balance. The present study can be envisaged as one more contribution to this line of research.

The present paper investigates how gender diversity impacts the effect of political connections on banking performance. This research is motivated by the apparent diversity of scientific opinions regarding the influence of political connections and gender diversity on banking performance and by the lack of research on the relationship between the two former dimensions. Furthermore, in view of Agency Theory and Kirsch (2018), women

as compared to men are more diligent and likely to better monitor management. Thus, the monitoring of activities by a female can yield a reduction in agency costs caused by political connections and thereby impact performance. Given that women are more conservative, more averse to excessive risk-taking (Palvia et al., 2014) and with a greater ethical concern than men (Ku Ismail and Abdul Manaf, 2016), the presence of women on the Boards of Directors conditions unethical practices, affecting the profitability of banks and the quality of their assets. By promoting cognitive disparity between the members of the Board of Directors, gender diversity increases the board's independence of thinking and, consequently, its performance of supervisory and advisory functions (Zhou et al., 2019). Gender diversity expectably weakens the intensity of both positive and negative relationships between political connections and banking performance—one general expectation that can be translated in the following formal hypothesis:

H2. Gender diversity mitigates the effect of political connections on banking performance.

2.3. Variables, Sample and Model

2.3.1. Sample Used in the Study

The sample used in the present study comprises 83 banks, out of the total number of entities overseen by the ECB, in the 19 countries that adopted the euro currency (117 entities on 1 January 2019—European Central Bank, 2019a). Banks directly supervised by the ECB account for 82% of Eurozone banking assets (European Central Bank, 2018b). In 2017, the sampled banks corresponded to 88.4% of the total assets of significant banks, i.e., supervised by the ECB. These entities are considered significant in light of criteria such as asset size, economic importance, cross-border activities and

direct public financial assistance (European Central Bank, 2018c). The difference between 117 and 83 banks derives from data availability — to use a balanced panel, the sample to be studied comprises 83 banks, for which there are available data in all the sample periods (2013 through 2017). Table 2.1 lists the number of banks, per country, supervised by the ECB and analysed in the present study.

Table 2.1 - Banks analyzed in the study

Country	List of supervised entities	Analyzed banks
Austria	6	2
Belgium	7	6
Cyprus	3	1
Germany	21	16
Estonia	3	3
Spain	12	10
Finland	3	1
France	12	9
Greece	4	4
Ireland	6	1
Italy	12	10
Lithuania	2	2
Luxembourg	6	3
Latvia	2	2
Malta	3	3
Netherlands	6	3
Portugal	3	2
Slovenia	3	2
Slovakia	3	3
Total	**117**	**83**

The period under review is 2013-2017. This period was chosen for two main reasons: firstly, as of 2013, ECB has introduced gender targets to increase female participation on boards, so as to reach 35% by 2019 (European Central Bank, 2018a). The ECB is, therefore, promoting gender diversity — as in some countries such as Spain, through the "law of equality" (Reguera-Alvarado et al., 2017). Secondly, as of November 4, 2014, the ECB has been intervening in the appointment of board members of the significant banks under its direct supervision, by assessing candidates' fit and good repute

(European Central Bank, 2017a). Non-significant banks are under the supervision of the national banks of their respective countries, which aligned their rules with those issued by the ECB (e.g., Bank of Portugal, 2018).

The fact that a board candidate currently holds or held in the last two years, a political office and/or a government office does not prevent him from being appointed unless significant conflicts of interest exist — as evaluated by examining the nature, powers and political office, and its relationship with the bank (European Central Bank, 2017a; Bank of Portugal, 2018). Given that our sample comprises only banks directly supervised by the ECB, the regulatory framework for political connections is the same for all the entities under study, as all sampled banks have to comply with the same rules — contrarily to what occurs in studies addressing banks subject to diverse regulatory frameworks (e.g., Chen et al., 2018; García-Meca et al., 2015).

Data collection was carried out in two stages. In the first stage, we collected the names of the members of the banks' Boards of Directors through their annual reports and accounts. In a second step, in order to assess the possibility of political connections of these elements, their biographies (published on the banks' institutional websites) were analysed. If this information were not available on bank websites, we used press releases, annual bank reports, LinkedIn pages—following Hung et al. (2017). We emphasize that for two-tier boards, we consider only the elements of the management board, as it is this body that manages the daily business, as in the one-tier board. According to Puchniak and Sik Kim (2017), double boards (two-tier boards) are not equivalent to one tier-boards. In fact, in the two-tier boards there is a clear separation of responsibilities, as a member of the management board cannot be a member of the supervisory board at the same time (Davies et al., 2013). Moreover, on the two-tier board, the management board manages the daily business and the supervisory board supervises management board decisions; on

one-tier board all board members participate in corporate decisions (Pletzer et al., 2015). In addition, in the two-tier board banks, the separate treatment of the two boards is seen in the literature, not joining them as a single board (e.g., Farag and Mallin, 2017; Fernández-Temprano and Tejerina-Gaite, 2020; Kramaric and Miletic, 2017; Matuszak et al., 2019; Nomran and Haron, 2019). Thus, as our focus lies on the influence of political connections on the decisions of bank administrations, in two-tier boards we consider the management board. Bank financial data were collected through Moody's Analytics BankFocus database; data on macroeconomic variables were obtained from the World Bank.

2.3.2. Variables

2.3.2.1. Dependent Variables

In line with previous studies (e.g., Chen et al., 2018; Hung et al., 2017; Talavera et al., 2018), three proxy variables were used to measure banking performance, namely, return on average assets ($ROAA$) return on average equity ($ROAE$) and loan loss provisions to total loans ($LLPTL$). The first two variables provide profitability measures; the third variable is a risk measure, assessing the frailty of banks' assets — so an increase in this indicator means an increase in overdue credit (non-performing loans (NPL)) in the bank's loan portfolio (Hung et al., 2017).

2.3.2.2. Explanatory Variables

2.3.2.2.1. Variables of Interest

Regarding the explanatory variables of interest, the political connections indicator (political connections on board ($POLBO$)) is measured by the percentage of members of

the Board of Directors with political connections in the past, as defined by Carretta et al. (2012), García-Meca and García (2015) and Pathan and Faff (2013), i.e., someone who worked as a bureaucrat/advisor in a ministry and/or a politician who is elected an was a former minister. Gender diversity (women on board (WBO)) is measured by the percentage of women on the boards, in line with Adusei et al. (2017), García-Meca et al. (2018), Owen and Temesvary (2018) and Rodríguez-Ruiz et al. (2016). To measure gender diversity, the Shannon Index (SIN) was also calculated, which, according to Campbell and Mínguez-Vera (2008), is more sensitive to small variations in the gender composition of boards.

Given that the present study analyses the interaction between gender diversity and political connections, we centred these two variables. We then created the product terms from these centred variables (the moderator effect between "women on board" and "political connections on board" ($POLBO \cdot WBO$) and the moderator effect between "women on board" measured by Shannon Index and "political connections on board" ($POLBO \cdot SIN$)), as in Salachas et al. (2017). Such transformation aims at reducing the correlation between the two variables (Aiken and West, 1991; Moon, 2018).

Tables 2.2 and 2.3 present a summary characterization of the sample, with regard to gender diversity and political connections and how these variables were operationalized. The number of women on ECB-supervised bank boards has been increasing, at a rate of 43% over the period 2013-2017. It is also noted that women, although in minority, have a higher rate of political connections than men. However, the percentage of board elements with political connections decreases slightly over the period under study. This is in line with the ECB's requirements in assessing the good reputation of administrations.

Table 2.2 - Gender diversity and Political connections: summary characterization of the sample

	2013	2014	2015	2016	2017
Number of women	135	140	162	187	193
Number of political women	32	33	32	38	35
Number of board members=Total board	828	836	827	833	843
Number of political board members	117	118	111	115	109
Number of women/Total board (%)	16.30%	16.75%	19.59%	22.45%	22.89%
Number of political women/Total board (%)	3.86%	3.95%	3.87%	4.56%	4.15%
Number of political women/Total political board members (%)	27.35%	27.97%	28.83%	33.04%	32.11%
Number of political women/Number of women (%)	23.70%	23.57%	19.75%	20.32%	18.13%
Number of political men/Number of men (%)	12.27%	12.21%	11.88%	11.92%	11.38%
Number of political board members/Total board (%)	14.13%	14.11%	13.42%	13.81%	12.93%

2.3.2.2.2. Control Variables

The control variables are either internal (bank-specific) or external determinants. Internal control variables are those that are influenced by management decisions; external variates are those that, although outside the bank's control, reflect the economic and legal environment that affects the functioning of financial institutions (Athanasoglou et al., 2008). Thus, the first set of variables concerns the characteristics of banks and the second set regards macroeconomic determinants.

The internal determinants used are as follows: i. bank size (e.g., Carretta et al., 2012; Chen et al., 2018; García-Meca and García, 2015; Hung et al., 2017; Talavera et al., 2018); ii. bank capital adequacy, which is higher the lower the risk the bank poses to savers (e.g., Athanasoglou et al., 2008; Dietrich and Wanzenried, 2011; Garcia and Guerreiro, 2016; Hung et al., 2017; Talavera et al., 2018); iii. leverage (e.g., García-Meca and García, 2015); iv. operational efficiency, a ratio that is higher for more inefficient banks (e.g., Garcia and Guerreiro, 2016; Hung et al., 2017); v. non-operational efficiency, the larger the more efficient the institution (e.g., Hung et al., 2017). To measure the macroeconomic environment, the following indicators were used: i. economic growth (e.g., Adusei et al., 2017; Chen et al., 2018); ii. corruption control, measured by the

Corruption Index calculated by the International Country Risk Guide (e.g., Chen et al., 2018).

Table 2.3 presents a summary of the variables' operationalization procedures, as well as the main studies that support these procedures, and Table 2.4 presents a summary of the descriptive statistics of the variables used in the study. It should be noted that in the period under review there are banks with negative returns and that the average political connections is 11.6% (maximum 75%) and the average gender diversity is 16.6% (maximum 60%).

Table 2.3 - Operationalization of variables

Variable	Codename	Formula	Signal	Authors
1. Dependent variables				
Performance	*ROAA*	After tax profit/average total assets	N.A.	Chen et al. (2018); Hung et al. (2017); Owen and Temesvary (2018); Talavera et al. (2018)
	ROAE	After tax profit/average total equity	N.A.	Chen et al. (2018); Talavera et al. (2018)
	LLPTL	Loan Loss Provisions/Total loans	N.A.	Hung et al. (2017)
2. Explanatory variables				
Political connections	*POLBO*	Political board members/Total board	+/-	Carretta et al. (2012); Cheng (2018)[2]
Gender Diversity	*WBO*	Number of women/Total board (%)	+/-	Adusei et al. (2017); García-Meca et al. (2018, 2015); Owen and Temesvary (2018); Rodríguez-Ruiz et al. (2016)[3]
	SIN	$-\sum_i^n P_i \, lnP_i$, where Pi is the percentage of board members in each category (female/male) and n is the total number of categories	+/-	Campbell and Mínguez-Vera (2008); Owen and Temesvary (2018); Yap et al. (2017)[4].
Size	*TA*	The natural logarithm of Total Assets	+/-	Athanasoglou et al. (2008); Chen et al. (2018); García-Meca and García, (2015); Hung et al. (2017); Rodríguez-Ruiz et al. (2016); Talavera et al. (2018)

[2] In other studies, political connections have been measured using a dummy variable, equal to 1 if the board member has past experience in political office and 0 otherwise (e.g., Chen et al., 2018; Hung et al., 2017; Wong and Hooy, 2018) or through the history of political office (e.g., Chen et al., 2014).

[3] Gender diversity has also been measured as a dummy variable, equal to 1 if there is at least one female element on the board and 0 otherwise (e.g., Hung et al., 2017; Yap et al., 2017).

[4] Among the set of studies presented, only Owen and Temesvary (2018) refers to the banking sector, using the Blau index ($1 - \sum_i^n P_i^2$) instead of the Shannon index. According to Campbell and Mínguez-Vera (2008), the properties of both indices are qualitatively similar, although Shannon's index, being a logarithm, is more sensitive to small differences in gender diversity.

Table 2.3 - Operationalization of variables (cont.)

Variable	Codename	Formula	Signal	Authors
Capitalization	*ETA*	Total Equity/Total Assets	+/-	Athanasoglou et al. (2008); Dietrich and Wanzenried (2011); Garcia and Guerreiro (2016); Hung et al. (2017); Talavera et al. (2018)
Leverage	*LEV*	Debt/Total Equity	+/-	Chen et al. (2018); García-Meca and García (2015)
Managerial efficiency	*CIR*	Cost-to-income ratio: total cost/total income	+/-	Dietrich and Wanzenried (2011); Garcia and Guerreiro (2016); Hung et al. (2017)
Non operational efficiency	*NINC*	Non-interest income/Total income	+/-	Hung et al. (2017)
Economic growth	*GDPPC*	The natural logarithm of Gross Domestic Product *per capita*	+/-	Chen et al. (2018)[5]
Corruption Control	*CIN*	Calculated by International Country Risk Guide. This index ranges from 0 to 6, with 6 signifying a low level of corruption/high control of corruption in the country.	+	Chen et al. (2018)

Table 2.4 - Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROAA	415	0.273	1.336	-12.070	6.410
ROAE	415	2.504	18.547	-162.270	81.890
LLPTL	415	0.010	0.020	-0.066	0.213
POLBO	415	0.116	0.156	0.000	0.750
WBO	415	0.166	0.138	0.000	0.600
SIN	415	0.030	0.225	-0.366	0.297
TA	415	18.034	1.644	13.249	21.455
ETA	415	0.077	0.040	0.013	0.253
LEV	415	16.564	10.237	2.959	90.001
CIR	415	60.954	54.202	-525.330	587.410
NINC	415	39.474	30.041	-147.990	319.510
GDPPC	415	10.180	0.414	9.221	11.304
CIN	415	0.660	0.153	0.333	0.917

Notes
Obs: Observations, Std. Dev.: Standard Desviation; Min: minimum; Max: Maximum.
Check Table 2.3 for description of variables.

[5] In the literature, GDP or its growth rate has been used (e.g., Athanasoglou et al., 2008; Dietrich and Wanzenried, 2011; Garcia and Guerreiro, 2016). Here we follow the recent study by Chen et al. (2018).

2.3.3. Model

The relationships previously exposed in the above hypotheses suggest the specification of the following dynamic model for panel data:

$$Performance_{it}=\delta Performance_{i,t-1}+\theta POLBO_{it}+\partial WBO_{it}+\gamma POLBO_{it}WBO_{it}+\sum_{j=1}^{J} B_j X_{it}^{j}+\epsilon_{it}+v_i.$$

As there is a possibility of the nonlinearity of the relationship between the variables of interest and performance, the following dynamic model was also estimated, allowing for this possibility:

$$Performance_{it}=\delta Performance_{i,t-1}+\theta POLBO_{it}+\partial WBO_{it}+\gamma POLBO_{it}WBO_{it}+\beta POLBO_{it}^{2}+$$

$$\varepsilon POLBO_{it}^{2}WBO_{it}+\vartheta WBO_{it}^{2}+\mu POLBO_{it}WBO_{it}^{2}+\rho POLBO_{it}^{2}WBO_{it}^{2}+\sum_{j=1}^{J} B_j X_{it}^{j}+\epsilon_{it}+v_i$$

As mentioned, banking performance is alternatively measured by the variables $ROAA$, $ROAE$ and $LLPTL$. Contrarily to the variable $POLBO$, the SIN is also used as a measure of gender diversity. In addition, we use a set of control variables, described in the previous section, represented in the model by the vector X^j. All variables are bank-indexed (index i) and period-indexed (t). Finally, the error term is composed of a random element (ϵ_{it}), which can vary across banks and time periods, and the individual effect (v_i), bank-specific and supposed time-invariant.

When estimating dynamic panel data models, under which one or more explanatory variables are not strictly exogenous (the lagged dependent variable, at least), common fixed effects approaches — such as least squares dummy variables or first differencing—may produce severely biased estimates (Rumler and Waschiczek, 2016; Wintoki et al., 2012). Thus, the generalized moment method (GMM), as proposed by Arellano and Bond (1991), is the method selected here to estimate the present panel data dynamic model (Baltagi, 2005). This method has two advantages. Firstly, with this type of estimator, we can allow for the issue of possible simultaneous determination of the

dependent variable (performance) and some explanatory variables. For example, banking performance may explain political connections, as better/worse-performing banks may attract elements with more/less political connections. Furthermore, the GMM estimator also allows dynamics to be incorporated into the models, as lagged regressors are used as valid instruments. Secondly, this methodology, contrarily to simultaneous equations' estimation methods (such as maximum likelihood and least-squares in two or three stages — 2SLS or 3SLS, respectively — enables the control of individual heterogeneity, avoiding the risk of inconsistent parameter estimates (García-Meca et al., 2015). This point is crucial in the present study, as banking performance probably relates to unobservable aspects specific to each bank (unobserved individual heterogeneity). To avoid this risk, the individual effect is eliminated through first-differencing of the variables, as shown in equation (2.1).

Given the above, the method used in the present study corresponds to the GMM two-step system GMM, developed by Blundell and Bond (1998), a derivation of the Arellano and Bond estimator. This method combines the equation in levels,

$$Performance_{it}=\delta Performance_{i,t-1}+\theta POLBO_{it}+\partial WBO_{it}+\gamma POLBO_{it}WBO_{it}+\sum_{j=1}^{J} B_j X_{it}^{j}+\epsilon_{it}+v_i$$

—where the variables in first differences are used as instruments—and the equation in first differences:

$$Performance_{it}-Performance_{i,t-1}=\delta(Performance_{i,t-1}-Performance_{i,t-2})+\theta(POLBO_{it}-$$

$$-POLBO_{i,t-1})+\partial(WBO_{it}-WBO_{i,t-1})+\gamma(POLBO_{it}-POLBO_{i,t-1})(WBO_{it}-WBO_{i,t-1})+(\sum_{j=1}^{J} B_j X_{it}^{j}-$$

$$\sum_{j=1}^{J} B_j X_{i,t-1}^{j})+(\epsilon_{it}-\epsilon_{i,t-1})+(v_i-v_i), \quad (2.1)$$

—where level variables are used as instruments.

This method is recommended when the number of temporal observations is not very high and the dependent variable has a high degree of persistence (in this case, high

correlation between present and past performance) (Blundell and Bond, 1998). Thus, for the equation in differences we use as instruments the political connections, gender and product diversity between lags one and two periods (t-1 and t-2) and for the level equation, we use as instruments the first and second differences of those variables.

To validate the adopted specification two tests were used, in line with the procedure adopted by Dietrich and Wanzenried (2011), Moon (2018), Rumler and Waschiczek (2016) and Tan (2016). Firstly, the error autocorrelation was evaluated through the statistics $m1$ and $m2$ developed by Arellano and Bond (1991), where the null hypothesis is the absence of error autocorrelation. A second specification test corresponds to the Hansen test, asymptotically $\mathcal{X}^2$, where the null hypothesis is a null correlation between the instruments and the error term (i.e. the hypothesis that the instruments are valid). In addition, to assess the joint significance of the model variables, a Wald test was also performed.

2.4. Results

2.4.1. Correlation Analysis

Table 2.5 presents the correlation matrix between the variables used in the study. Regarding the analysis of the variables of interest, there is a negative correlation between political connections ($POLBO$) and the different performance measures — an increase in the political connections is associated with a decrease in profitability ($ROAA$ and $ROAE$) and an increase in Credit Risk ($LLPTL$). The correlation between gender diversity (WBO) and performance has the opposite meaning to that of political connections. Regarding control variables, we stress that the high correlations presented in the table, namely those between the proxy used to measure performance, leverage (LEV) and equity to total assets

ratio (ETA), cost-to-income ratio (CIR) and non-interest income ($NINC$) and gross domestic product *per capita* ($GDPPC$) and corruption control index (CIN), refer to variables that are not used simultaneously in the same estimation. Thus, for each of the estimates presented in the next section, the correlations between the independent variables are reduced — so the precision of our estimates does not seem to be strongly affected by high regressor correlations.

Table 2.5 - Correlations matrix

	ROAA	***ROAE***	***LLPTL***	***WBO***	***POLBO***	***SIN***	***TA***	***ETA***	***LEV***	***CIR***	***NINC***	***GDPPC***	***CIN***
ROAA	1												
ROAE	0.8524***	1											
LLPTL	-0.7324***	-0.8106***	1										
WBO	0.0438	0.0325	-0.0161	1									
POLBO	-0.0353	-0.0859*	0.083*	0.2715***	1								
SIN	0.0464	0.0282	0.0376	0.8766***	0.2812***	1							
TA	-0.0039	-0.1136**	-0.0444	0.1319***	0.2629***	0.1053***	1						
ETA	0.1049**	0.2506***	-0.0222	0.0301	-0.1647***	0.0306	-0.546***	1					
LEV	-0.1163**	-0.1565***	-0.0889*	0.039	0.2315***	-0.0311	0.4145***	-0.7539***	1				
CIR	-0.2133***	-0.3138***	0.1869***	-0.0385	-0.1954***	-0.0693	-0.0244	0.0259	-0.2155***	1			
NINC	0.1097**	0.1744***	-0.1459***	0.1457***	0.0996**	0.2144***	0.105**	-0.0875*	0.1579***	-0.6395***	1		
GDPPC	0.0444	-0.0723	-0.1824***	-0.0872*	0.1975***	-0.0995**	0.4358***	-0.4512***	0.3307***	0.0166	0.1034**	1	
CIN	0.1315***	0.0541	-0.3085***	-0.216***	0.0567	-0.3226***	0.2273***	-0.2991***	0.2839***	-0.012	0.0332	0.6727***	1

Notes
*: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01
Check Table 2.3 for description of variables.

2.4.2. Estimation Results for the Base Model

The explanatory variables of the base model are grouped into three sets: 1) variables of interest ($POLBO$, WBO, $POLBO \cdot WBO$); 2) bank characteristics (total assets (TA), ETA and CIR); 3) macroeconomic variables ($GDPPC$). In this sense, the estimation of model 1 followed a sequential process to highlight the effect of these three groups of variables. In the first step, we include the variables of interest for each of the variables to be explained; in the second step, we use the internal variables of interest and control; and in the third step, we also include macroeconomic variables. The results of these estimates are summarized in Table 2.6.

Regarding the estimates for Model 1, we verify that the inclusion of interaction ($POLBO \cdot WBO$) alters the statistical significance of political connections, maintaining its negative impact on profitability ($ROAA$ and $ROAE$) and positive on risk ($LLPTL$). Gender diversity exhibits statistical significance and a positive impact on different performance measures. However, when introducing control variables, gender diversity is no longer individually statistically significant.

Regarding political connections, these have a negative impact on $ROAA$ and $ROAE$ on Models 2 and 3 and this effect is statistically significant at the 1% significance level. Moreover, their effect on $LLPTL$ is positive in these models and is statistically significant at the 5% significance level only in Model 3. An analysis of these results suggests that political connections reduce banks' profitability and increase their risk, by increasing overdue credit (NPL) in the bank's loan portfolio — in line with the findings of Hung et al., (2017). Such results are in agreement with those obtained by Carretta et al. (2012); Chen et al. (2018); García-Meca and García (2015), leading to the conclusion that personal interests of members with political connections overlap with the interests of

the institution, through the approval of unprofitable projects and relaxation of risk analysis of loans under appraisal.

Thus, it is clear that this negative impact has not yet been mitigated by the ECB's 2014 imposition, consisting of curricular and suitability appraisal of prospective members of the Boards of Directors, prior to their acceptance for management positions. This conclusion is based on the fact that mandates vary from bank to bank, so from 2015 to 2017, there are banks whose managers were previously evaluated, while in other banks this was not the case, as a renewal of mandates has not yet occurred.

Regarding the moderating effect of gender diversity, it seems that the latter accentuates the negative impact of political connections on $ROAA$ and $ROAE$, and the positive impact on $LLPTL$ — contrarily to what was postulated under hypothesis 2 — exhibiting statistical significance in Models 2 and 3. This result rests on the fact that the increased participation of female elements results from impositions, as advocated by Campbell and Mínguez-Vera (2008). In the same vein, Ahern and Dittmar (2012) show that the 40% imposition of female quotas in Norway is associated with poorer financial performance, as this quota has placed inexperienced elements on the boards, leading to increased leverage and acquisitions.

Given the literature, to which we refer in the previous sections, the impact of political connections and gender diversity on performance evinces contradictory patterns, suggesting the existence of a possible nonlinear relationship between variables. In this sense, it is crucial to consider a model specification (Model 4) that allows for these possible nonlinear relationships. This model highlights the quadratic effects of the variables of interest, whose graphical representations are shown in Figure 2.1 (using the procedure suggested by Aiken and West, 1991), considering the standard deviation value of gender diversity to be a high level of this variable. The results obtained when

considering nonlinear effects on the variables to be explained reveal that gender diversity and political connections have a negative effect on profitability and a positive effect on risk, being statistically significant at the 1% level. All interaction terms are found to be statistically significant at the 1% and 5% levels. Looking at Figure 2.1, we find the following conclusions: i. when gender diversity is high, the relationship between political connections and profitability is *U*-shaped, when banking performance is measured by $ROAA$ and $ROAE$, and inverted *U*-shaped when banking performance is measured by $LLPTL$ (as this performance measure is the opposite of performance measured by profitability). This means that, to some extent, political connections destroy banking performance (the portion of the convex curve before its minimum) and then favour it (the portion of the curve after its minimum); ii) when gender diversity is reduced, it is inverted *U*-shaped for $ROAA$ and $ROAE$ and *U*-shaped for $LLPTL$ — i.e., from a certain percentage (maximum of the concave curve) political connections begin to destroy banking performance as this performance measure is inverse to performance measured by profitability; iii) the curvature of the relationship between political connections and performance is less pronounced when gender diversity is reduced.

An analysis of figure 2.1 reveals that when there is a greater presence of female members on bank boards (curves denominated "WBO high" — about 14% for the sample under study), the negative impact of political connections on their performance becomes positive when the political connections are more than about 20% for $ROAA$ and $ROAE$ (minimum of the curve "WBO high") and 14% for $LLPTL$ (maximum of the curve "WBO high"), which means that gender diversity mitigates this effect, corroborating the second hypothesis. That is, when gender diversity is high if political connections are over 20% or 14% (depending on the bank performance measure considered), profitability increases and risk decreases, respectively. However, for percentages of political connections less

than these values, gender diversity does not improve banking performance. Moreover, when the presence of female elements is reduced (curve designated "WBO low"), if the political connections are higher than 12.3% (maximum of the curve "WBO low"), when banking performance is measured by $ROAA$, and higher than 10% for $ROAE$ (maximum of the curve "WBO low") and higher than 16% (minimum of the curve "WBO low") for $LLPTL$, performance is reduced. Thus, we find opposite results when we have high or low gender diversity — respectively, curves "WBO high" and "WBO low".

Our results are in line with those of Kogut et al. (2014), showing that with a gender share of 10% to 20%, this diversity can contribute to social justice and intended structural changes. In the same vein, Farag and Mallin (2017) consider that such reduced quotas may be preferable as they are the key to greater structural equality, in line with Rodríguez-Ruiz et al. (2016), who conclude that banks with a certain degree of balance in their board composition, i.e. moderate female levels, perform better. The imposition of gender quotas may, thus contradict the idea that organizations choose their boards to maximize their value (Ahern and Dittmar, 2012). Our results are also in line with Owen and Temesvary (2018), who conclude that increasing gender diversity in bank boards will bring performance increases as long as banks have good management quality. This quality underlies the supervisory and advisory functions of boards, including the management of political connections. These functions will be best performed whenever there is greater gender diversity, as there will be greater independence of thinking on the boards (Zhou et al., 2019).

The results also support the arguments that female gender differentiating behaviors such as greater ethical concern and risk aversion mitigate the negative effects of political connections on banking performance. Although female elements have more political connections than men, as shown in Table 2.2, the presence of female elements,

with and without political connections, is crucial to avoid personal interests of these members from being privileged in detriment of those of the institution.

Regarding the impact of the control variables on performance (Models 2, 3 and 4 in Table 2.6), the size of banks has a positive and statistically significant impact when economic growth is not included. When we consider GDP *per capita*, the size of institutions maintains this impact on the $LLPTL$ only, meaning that the larger the bank's assets, the greater the bank's risk. In this line, GDP *per capita* only influences $LLPTL$.

The proxy used to measure bank capitalization has a statistically significant positive impact on profitability measures in Models 2, 3 and 4, and on risk ($LLPTL$), in Model 4.

Finally, the significance of CIR ratio across Models 2, 3, and 4 shows that the higher the bank's inefficiency, the lower the bank's return and the greater the risk. Thus, banks, in order to improve their management practices and consequently their performance, banks must control costs efficiently (Nasserinia et al., 2014).

It should be noted that the results displayed in Tables 2.6, A2.1, A2.2 and A2.3 show that the lagged performance variable is statistically significant, confirming the dynamic character of the model specification, i.e. that past performance impacts present banking performance.

In conclusion to the present section, we note that all the adopted models appear to be correctly specified, for the following reasons: i) there is no evidence of autocorrelation of first and second-order errors ($m1$ and $m2$ statistics), as the null hypothesis is not rejected at acceptable significance levels (1%, 5% and 10% for second order and 1% for the first order); ii) there is no evidence of correlation between the instruments and error terms (Hansen statistic), as the null hypothesis that the instruments are valid is not

rejected; and, iii) all variables are jointly statistically significant, since we reject the null hypothesis of the Wald (Z) test that all regression coefficients are null.

Table 2.6 - Results for the base model

	Model 1.1.			Model 1.2.			Model 2			Model 3			Model 4		
Dependent variable	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*
Dependent variable lagged 1 period	0.197***	0.185***	0.242***	0.175***	0.169***	0.259***	0.104***	0.135***	0.291***	0.099***	0.133***	0.283***	0.127***	0.178***	0.313***
POLBO	-0.747	-7.343	0.009	-1.161***	-13.707***	0.005*	-0.988***	-10.469***	0.005	-0.916***	-9.969***	0.005**	-2.233***	-24.087***	0.007***
WBO	1.484***	19.142***	0.032***	1.694***	23.421***	0.033***	-0.196	-5.941**	0.007**	-0.107	-5.155	0.004	-1.368***	-12.412***	0.028***
POLBO·WBO				-9.494***	-135.354***	-0.011	-5.054***	-76.695***	0.041***	-4.520***	-75.367***	0.042***	-14.643***	-137.804***	0.151***
$POLBO^2$													5.141***	56.325***	0.005**
$POLBO^2 \cdot WBO$													40.751***	366.933***	-0.499***
WBO^2													5.847***	53.506***	-0.025***
$POLBO \cdot WBO^2$													53.505***	371.885***	-0.188***
$POLBO^2 \cdot WBO^2$													-146.458***	-784.002***	-1.094***
TA							0.009***	0.274***	0.0002***	-0.007	0.139	0.0007***	-0.022*	-0.016	0.0008***
ETA							6.614***	19.860**	-0.013*	6.419***	17.756**	-0.0003	6.847***	23.667***	-0.009**
CIR							-0.003***	-0.024***	0.00001***	-0.003***	-0.023***	0.00001***	-0.003***	-0.014***	0.00001***
GDPPC										0.030	0.245	-0.001**	0.029	0.161	-0.0009***
Z	131.640 (0.000)	137.100 (0.000)	150.800 (0.000)	201.47 (0.000)	168.48 (0.000)	335.48 (0.000)	1372.46 (0.000)	674.49 (0.000)	1334.39 (0.000)	1528.92 (0.000)	655.87 (0.000)	1506.13 (0.000)	27177.17 (0.000)	11818.19 (0.000)	160792.39 (0.000)
m_1	-1.000 (0.319)	-1.780 (0.075)	-2.100 (0.036)	-0.990 (0.322)	-1.730 (0.084)	-2.100 (0.035)	-0.740 (0.460)	-1.600 (0.109)	-2.260 (0.024)	-0.750 (0.451)	-1.590 (0.111)	-2.250 (0.025)	-0.790 (0.431)	-1.650 (0.098)	-2.290 (0.022)
m_2	-1.370 (0.171)	-0.640 (0.524)	0.790 (0.430)	-1.290 (0.196)	-0.610 (0.540)	0.830 (0.405)	-1.470 (0.141)	-0.990 (0.322)	0.870 (0.382)	-1.460 (0.144)	-0.980 (0.326)	0.860 (0.387)	-1.550 (0.121)	-0.770 (0.440)	-0.900 (0.368)
$Hansen$	25.920 (0.357)	26.630 (0.322)	-22.820 (0.531)	36.600 (0.349)	29.230 (0.701)	28.540 (0.732)	33.170 (0.508)	37.570 (0.309)	37.540 (0.310)	32.840 (0.525)	37.200 (0.324)	37.340 (0.318)	54.920 (0.439)	59.680 (0.277)	61.870 (0.216)

Notes

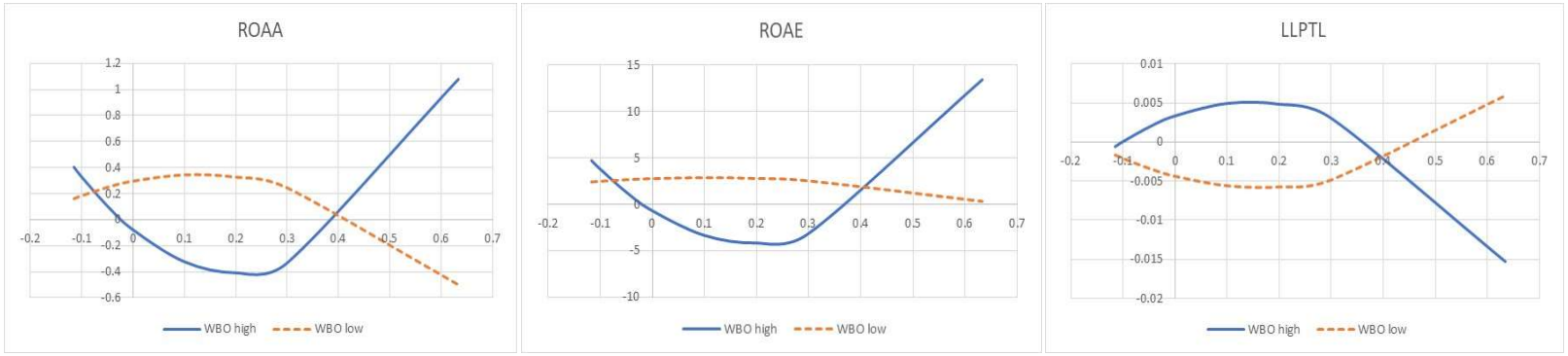
Models 1, 2 and 3 represent linear relationships between the variables under study and model 4 the nonlinear (quadratic) relationships.

p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.

Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.

Check Table 2.3 for description of variables.

Figure 2.1 - Quadratic effects on the relationship between political connections and performance, moderated by gender diversity (WBO)



2.4.3. Robustness Analysis

To analyze the robustness of our results, we re-estimated the four models, changing the proxy for gender diversity (in a first step) and for the control variables (in a second step). The results of these estimates are summarized in Tables A2.1 to A2.3 (Appendix A). Table A2.1 presents the results obtained for the proposed models, where we replace, respectively, female percentage with the SIN, capitalization with leverage, operational efficiency with non-operational efficiency, and GDP *per capita* with corruption control. In Table A2.2, as compared to Table 2.6, we replaced the female percentage by the SIN and in Table A2.3, as compared to Table 2.6, leverage, non-operational efficiency and corruption control were used as control variables.

The results obtained confirm the conclusions set out in the previous subsection. Specifically, we note that political connections have a negative impact on profitability and a positive effect on risk, with both effects accentuated by the presence of women on bank boards. Note that in some models, gender diversity is also statistically significant, with the same sign as that of political connections.

The graphical representation of the quadratic effects from the robustness checks are consistent with those presented in Figure 2.1. In addition, at higher levels of gender diversity, political connections negatively affect bank profitability, and risk positively, to some extent. Thus, when gender diversity is high and political connections are greater than 20% (Tables A2.1 and A2.3) or 23% (Table A2.2), these links have a positive impact on profitability, i.e. increase it. Regarding the effect on risk ($LLPTL$), when gender diversity is high, political connections reduce banks' risk when they are over 17% (Table A2.1), 14% (Table A2.2) or 20% (Table A2.3).

Finally, it should be noted that leverage and non-operational efficiency exhibit an opposite sign to the ETA ratio and managerial efficiency, respectively, as these measures

are the opposite of each other. The relationship between corruption control and performance shows that the greater this control, the greater the banks' profitability and the lower their risk, corroborating the results obtained by Chen et al. (2018).

2.5. Conclusion

The present study seeks to contribute to the understanding of the effect of gender diversity on the relationship between political connections and banking performance, allowing for linear and nonlinear relationships between variables in the period following two ECB directions—the gender quota and curriculum assessment and suitability of members of significant banks' boards. The study is a contribution to the relevant literature on this subject, namely, with regard to the banks of greatest interest in the Eurozone.

Our results suggest that political connections have a negative impact on banking performance, i.e. they tend to reduce banks' profitability and increase their risk. This means that the personal interests of members with political connections overlap with the institutions' interests, through the approval of unprofitable projects and relaxation of the risk analysis of loans. Concerning the moderating effect of gender diversity, it is noted that the latter accentuates the negative impact on $ROAA$ and $ROAE$, and the positive effect on $LLPTL$. This result is based on the fact that the increased participation of female members results from ECB impositions.

However, by examining nonlinear (quadratic) effects of the variables of interest, we can conclude that: i) when gender diversity is high, the relationship between political connections and profitability ($ROAA$ and $ROAE$) is *U*-shaped, and inverted *U*-shaped for credit risk ($LLPTL$); ii) when gender diversity is reduced, *U* is inverted for $ROAA$ and $ROAE$ and U for $LLPTL$; and, iii) the curvature of the relationship between political connections and performance is less pronounced when gender diversity is reduced. Thus,

when there is a greater presence of female members on bank boards (around 14%), the negative impact of political connections on performance becomes positive when political connections are greater than about 20% for $ROAA$ and $ROAE$ and 14% for $LLPTL$, which means that gender diversity mitigates this effect, rather than accentuating it, as the linear relationship indicated. The gender quota, between 10% and 20%, can bring about social justice and intended structural changes. In view of the above, we conclude that the differentiating characteristics of women, such as greater ethical sensitivity and greater risk aversion, mitigate the negative effects of political connections on banking performance, making the institution's interests privileged over personal ones.

Our study contributes to the growing literature on political connections and gender diversity by providing greater insight into the determinants of banking performance. This study may also suggest benefits for the regulator and possible limitations of its two impositions. In addition, the results obtained may be useful in assessing whether or not the regulator's instructions are proving beneficial in a sector as important to the economy as the banking sector.

As the period studied may not yet fully reflect the impact of the assessment of the suitability of board members, it is important to revisit the present paper's main subject in the future to re-estimate the impact of political connections on banking performance. Furthermore, after 2019, the impact of the 35% gender quota imposition on the effect of political connections on banking performance should be studied, assessing the effectiveness of both ECB impositions. In the future, it would also be interesting to analyze banks with more than 50% female on the Boards of Directors and to understand the impact of a reduction in the male gender on banking performance.

Appendix A

Table A2.1 - Results for the model using SIN, LEV, NINC, CIN

	Model 1.1.			Model 1.2.			Model 2			Model 3			Model 4		
Dependent variable	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*
Dependent variable lagged 1 period	0.207***	0.189***	0.299***	0.214***	0.193***	0.298***	0.169***	0.184***	0.295***	0.168***	0.182***	0.275***	0.170***	0.177***	0.297***
POLBO	-0.197	0.996	0.004	-0.692***	-8.482**	0.004*	-0.618**	-10.126***	0.010***	-0.638**	-7.476**	0.006*	-0.698**	-7.978***	0.008***
SIN	0.484**	5.738*	0.025***	0.263	8.753***	0.021***	-0.438**	-4.832*	0.013***	-0.319*	-4.274*	0.010***	-0.227	-10.685***	0.014***
POLBO·SIN				-1.925***	-46.451***	-0.012	-2.645***	-39.981***	0.035***	-2.216***	-35.691***	0.033***	-13.134***	-122.799***	0.124***
$POLBO^2$													1.818***	13.655**	0.028***
$POLBO^2 \cdot SIN$													34.413***	328.634***	-0.464***
SIN^2													0.631	-38.886***	0.010
$POLBO \cdot SIN^2$													-34.606***	-364.886***	0.202***
$POLBO^2 \cdot SIN^2$													76.711***	938.295***	-1.156***
TA							0.029***	0.297***	0.0003***	-0.001	-0.045	0.0009***	-0.006*	-0.064	0.001***
LEV							-0.019***	-0.085	-0.00006*	-0.020***	-0.114**	-0.000003	-0.016***	-0.124***	-0.00004
NINC							0.004***	0.022**	-0.00005***	0.003***	0.020**	-0.00004***	0.003***	0.012**	-0.00003***
CIN										0.855***	9.913***	-0.018***	0.717***	10.528***	-0.021***
Z	321.900 (0.000)	231.46 (0.000)	244.430 (0.000)	467.33 (0.000)	296.270 (0.000)	449.88 (0.000)	532.73 (0.000)	685.67 (0.000)	1497.84 (0.000)	520.66 (0.000)	571.29 (0.000)	1865.76 (0.000)	11074.86 (0.000)	9534.08 (0.000)	188547.43 (0.000)
m_1	-0.960 (0.337)	-1.720 (0.085)	-2.200 (0.028)	-0.910 (0.364)	-1.660 (0.097)	-2.190 (0.029)	-0.680 (0.498)	-1.670 (0.095)	-2.230 (0.026)	-0.660 (0.508)	-1.680 (0.094)	-2.250 (0.025)	-0.730 (0.467)	-1.640 (0.102)	-2.200 (0.028)
m_2	-1.390 (0.163)	-0.570 (0.566)	0.930 (0.352)	-1.440 (0.151)	-0.560 (0.578)	0.920 (0.359)	-1.390 (0.165)	-0.720 (0.475)	0.850 (0.398)	-1.400 (0.163)	-0.790 (0.427)	-0.800 (0.424)	-1.500 (0.132)	-0.930 (0.351)	0.710 (0.476)
$Hansen$	27.720 (0.272)	25.150 (0.398)	27.120 (0.299)	42.350 (0.154)	37.660 (0.305)	35.070 (0.417)	21.710 (0.949)	24.090 (0.896)	35.000 (0.420)	19.000 (0.982)	21.560 (0.952)	33.670 (0.484)	49.510 (0.648)	57.060 (0.362)	60.660 (0.248)

Notes

Models 1, 2 and 3 represent linear relationships between the variables under study and model 4 the nonlinear (quadratic) relationships.

p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.

Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.

Check Table 2.3 for description of variables.

Table A2.2 - Results for the model that uses SIN instead of WBO

	Model 2			Model 3			Model 4		
Dependent variable	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*
Dependent variable lagged 1 period	0.136***	0.174***	0.302***	0.137***	0.172***	0.300***	0.159***	0.191***	0.327***
POLBO	-0.890***	-9.910***	0.003	-0.904***	-9.549***	0.004	-0.856***	-7.108***	0.005**
SIN	-0.539***	-6.548***	0.010***	-0.532***	-5.986***	0.009***	-0.750***	-12.040***	0.021***
POLBO·SIN	-3.434***	-44.186***	0.027***	-3.332***	-41.011***	0.029***	-11.033***	-131.038***	0.120***
$POLBO^2$							2.115	21.866***	0.033***
$POLBO^2 \cdot SIN$							25.441***	276.064***	-0.493***
SIN^2							-0.728	-43.648***	0.025***
$POLBO \cdot SIN^2$							-22.025***	-386.832***	0.207***
$POLBO^2 \cdot SIN^2$							35.128***	751.088***	-1.356***
TA	0.008**	0.259***	0.0001***	-0.0007	0.066	0.0005	0.005	0.613***	0.0002**
ETA	6.572***	21.347***	-0.011*	6.410***	18.090**	-0.0022	6.043***	23.479***	-0.011***
CIR	-0.003***	-0.025***	0.00001***	-0.003***	-0.022**	0.00001***	-0.002***	-0.017***	0.000009***
GDPPC				0.016	0.347	-0.0006	-0.007	-0.689**	-0.0001
Z	1290.40 (0.000)	939.19 (0.000)	1334.56 (0.000)	1318.89 (0.000)	954.20 (0.000)	1423.36 (0.000)	58179.10 (0.000)	66098.35 (0.000)	282390.50 (0.000)
m_1	-0.770 (0.444)	-1.670 (0.095)	-2.270 (0.023)	-0.760 (0.445)	-1.660 (0.097)	-2.270 (0.023)	-0.760 (0.446)	-1.610 (0.107)	-2.200 (0.028)
m_2	-1.460 (0.145)	-0.820 (0.413)	0.930 (0.350)	-1.460 (0.145)	-0.810 (0.421)	0.930 (0.353)	-1.560 (0.120)	-0.800 (0.425)	-0.830 (0.404)
$Hansen$	29.590 (0.683)	36.100 (0.370)	28.030 (0.755)	30.190 (0.655)	36.280 (0.363)	28.030 (0.755)	58.110 (0.326)	60.660 (0.248)	60.540 (0.252)

Notes
Models 2 and 3 represent linear relationships between the variables under study and model 4 the nonlinear (quadratic) relationships.
p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.
Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.
Check Table 2.3 for description of variables.

Table A2.3 - Results for the model using LEV, NINC and CIN instead of ETA, CIR and GDPPC

	Model 2			Model 3			Model 4		
Dependent variable	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*	*ROAA*	*ROAE*	*LLPTL*
Dependent variable lagged 1 period	0.154***	0.158***	0.271***	0.146***	0.156***	0.238***	0.146***	0.171***	0.263***
POLBO	-0.848***	-11.275***	0.011***	-0.619***	-8.971***	0.004	-2.329***	-21.152***	0.007***
WBO	-0.324	-4.597	0.005	0.199	-1.459	-0.004	-0.523**	-4.760*	0.017***
POLBO·WBO	-5.340***	-71.934***	0.042***	-3.371**	-65.227***	0.033**	-14.172***	-102.697***	0.150***
$POLBO^2$							5.553***	46.605***	0.011***
$POLBO^2 \cdot WBO$							39.554***	238.784***	-0.429***
WBO^2							5.591***	43.855***	-0.037***
$POLBO \cdot WBO^2$							32.420***	233.071***	-0.256***
$POLBO^2 \cdot WBO^2$							-100.705***	-303.836*	-0.353*
TA	0.026***	0.297***	0.0003***	-0.011	-0.032	0.001***	-0.016***	-0.040	0.001***
LEV	-0.016***	-0.044	-0.0001**	-0.017***	-0.084*	-0.00001	-0.016***	-0.147***	-0.000008
NINC	0.003***	0.009	-0.0002***	0.003***	0.007	-0.00002***	0.001*	0.004	-0.00003***
CIN				1.072***	9.559***	-0.026***	1.037***	8.169***	-0.027***
Z	503.32 (0.000)	414.06 (0.000)	1177.62 (0.000)	294.11 (0.000)	330.91 (0.000)	1559.83 (0.000)	8393.03 (0.000)	10389.56 (0.000)	62004.49 (0.000)
m_1	-0.670 (0.505)	-1.640 (0.101)	-2.220 (0.026)	-0.650 (0.515)	-1.670 (0.094)	-2.220 (0.026)	-0.790 (0.429)	-1.700 (0.089)	-2.240 (0.025)
m_2	-1.370 (0.170)	-0.750 (0.451)	0.780 (0.433)	-1.350 (0.178)	-0.840 (0.401)	0.730 (0.468)	-1.380 (0.168)	-0.830 (0.408)	0.740 (0.460)
$Hansen$	26.810 (0.805)	22.320 (0.938)	43.020 (0.138)	19.190 (0.981)	21.050 (0.960)	35.520 (0.397)	46.62 (0.752)	42.64 (0.868)	60.580 (0.250)

Notes
Models 2 and 3 represent linear relationships between the variables under study and model 4 the nonlinear (quadratic) relationships.
p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.
Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.
Check Table 2.3 for description of variables.

3

Chapter 3 – Political Connections and Remuneration of Bank Board's Members: Moderating Effect of Gender Diversity

3.1. Introduction

The remuneration of members of the Boards of Directors has received considerable attention, from both the academic community and the business community, especially after the financial crisis of 2007/2008 (Cook et al., 2019). This crisis exposed weaknesses in the banking sector concerning risk control and management (Ayadi et al., 2019). Management remuneration has been identified as one of the causes for the crisis mentioned above, in the sense that it encouraged the taking of excessive risks (Boateng et al., 2019; García-Meca, 2016) with real economic impact (Owen and Temesvary, 2019). To minimize this weakness, American and European authorities, especially since 2013, have been intensively regulating the remuneration policies of the members of the banks' Board of Directors, to force them to eliminate incentives linked to excessive risk-taking (Murphy, 2013). The guidelines underlying the regulations were aimed at mitigating the lack of transparency and regulation of the remuneration of the members of the Boards of Directors, questioned at the time of the 2007/2008 crisis (de Andrés et al., 2019).

In addition to the remuneration of banks' Boards of Directors, two other important characteristics of these boards have received particular attention from recent literature: i. the presence of politicians or ex-politicians on the Boards of Directors (Chen et al., 2018; García-Meca, 2016; Hung et al., 2017, 2018), which leads to the existence of political connections and politically connected companies (Chen et al., 2018; Saeed et al., 2016), and ii. the existence of policies and practices that seek to include people considered in some way different from traditional people in organizations, thereby promoting a more inclusive culture (Herring, 2009), with emphasis on gender diversity (García-Meca et al., 2018; Owen and Temesvary, 2018, 2019).

The effect of political connections and gender diversity on the remuneration of the Boards of Directors has been studied individually, not allowing for possible interactions between the two. Furthermore, the direction of its effect is far from being consensual. With regard to political connections, recent literature (e.g., Abdul et al., 2018; Ding et al., 2015; Fralich and Fan, 2018; Fung and Pecha, 2019; García-Meca, 2016; Wu et al., 2018) has found that the effects of political connections on the remuneration of board members and/or CEO are either positive, negative or simply non-existent. The study by García-Meca (2016) seems to be the only one that focuses on the banking sector. Thus, further studies on these themes in the banking sector seem opportune. The present paper aims to study the impact of political connections on the remuneration of banks' Board of Directors, also analyzing the influence of gender diversity on that impact. Thus, we aim to answer two important research questions: i. What is the impact of political connections on the remuneration of the members of banks' boards? and, ii. How does gender diversity affect the relationship between political connections and remuneration? We try to provide meaningful answers to these questions across three important occurrences which took place during the period under study: i. the introduction of gender quotas in 2013 in ECB up to 35% in 2019 (European Central Bank, 2018a); ii. the Directive 2013/36/EU (CRD IV) of the European Union, in force as of July 2013, defining corporate governance principles, promoting diversity in board composition, defining the structure of remuneration policies, discouraging excessive risk-taking behavior; and, iii. the responsibility, assumed by the ECB in November 2014, for the validation of decisions regarding the appointment of members of the Boards of significant banks, assessing the adequacy and suitability of candidates (European Central Bank, 2017a).

We think that our study conveys relevant contributions to the extant literature. Firstly, to the best of our knowledge, the relationships with this regulatory framework

have not been studied before. To this effect we consider a sample on 61 banks supervised by the ECB, from 2011 to 2019, a period that covers the two levies by the ECB and the one by the European Union. Through the present study we aim at a better understanding of the effect of political connections, gender diversity, and public impositions on the Boards of Directors (e.g., gender quotas and assessment of members' suitability) on remuneration policies. Furthermore, the study departs from the existing literature (e.g., Fralich and Fan, 2018; Fung and Pecha, 2019; Wu et al., 2018), in that it analyzes the remuneration of the boards, not only of the CEO, since all Boards members are responsible for the management of banking organizations.

Secondly, in our view, the study provides a valuable source of knowledge for Regulating Authorities (ECB and European Union). Our results may help assess the impact of its measures (ECB's gender quota, CRD IV, ECB direct supervision) on the remuneration policies of banks. These entities can evaluate whether: i. the gender quota accentuates or mitigates the impact of political connections on remunerations; ii. political connections are perpetuated in the banking system over the study period and have an impact on remuneration; and, iii. Directive 2013/36/EU favors sound management in the banking sector, with regard to board members' remuneration.

Finally, the present paper focuses on the banking sector which plays a vital role in most economies, both nationally and locally, for the efficient transformation of savings in investment (Ebrahimnejad et al., 2014; Pathan and Faff, 2013) and their contribution to the payment and liquidity system (Fama, 1985). Only a stable and solid financial market allows the resources obtained by banks (deposits/savings) to be allocated to the most productive projects, thus favoring economic development (Huang et al., 2015), attested by the future growth of the Gross Domestic Product (Jokipii and Monnin, 2013). Indeed, the development of the financial sector affects the speed and pattern of countries'

economic development (Levine, 1997). Furthermore, the banking sector has specific characteristics, such as asymmetric information, which facilitates the concealment of political motivations in loans, as well as the fact that banks operations, across the economy as a whole, provide more opportunities for political influences (Dinc, 2005). In addition, the banking sector is subject to specific regulations with significant effects on the composition (Booth et al., 2002) and remuneration (García-Meca, 2016) of Boards of Directors.

The remainder of the paper is structured as follows. Section 3.2. focuses on the review of the literature relevant to our research questions. Section 3.3. describes the sample and methodology. Section 3.4. presents and comments on empirical results. Finally, Section 3.5. concludes the paper, referring its limitations and suggesting future related research.

3.2. Background and Research Questions

One of the consequences of the 2007/2008 financial crisis was the emanation of regulatory measures aimed at the remuneration of bank administrations, especially after 2013. In this sense, the European Union approved the Directive 2013/36/EU, known as CRD IV, establishing that Competent authorities, in particular the ECB, must ensure that banking institutions comply with the principles set out in the Directive on personnel remuneration policies. Specifically, this Directive defines the principles of corporate governance, promotes diversity in board composition, defines the structure of remuneration policies, discouraging excessive risk-taking behavior, which can compromise the sound and effective management of risks (European Parliament and European Council, 2013a). This same year, the Regulation n.º 575/2013 of the European Parliament and the European Council also established prudential requirements for credit

institutions, highlighting the importance of sound remuneration policies (European Parliament and European Council, 2013b). Subsequently, in 2014, the European Commission approved the Delegated Regulation n.º 604/2014 which complements the previous Directive, identifying the categories of staff whose professional activities have a significant impact on the institution's risk profile, which include administrators (European Commission, 2014). Other diplomas on the subject were issued by the European Banking Authority (EBA), namely the following: i. EBA/GL/2015/22, on guidelines for healthy remuneration policies (European Banking Authority, 2016a); ii. EBA/GL/2016/06, on guidelines regarding remuneration policies and practices related to retail banking products and services sale and supply of (European Banking Authority, 2016b); and, iii. EBA/GL/2017/11, on internal government guidelines (European Banking Authority, 2018). In the same line, the ECB has published guidelines on remuneration policy by issuing letters, which it sends to the banks under its supervision, stressing the importance of a solid remuneration policy (European Central Bank, 2018d, 2019b).

The guidelines mentioned above are intended to promote sound remuneration management of banks' Boards members. Nonetheless, the literature has verified that qualitative characteristics of these bodies, such as, for example, the existence of political connections, can affect strategic decisions of organizations, including the remuneration policy, one essential determinant of corporate governance (García-Meca, 2016).

The occurrence of political connections in the board can be viewed in the light of the Theory of Resource Dependency, which maintains that organizations need to acquire and exchange resources, leading to a dependency between companies and external units, of which governments are an example (de Cabo et al., 2012). Such dependence creates risks and uncertainty which can be attenuated by establishing political connections

(Hillman, 2005), allowing companies to obtain a more reliable resource base to increase their value (Wong and Hooy, 2018). Thus, these political connections correspond to a social relationship in order to acquire authority or power (Wong and Hooy, 2018), are omnipresent (Banerji et al., 2018), and can be considered a type of "invisible corruption" (Guo, 2019). Nonetheless, we cannot ignore that, according to Agency Theory, as proposed by Jensen and Meckling (1976), the separation between shareholders and managers generates information asymmetries (agency problems) that constitute an incentive for board members with political connections to use political resources for their personal interest, to the detriment of shareholders' interests. This can lead, for example, to excessive compensation in the form of higher wages (Shleifer and Vishny, 1989) and expropriation of shareholders' wealth (Bebchuk and Fried, 2004). However, in the light of Agency Theory, if management remuneration policy creates agency problems, shareholders can use this same policy to monitor managers, thus mitigating agency problems (Dong and Ozkan, 2008) as many political connections increase the risk of agency problems (Haris et al., 2019). Thus, this may imply a negative relationship between political connections and remuneration.

Political connections have been studied from different perspectives, referring, for example, their impact on remuneration policy (e.g., Ding et al., 2015; Fung and Pecha, 2019; García-Meca, 2016), on firm's performance (e.g., Hung et al., 2017; Wong and Hooy, 2018), their role in financial markets (e.g., Faccio et al., 2006), in fiscal policies (e.g., Adhikari et al., 2006; Li et al., 2016; Lin et al., 2015), and job creation (e.g., Menozzi et al., 2012). Specifically, companies with political connections more easily obtain investment projects, bank loans (Wang et al., 2018), green subsidies (Lin et al., 2015), face lower tax rates (Adhikari et al., 2006; Li et al., 2016), higher stock quotes (Faccio, 2006), as well as greater ease of entry into industries with strong barriers (Chen

et al., 2014). In addition, it has been shown that political connections have a positive effect on employment (Menozzi et al., 2012), increasing the likelihood that companies be rescued in times of economic difficulties (Faccio, 2006; Faccio et al., 2006), which leads to a decrease in systemic risk and, consequently, lower cost of capital (Boubakri et al., 2012). Nonetheless, the literature has also reported negative effects of political connections on corporate performance. In particular, companies with political connections can have lower levels of productivity (Domadenik et al., 2016), make sub-optimal investments (Ling et al., 2016), have higher debt ratios (Faccio, 2010) and often elect less competent elements for management positions, for their connections with other members of the Board of Directors (García-Meca, 2016).

We should note that the recent literature is far from consensual regarding the effects of political connections on the remuneration of board members and/or CEO's: while some studies sustain a positive effect (e.g., Fralich and Fan, 2018; García-Meca, 2016; Wu et al., 2018) or indicate a negative effect (e.g., Fung and Pecha, 2019), other studies find no significant effect (e.g., Abdul et al., 2018; Ding et al., 2015; García-Meca, 2016). It should be noted that, among these studies, only García-Meca (2016) studies the banking sector in a single European country (Spain); all remaining studies involve listed non-financial companies. García-Meca (2016), using Agency Theory as a reference, shows that the presidents of Spanish savings banks with political connections use their networks and internal power to extract a high level of remuneration; however, the percentage of politicians on the boards does not significantly affect the remuneration of these elements, showing only a negative relationship. Also, Wu et al. (2018) rely on Agency Theory to demonstrate that political connections bring value to organizations, so they must be considered when determining the remuneration of their CEO. Moreover, companies may be willing to provide higher remuneration, taking into account the

benefits associated with political connections (Ding et al., 2015; Horton et al., 2012), which can be a strategic factor (Fralich and Fan, 2018). In this same sense, Ding et al. (2015) show that politically connected executives receive higher compensation in private companies than in public ones, since they use public companies to obtain power at the expense of higher pay. In addition, these authors conclude that members of boards with political connections receive higher remuneration only when owners do not have substantial political influence. However, Fung and Pecha (2019) do not find significant results between the level of remuneration and political connections, verifying that members with political connections are less likely to receive higher remunerations, which may mean that these members intend to hold government positions in the future, not wanting to be associated with excessive remuneration, as high remunerations is perceived negatively in political circles. Fralich and Fan (2018) conclude that in Chinese entities members with political connections act in support of the Chinese national government's policy of social harmony, preventing excessive executive compensation. Moreover, other studies, that investigate "value", find that members with political connections lack banking experience in areas such as accounting, finance and corporate governance and serve in multiple directorships (Kang and Zhang, 2018; Zhang and Truong, 2019), not demanding high remunerations.

Given the above considerations, the mixed and scarce results that the literature has indicated for the relationship between political connections and remuneration suggest the convenience for further studies—namely because it is not straightforward to foresee the impact of political connections on remuneration. Furthermore, there are no studies that consider the actual level of political connections, assuming a linear-type relationship between the two. The present study relaxes this assumption by allowing, from the outset, a nonlinear functional relationship between remuneration and the level of political

connections, providing a meaningful answer to our first research question (the relationship between political connections and remuneration of board members).

Regarding gender diversity, the study of its impact on Boards composition has also received increasing attention in the literature. Two main reasons explain this finding: i. women are still underrepresented in these councils in most countries worldwide (Yap et al., 2017); and, ii. several European countries, such as Norway, Spain, Finland, Iceland, France, Italy, and Belgium, have defined gender quotas in the Boards of Directors (Pucheta-Martínez and Bel-Oms, 2015; Terjesen et al., 2015), apparently in view of the positive effects of this diversity (Arnaboldi et al., 2020) according to behavioral finance. This branch of finance observes that male and female economic agents exhibit behavioral differences. For example, women are more risk and competition averse, their preferences are more flexible (Croson and Gneezy, 2009) and are less power-oriented (Adams and Funk, 2012). They also exhibit greater ethical concerns (Ku Ismail and Abdul Manaf, 2016), propose less aggressive strategies, invest less in research and development and more in social sustainability initiatives (Apesteguia et al., 2012), which implies that the companies to which they belong have higher levels of social responsibility (Galbreath, 2018). It has also been suggested that men exhibit overconfidence in decision-making (e.g., Barber and Odean, 2001; Huang and Kisgen, 2013), while women develop a more confident leadership style than men (Trinidad and Normore, 2005).

The literature analyzing the relationship between gender diversity in the Boards of Directors and their remuneration policies is somewhat inconclusive. While some studies show that gender diversity increases the remuneration of members of the Boards (e.g., Abdul et al., 2018; O'Reilly and Main, 2010) and some studies conclude to the contrary (e.g., Westphal and Zajac, 1995), other papers report insignificant effects (e.g., Fralich and Fan, 2018; Fung and Pecha, 2019; García-Meca, 2016; Wu et al., 2018).

Westphal and Zajac (1995) find that the higher the demographic similarity in the Boards, the higher the CEO's remuneration. Thus, García-Meca (2016) states that directors, being more cautious in remuneration policies, reduce the remuneration of the board members, given their ethical behavior, risk aversion and better ability to identify unethical conduct. Thus, the presence of women on the Boards of Directors can reduce opportunistic behavior, leading to greater control of the salaries of the members of these boards (Pucheta-Martínez et al., 2017). However, some studies show a positive relationship between the presence of the female gender and the remuneration of the Boards' members. This relationship is justified by the fact that feminine elements are more generous, have less experience, and can be convinced to grant higher remunerations to CEO's (O'Reilly and Main 2010). Directors may also have difficulties in making decisions on key issues, such as the remuneration of members of the Board of Directors (Pucheta-Martínez et al., 2017). Nonetheless, given that women may also be sought to improve the performance of organizations, they may increase remuneration in view of this objective (Abdul et al., 2018). Moreover, gender diversity may mitigate agency costs and conflicts of interest between directors and shareholders (Jurkus et al., 2011) because female directors improve the board's control and monitoring (Adams and Ferreira, 2009; Carter et al., 2003), which can affect remunerations.

Considering the duality of results, some of the literature has moved towards the study of nonlinear relationships between gender diversity and the remuneration of members of the Boards of Directors, providing empirical support for a *U*-shaped relationship (e.g., Owen and Temesvary, 2019; Pucheta-Martínez et al., 2017). Pucheta-Martínez et al. (2017), in their study of Spanish non-financial listed companies, find that there is greater cohesion between groups as the presence of the female gender increases in the Board, which may lead to lower CEO remuneration. However, cooperative

behavior can be replaced by competitive practices, since the inclusion of more female members can cause dissatisfaction in the boards, increasing the salary of CEO's (Pucheta-Martínez et al., 2017). Owen and Temesvary (2019) show that the negative influence of gender diversity on remuneration, which is beneficial for the American banking sector, comes from reduced diversity (up to 22.5%).

Inspired by these results, the present study analyzes the effect of gender diversity upon the relationship between political connections on board members' remuneration. To the best of our knowledge, this has not yet been investigated in the literature. Nonetheless, as women have more significant ethical concerns (Ku Ismail and Abdul Manaf, 2016), it is our conviction that the presence of female elements on the Boards of Directors politically exposed conditions unethical practices, affecting the remuneration of its members. Pucheta-Martínez et al. (2017) state that women reduce opportunistic behaviors and Abdul et al. (2018) state that women's presence increases responsibility and improves communication, leading to better governance. Thus, it is expected that gender diversity impacts the political connections-remuneration relationship, i.e., that gender diversity can accentuate or mitigate the effect of political connection on remuneration. Therefore, in this study we aim at providing a meaningful answer to our second research question, regarding the impact of gender diversity on the relationship between political connections and remuneration of board members.

In order to appropriately address our research questions, as already mentioned we should consider the three relevant measures issued during the period under study (introduction of gender quotas in 2013 in ECB up to 35% in 2019 (European Central Bank, 2018a), Directive 2013/36/EU (CRD IV) of the European Union, in force as of July 2013, and the responsibility, assumed by the ECB in November 2014, for the validation of decisions regarding the appointment of members of the Boards members of significant

banks, assessing the adequacy and suitability of candidates (European Central Bank, 2017a)). Analyzing the measures imposed in 2013, one the one hand tighter rules on variable remuneration may imply an increase in fixed remuneration, and the consequent increase in total remuneration, as documented by de Andrés, Reig, and Vallelado (2019). On the other hand, gender diversity on the boards and the assessment of the board members' suitability were intended to make the banks' corporate governance more robust (European Banking Authority, 2017) and promote ethic concerns within the board. Regarding the ECB's direct supervision and analysis of the board members' suitability from 2014, the supervisor can exclude members who would favor their personal interests first and who demanded higher remuneration. In this way, we try to answer our two main research questions in the context of the differentiated impact of these three measures on remuneration.

3.3. Sample, Variables and Model

3.3.1. Sample

The present sample comprises 61 Eurozone banks, within the total number of entities supervised by ECB, in the 19 countries adopting the euro currency (117 entities on 1.01.2019, European Central Bank, 2019a). Banks directly supervised by the ECB represent 82% of the Eurozone banking assets (European Central Bank, 2018b) and the banks included in the sample corresponded, in 2019, to 68,2% of the total assets of significant banks, i.e., banks under direct supervision by the ECB. These entities are considered significant according to such criteria as asset size, economic importance, cross-border activities and direct public financial assistance (European Central Bank, 2018c). Of the total number of banks directly supervised by the ECB, we consider banks

with available data for the variables used in the study. Table 3.1 compares, by country, the banks supervised by the ECB and those in our sample.

Table 3.1 - Banks included in the sample by country

Country	List of supervised entities by country	Banks in sample by country
Austria	6	1
Belgium	7	4
Cyprus	3	1
Germany	21	11
Estonia	3	2
Spain	12	8
Finland	3	1
France	12	5
Greece	4	2
Ireland	6	1
Italy	12	7
Lithuania	2	2
Luxembourg	6	1
Latvia	2	2
Malta	3	3
Netherlands	6	3
Portugal	3	2
Slovenia	3	2
Slovakia	3	3
Total	**117**	**61**

The period under analysis runs from 2011 through 2019. This period was chosen for three main reasons. Firstly, since 2013, internally, the ECB has introduced gender quotas up to 35% in 2019 (European Central Bank, 2018a). The ECB is thus promoting gender diversity, as in Spain through the Equality Law (Reguera-Alvarado et al., 2017). Secondly, since November 2014 the ECB has been responsible for decisions regarding the appointment of directors of banks under its direct supervision, assessing candidates' suitability (European Central Bank, 2017a). Non-significant banks are under the supervision of central banks of their respective countries, which have aligned their rules with those issued by the ECB (e.g., Bank of Portugal, 2018). Thirdly, in 2013 the European Union approved Directive 2013/36/EU (CRD IV) which establishes that

banking institutions comply with principles set out in the Directive on personnel remuneration policies and promote diversity in board composition (European Parliament and European Council, 2013a).

It should be noted that the fact that a candidate for the management of a significant bank currently holds, or held in the past two years, a political experience does not prevent him from being accepted—unless there are significant conflicts of interest, assessed by examining the nature and powers of political office and its relationship with the bank (Bank of Portugal, 2018; European Central Bank, 2017a). Given that our sample comprises only banks directly supervised by ECB, the regulatory framework for political connections is the same for all entities, as all banks under analysis share and have to comply with the same rules—contrarily to what happens in studies on banks subject to a different regulatory framework (e.g., Chen et al., 2018; García-Meca et al., 2015).

Data were collected in two stages. In a first step, we collected the names of the members of the banks' boards from their reports and accounts. Then, in order to assess the possible existence of political connections of these elements, their biographies, published on banks' websites, were analyzed. Whenever this information is not on the banks' webpages, press releases, annual bank account reports and LinkedIn pages were used, in line with the approach of Hung et al. (2017). The data on these members' remuneration is from the Reports and Accounts and from the Pillar III reports.[6] Banks' financial data were taken from the Moody's Analytics BankFocus and Orbis Europe databases; data on macroeconomic variable were obtained from the International Country Risk Guide.

[6] Banking institutions must disclose their risk management and capital ratios in order to comply with the provisions of Basel III Accord, namely with regard to Pillar III.

In the case of two-tier boards, we consider the management board because we are interested in the influence of political connections on bank administrations' decisions. Here we follow the strand of the literature that proposes a separate treatment of the two boards in two-tier board banks, rather than joining them as a single board (e.g., Fernández-Temprano and Tejerina-Gaite, 2020; Nomran and Haron, 2019).

3.3.2. Variables

3.3.2.1. Dependent Variables

To measure the remuneration policy of the Boards of Directors, the literature has used the following proxies: i. log of the total remuneration of all board members (e.g., Abdul et al., 2018; García-Meca, 2016); ii. log of the average remuneration of the boards, i.e., the ratio of the remuneration to the number of board members (e.g., García-Meca, 2016); iii. log of the bank CEO's remuneration (e.g., Fralich and Fan, 2018; Fung and Pecha, 2019; Pucheta-Martínez et al., 2017; Wu et al., 2018). In this study, as we focus on the Board of Directors, we use each of the first two variables (denoted as REM and $REMAV$, respectively). Remuneration includes fixed components (salaries) and variable components (monetary benefits), disclosed in the reports supporting the collection of information.

3.3.2.2. Explanatory Variables

3.3.2.2.1. Variables of Interest

With regard to explanatory variables, the level of political connections (denoted as $POLBO$) is measured as the percentage of members of the Board of Directors with political connections in the past, as in Carretta et al. (2012), García-Meca (2016) and García-Meca and García (2015). Following Owen and Temesvary (2019), gender

diversity (denoted as SIN) is represented by the Shannon index, which, according to Campbell and Mínguez-Vera (2008) is more sensitive to small variations in the gender composition of the Boards of Directors than the percentage of women in the board. We also calculated this percentage to measure gender diversity (denoted as WBO), following García-Meca (2016) and Owen and Temesvary (2018). Following Salachas et al. (2017), we centered both variables, aiming at a reduction of the degree of correlation between the two variables (Aiken and West, 1991; Moon, 2018).

Table 3.2 characterizes the sample with regard to gender diversity and political connections. As can be seen, the number of women on the boards of banks supervised by ECB has increased, with a 127,8% growth rate between 2011 and 2019. It is also noted that women, although a minority on boards, have a higher rate of political connections than men. Nonetheless, the percentage of board members with political connections decreases slightly over the period; a decrease that can be considered in line with the ECB assessment of the suitability of administrations.

Table 3.2 - Gender diversity and Political connections: summary characterization of the sample

	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Number of women	72	77	98	99	118	136	143	141	164
Number of political women	16	18	23	23	21	26	24	20	19
Number of board members=Total board	655	621	613	612	603	608	615	592	608
Number of political board members	93	92	89	87	77	81	77	73	70
Number of women/Total board (%)	10.99%	12.40%	15.99%	16.18%	19.57%	22.37%	23.25%	23.82%	26.97%
Number of political women/Total board (%)	2.44%	2.90%	3.75%	3.76%	3.48%	4.28%	3.90%	3.38%	3.13%
Number of political women/Total political board members (%)	17.20%	19.57%	25.84%	26.44%	27.27%	32.10%	31.17%	27.40%	27.14%
Number of political women/Number of women (%)	22.22%	23.38%	23.47%	23.23%	17.80%	19.12%	16.78%	14.18%	11.59%
Number of political men/Number of men (%)	13.21%	13.60%	12.82%	12.48%	11.55%	11.65%	11.23%	11.75%	11.49%
Number of political board members/Total board (%)	14.20%	14.81%	14.52%	14.22%	12.77%	13.32%	12.52%	12.33%	11.51%

Two dummy variables ($D1$ and $D2$) were also considered in the study, in order to assess the impact of the ECB regulatory measures, as mentioned in the previous Section. $D1$ refers to the ECB gender quota and the Directive 2013/36/EU, assuming zero value

in 2011 and 2012 and value one as of 2013. The indicator $D2$ refers to the ECB's direct supervision of significant banks in 2014, taking zero value in 2011 through 2013 and value one as of 2014.

3.3.2.2.2. Control Variables

Both internal (bank-specific) and external determinants (macroeconomic conditions) are used as control variates. Internal determinants are those influenced by management decisions, and external determinants are those that, although outside the bank's control reflect the economic and legal environment that affects its functioning (Athanasoglou et al., 2008).

In line with previous studies, the following were used as internal determinants (covariate notations in parentheses): i. education level - directors holding a MsC or a PhD degree (EDU) (e.g., Berger et al., 2014); ii. leverage (LEV) (e.g., Abdul et al., 2018; Pucheta-Martínez et al., 2017; Wu et al., 2018); and, iii. non-operational efficiency ($NINC$) (e.g., Hung et al., 2017). As macroeconomic variable we consider corruption control, as measured through the International Country Risk Guide Corruption Index (CIN) (e.g., Chen et al., 2018)—so as to control whether countries' corruption levels impact remuneration levels (in line with McFarlane and Das, 2019).

Table 3.3 presents a summary of how the variables were obtained, referring the main studies supporting their operationalization. Table 3.4 displays descriptive statistics for each variable used. The average of $POLBO$ is 10.6% (maximum 58.3%) and the average of WBO is 16.3% (maximum 66.6%), which is equivalent to an average Shannon index value of 2%. On average, 39.9% of Board members have MsC's or PhD's. The average leverage ratio indicates that debt is 13 times higher than equity and this ratio and the efficiency measure $NINC$ present negative minimum values, in accordance with the

negative equity and negative results reported by some banks, respectively. The average, minimum and maximum corruption index values show that countries have low levels of corruption, that is, high levels of corruption control.

Table 3.3 - Operationalization of variables

Variable	Codename	Formula	Signal	Authors
1. Dependent variables				
Remuneration	*REM*	Natural log of the total remuneration of the Board of Directors	N.A.	Abdul et al. (2018); García-Meca (2016)
	REMAV	Natural log of the ratio between total remuneration of the Board of Directors and number of board elements	N.A.	García-Meca (2016)
2. Explanatory variables				
Political connections	*POLBO*	Political board members/Total board	+/-	García-Meca (2016)
Gender Diversity	*SIN*	$-\sum_i^n P_i \, lnP_i$, where Pi is the percentage of board members in each category (female/male) and n is the total number of categories	+/-	Campbell and Mínguez-Vera (2008); Yap et al. (2017)
	WBO	Number of women/Total board (%)	+/-	Abdul et al. (2018); Arnaboldi et al. (2020) ; García-Meca et al. (2015); Pucheta-Martínez et al. (2017)
The ECB gender quota and the Directive 2013/36/EU	*D1*	It assumes zero value in the years 2011 and 2012 and value one in the period 2013 to 2019	+/-	
The ECB's direct supervision of significant banks in 2014	*D2*	It assumes zero value in the years 2011, 2012 and 2013 and value one between 2014 and 2019.	+/-	
Members holding MsC or PhD degree	*EDU*	Board members holding MsC or PhD/Total board	+/-	Berger et al. (2014)
Leverage	*LEV*	Debt/Total Equity	+/-	Abdul et al. (2018); Pucheta-Martínez et al. (2017); Wu et al. (2018)
Non operational efficiency	*NINC*	Non-interest income/Total income	+	Beltratti and Stulz (2012); Duygun et al. (2015); Hung et al. (2017)
Corruption Control	*CIN*	Calculated by International Country Risk Guide. This index ranges from 0 to 6, with 6 signifying a low level of corruption/high control of corruption in the country.	+	Chen et al. (2018)

Table 3.4 - Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
REM	549	14.654	1.124	6.907	17.835
REMAV	549	12.502	1.105	5.298	15.889
POLBO	549	0.106	0.137	0.000	0.583
SIN	549	0.020	0.229	-0.366	0.301
WBO	549	0.163	0.140	0.000	0.666
EDU	549	0.399	0.263	0.000	1.000
LEV	549	12.973	59.808	-1285.588	112.676
NINC	549	21.421	18.167	-62.828	203.545
CIN	549	0.651	0.154	0.333	1.000

Notes
Obs: Observations, Std. Dev.: Standard Desviation; Min: minimum; Max: Maximum.
Check Table 3.3 for description of variables.

3.3.3. Regression Model and Estimation Method

3.3.3.1. Regression Model

In order to address the research questions of the present study, we specified the dynamic panel data base model

$$REMU_{it} = \alpha REMU_{i,t-1} +$$

$$\beta_1 POLBO_{it} + \beta_2 POLBO_{it}^2 + \gamma_0 GD_{it} + \gamma_1 GD_{it} POLBO_{it} + \gamma_2 GD_{it} POLBO_{it}^2 + \delta D1_t +$$

$$\eta_0 D2_t + \eta_1 D2_t POLBO_{it} + \eta_2 D2_t POLBO_{it}^2 + \sum_{j=1}^{J} \theta_j X_{j_{it}} + u_{it} + v_i \,, \quad (3.1)$$

where Greek letters denote parameters, i and t are, respectively, individual- (bank-) and time-indices, and variables' notation is as follows: $REMU$ denotes the remuneration (represented by one of two alternative measures—see below), $POLBO$ represents political connections, GD denotes the gender diversity covariate in general (this covariate is represented by one of two alternative measures—see below), $D1$ and $D2$ are dummy variables, and $X_j, j = 1, \dots, J$, denote control variates. Following the customary panel data approach, the error is assumed composed of two uncorrelated terms—v_i, denoting an individual (bank-specific, time-invariant) unobserved effect, and u_{it}, representing

remaining unobservables that affect $REMU_{it}$ and are uncorrelated with v_i and the model's covariates.

As already mentioned, the remuneration variable, $REMU$, corresponds to one of two definitions of remuneration, REM and $REMAV$. The covariate GD represents each of the two alternative measures described in the previous sub-section (SIN and WBO), and the set of control variables (X_j) was also already described.

Equation (3.1) implies a set of relevant assumptions which are worth mentioning, namely in view of the objectives of the present work. Firstly, the model accommodates the possibility of a nonlinear (quadratic) functional relationship between $REMU$ and $POLBO$. This appears as a sensible option in view of the available literature, which reports contradictory results regarding the direction of the impact of political connections on remuneration, under the assumption of a linear functional relationship between the two—see, e.g., Fung and Pecha (2019) and García-Meca (2016). In addition, by including the covariate $D2$ and its interactions with $POLBO$ and $POLBO^2$, we are able to evaluate whether the impact of $POLBO$ on $REMU$ is affected (or not) by the direct involvement of the ECB in the assessment of the probity of boards' candidates. In this way, from estimated marginal effects, we can, for instance, assess whether or not it is reasonable to conclude that ECB has tended to validate directors considered likely to reduce board remuneration.[7]

Secondly, and on the other hand, there seems to be no advantage in including a quadratic in the gender diversity covariate (GD in general). It seems reasonable enough to assume a linear relation between remuneration and gender diversity, and to include interaction terms between GD and $POLBO$ and $POLBO^2$. This option yields a

[7] This question was suggested by one anonymous Referee, with regard to a previous version of the text.

parcimonious enough specification, whereby the impact of GD on the marginal effect of $POLBO$ on $REMU$ is easy to gauge (thus paving the way for a clear answer to our research question 2). Thirdly, in what regards the binary covariate $D1$, we chose not to include interaction terms with the remaining covariates; the opposite would imply that the marginal effects of the latter on $REMU$ would be allowed to differ before and as of the introduction of the ECB gender quota and the Directive 2013/36/EU—in our view a futile complication.

The proposed base model thus provides a parametric framework which can be useful for our research purposes. More specifically, through its estimation we are able to gauge the following quantities of interest involved in the answers to each of the two main research questions of the paper:

- Given the adopted nonlinear functional relationship between $REMU$ and $POLBO$, the marginal effect of $POLBO$ on $REMU$ is not constant but involves covariates' values.[8] Following the customary practice in such a case, we estimate this effect through two alternative procedures: i. computing average partial effects (APE's), both in general (for the whole sample period) and for each subsample corresponding to $D2 = 0$ and $D2 = 1$ (respectively, before and as of the assessment of probity of boards' candidates by the ECB); ii. evaluating the quantities of interest at different values of $POLBO$ (first and third sample quantiles), with GD at its sample value closer to zero (as described above, GD is a centered covariate), for $D2 = 0$ and $D2 = 1$.
- Under the framework of model (3.1), the impact of gender diversity on the marginal effect of political connections on managers' remunerations (research question 2) is given by $\gamma_1 + 2\gamma_2 POLBO$.[9] This quantity is also not constant so we estimate it

[8] This marginal effect corresponds in general to the partial derivative $\partial REMU/\partial POLBO$.
[9] Corresponding to the mixed partial derivative $\partial(\partial REMU/\partial POLBO)/\partial GD = \partial^2 REMU/\partial GD\partial POLBO$.

according to two procedures: i. through computation of the sample average at parameters estimates, for all periods and all banks in the sample,

$$\sum_{t=1}^{9}\sum_{i=1}^{61}(\gamma_1 + 2\gamma_2 POLBO_{it})/(9 \times 61)\,; \tag{3.2}$$

ii. evaluating the derivative, $\gamma_1 + \gamma_2 POLBO$, at the parameters' estimates and at specific values of the covariate $POLBO$ (first and third sample quantiles).

· Under model (3.1) the impact of gender quotas directives on remuneration is constant, simply given by the coefficient of $D1$ (parameter δ). As mentioned, we assume that the marginal effects of other covariates on $REMU$ remain unaltered as of the issuance of these directives—hence the exclusion of interaction terms of $D1$ with other terms.

3.3.3.2. Estimation Method

Each model was estimated by two-step system GMM, an estimator for panel data dynamic models developed by Blundell and Bond (1998), building upon the previous panel model estimator of Arellano and Bond (1991). Usually, the Blundell-Bond estimator performs better with small samples than the latter, being particularly recommended for short panels (few temporal observations) and when the dependent variable has a high degree of persistence (here, strong correlation between present and past remuneration)—see Blundell and Bond (1998). The estimator allows for the inclusion in the model of lags of the dependent variable, which is important in the present case given that the theoretical framework predicts a dynamic pattern of behavior of the variable remuneration. Furthermore, the estimator is consistent under covariates' endogeneity, which can arise in the present case due to the possible simultaneous determination of the dependent variable and some explanatory variables. For instance, remuneration can explain political

connections since banks with better or worse remuneration policies can attract elements with more/less political connections.

In order to prepare the implementation of the panel data estimator, we previously checked the stationarity of the variables used in the study. Table B3.1 in the Appendix B details the results of a panel data test for stationarity of each of the panels used for estimation of model (3.1) (dependent variable and random covariates' panels). The results of the table indicate that all variables are stationary, so there seems to be no need to consider differences of these variables in the model.

The two-step system GMM estimator combines the initial equation in levels—equation (3.1)—where the variables in first differences are used as instruments, with the following equation in first differences, where variables in levels are used as instruments:

$$\Delta REMU_{it} = \alpha \Delta REMU_{i,t-1} +$$

$$\beta_1 \Delta POLBO_{it} + \beta_2 \Delta POLBO_{it}^2 + \gamma_0 \Delta GD_{it} + \gamma_1 \Delta(GD_{it} POLBO_{it}) + \gamma_2 \Delta(GD_{it} POLBO_{it}^2) +$$

$$\delta \Delta D1_t + \eta_0 \Delta D2_t + \eta_1 \Delta(D2_t POLBO_{it}) + \eta_2 \Delta(D2_t POLBO_{it}^2) + \sum_{j=1}^{J} \theta_j \Delta X_{j\,it} + \Delta u_{it}\,, \qquad (3.3)$$

For the levels equation—equation (3.1)—we use as instruments the first and second differences of the dependent variable and of the terms involving $POLBO$; for the difference equation—equation (3.3)—we use as instruments the dependent variable lagged two periods, and all terms involving $POLBO$, lagged one and two periods.

In order to validate the adopted specification, two statistical procedures were used, following Dietrich and Wanzenried (2011), Moon (2018), Rumler and Waschiczek (2016) and Tan (2016). Firstly, error serial correlation was assessed, with the $m1$ and $m2$ test statistics proposed by Arellano and Bond (1991), for which the null hypothesis is no autocorrelation. It is noted that, in accordance with Arellano and Bond (1991), the GMM estimator is inconsistent under second-order error autocorrelation. A second specification

test corresponds to the Hansen test, which assesses the null hypothesis of no correlation between instruments and error term, i.e., the hypothesis that the instruments are valid.

3.4. Empirical Results

3.4.1. Sample Correlations

Table 3.5 shows the sample correlations matrix between the variables used in the study. Expectably, those pairs of variables used in the model as mutually alternative exhibit high correlations (respectively, REM vs. $REMAV$ and SIN vs. WBO). While a negative sample correlation is found between $POLBO$ and $REMAV$, the sample correlation between $POLBO$ and REM, although also negative, is not statistically significant. In general, sample correlations between pairs of independent variables are reduced, so they do not pose noticeable problems for the precision of our estimates.

Table 3.5 - Correlation matrix

	REM	***REMAV***	***POLBO***	***SIN***	***WBO***	***EDU***	***LEV***	***NINC***	***CIN***
REM	1								
REMAV	0.8648***	1							
POLBO	-0.0518	-0.2565***	1						
SIN	0.2064***	-0.1294***	0.3367***	1					
WBO	0.1483***	-0.0602	0.2665***	0.8786***	1				
EDU	0.0028	0.0721*	-0.1699***	-0.0031	0.0183	1			
LEV	0.0244	0.0584	-0.0099	-0.0692	-0.0419	-0.0334	1		
NINC	0.0626	-0.0135	-0.0695	0.1888***	0.1761***	0.1330***	0.0238	1	
CIN	0.0562	0.2046***	0.0730*	-0.2299***	-0.1487***	0.0483	0.0581	-0.2431***	1

Notes
*: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01
Check Table 3.3 for description of variables.

3.4.2. Estimation Results

In Table 3.6, panel "Parameters' Estimates and Specification Tests", we present the estimation results for the different variants of the regression model (3.1), i.e., using each of the two remuneration measures as the dependent variable (REM or $REMAV$) and SIN as proxy to gender diversity. In the first two estimations, we do not include control

variables whereas, in the third and fourth columns estimates are for the whole set of explanatory variables, including the control variates EDU, LEV, $NINC$ and CIN. In view of the overall statistical significance of control variables' coefficients, our comments concern the estimation results in the last two columns of Table 3.6. The panel "Estimates of Marginal Effects" displays average partial effects (APE) as well as partial derivatives of $REMU$ at particular values of the covariates involved in these derivatives, as described in the previous section. To answer our research questions, we comment on these results, with a particular emphasis on the estimates of the impact of $POLBO$ on $REMU$, the impact of SIN upon the relationship between $POLBO$ and $REMU$, as well as the estimated impact of regulatory measures on boards' remunerations.

Table 3.6 - Estimation results for model (3.1)*; Gender diversity covariate: SIN*

Dependent variable ($REMU_t$):	REM_t	$REMAV_t$	REM_t	$REMAV_t$
Parameters' Estimates and Specification Tests				
Parameters' Estimates				
$REMU_{t-1}$	0.997***	0.996***	0.989***	0.971***
$POLBO$	-0.539***	-0.515***	-0.899***	-1.140***
$POLBO^2$	1.998***	3.484***	2.729***	4.578***
SIN	0.525***	0.679***	0.643***	1.039***
$SIN \cdot POLBO$	0.174	0.887***	1.983***	2.902***
$SIN \cdot POLBO^2$	-6.092***	-11.596***	-12.514***	-21.280***
$D1$	0.130***	0.084***	0.130***	0.037
$D2$	-0.128***	-0.091***	-0.110***	-0.133***
$D2 \cdot POLBO$	0.064	0.092	0.176	0.018
$D2 \cdot POLBO^2$	0.697	-0.718	0.268	-0.332
EDU			-0.438***	-0.399***
LEV			-0.004***	-0.067***
$NINC$			0.002**	0.001
CIN			0.414***	0.916***
Specification Tests				
Z	1.07e+09 (0.000)	1.07e+09 (0.000)	5.18e+08 (0.000)	1.08e+08 (0.000)
m_1	-4.740 (0.000)	-5.010 (0.000)	-4.730 (0.000)	-5.040 (0.000)
m_2	-0.390 (0.694)	-0.850 (0.395)	-0.170 (0.864)	-0.700 (0.482)
$Hansen$	48.570 (0.779)	53.500 (0.607)	44.300 (0.797)	47.080 (0.703)

Table 3.6 - Estimation results for model (3.1)*; Gender diversity covariate: SIN (cont.)*

Estimates of Marginal Effects				
Marginal effect of political connections on remuneration ($\partial REMU/\partial POLBO$)				
APE, full sample period (2011-2019)	-0.624***	-0.684***	-1.018***	-1.555***
APE, subsample with $D2 = 0$ (2011-2013)	-0.643***	-0.744***	-1.212***	-1.650***
APE, subsample with $D2 = 1$ (2014-2019)	-0.617***	-0.664***	-0.953***	-1.523***
Derivative at $D2 = 0$, high $POLBO$, $SIN \approx 0$	-0.298**	-0.094	-0.569***	-0.587***
Derivative at $D2 = 0$, low $POLBO$, $SIN \approx 0$	-0.963***	-1.253***	-1.477***	-2.110***
Derivative at $D2 = 1$, high $POLBO$, $SIN \approx 0$	-0.149***	-0.088***	-0.360***	-0.608***
Derivative at $D2 = 1$, low $POLBO$, $SIN \approx 0$	-1.046***	-1.009***	-1.357***	-2.020***
Impact of gender diversity on marginal effect of political connections ($\partial^2 REMU/\partial GD\partial POLBO$)				
APE	0.178	0.896**	1.992***	2.917***
Derivative at high $POLBO$	-0.562***	-0.514*	0.470**	0.329
Derivative at low $POLBO$	1.468***	3.351***	4.642***	7.422***

Notes
p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.
Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.
Check Table 3.3 for description of variables.

3.4.3. Discussion of Empirical Results

To answer our first research question, we need to analyze the relationship between remuneration and political connections, in particular through the marginal effect of $POLBO$ on $REMU$. As exposed in Table 3.6, panel "Estimates of Marginal Effects", the APE's, for the whole sample period and each subsample corresponding, respectively, to $D2 = 0$ and $D2 = 1$, the impact of $POLBO$ on $REMU$ is negative and statistically significant at 1% level for both remuneration measures. In other words, the main directional relationship between political connections and remuneration is estimated to be negative. In addition, this effect is more negative before the assessment of probity of boards' candidates by the ECB (when $D2 = 0$). Evaluating the partial derivatives of interest at different values of $POLBO$ (first and third sample quantiles—low and high political connections level, respectively), with GD at its sample value closer to zero (as described above, GD is a centered covariate), for $D2 = 0$ and $D2 = 1$, we find the same

type of results, i.e., the estimated effect of $POLBO$ on $REMU$ is negative and more pronounced for the subsample 2011-2013 ($D2 = 0$).

Our results suggest that directors with political connections are not driven by higher remuneration contracts but by other non-monetary incentives, such as prospects for political positions in the future (Adithipyangkul et al., 2011; Ding et al., 2015). These results are in line with Fung and Pecha (2019), who find a negative relationship between political connections and remuneration, justifying the fact that these directors do not want to be associated with high remunerations, as they may want to assume political positions in the future and because high remunerations is perceived negatively in political circles. Our results are also in line with the clues left by García-Meca (2016), who finds a negative relationship but statistically insignificant. Moreover, the negative relationship between $REMU$ and $POLBO$ may mean that directors with political connections often have lack industry experience in areas such as accounting, finance and corporate governance and serve in multiple directorships (Kang and Zhang, 2018), not demanding high remunerations. Indeed, Zhang and Truong (2019) found that members with political connections are more often absent at board meetings than those without political connections, because they also belong to other boards. One other possible explication finds support in Agency Theory, as proposed by Jensen and Meckling (1976). As directors with political connections can use their political resources to promote their own interests (Ding et al., 2015), shareholders can mitigate these agency problems by monitoring remuneration policies (Dong and Ozkan, 2008).

Regarding the direct supervision of the ECB (as of 2014), we find that the negative effect of political connections on both measures of remuneration is lower as of 2014 and that these negative impacts are more reduced when political connections are high (at the sample average of gender diversity). It is our conviction that the direct supervision and

the letters issued by ECB to banks have led to some degree of morality in remuneration, not valuing the political connections' second intentions (Ding et al. 2015; Horton et al., 2012). In this line, Fralich and Fan (2018) conclude that members with political connections support national policies and prevent excessive remuneration to boarding members.

Our second research purpose is to investigate how gender diversity affects the relationship between political connections and remuneration. To this effect, we started by computing the sample average (see expression (3.2)) as an estimate of the overall impact of gender diversity on the marginal effect of political connections on remunerations;[10] and, as before, we also obtained the values of the corresponding partial derivative at specific covariates' values (as explained in the previous section). As can be seen from panel "Estimates of Marginal Effects" gender diversity makes the impact of political connections less negative on both remuneration measures, that is more women on the board attenuates the negative effect of political connections on remunerations, having a stronger mitigating effect when political connections are low. This positive effect of gender diversity on the relationship between remuneration and political connections can be justified by the fact that women have a greater ethical concern (García-Meca, 2016). Indeed, according to the literature on behavioral finance, the presence of women on the Boards of Directors leads to more civilized behavior since women are more strict in complying with the rules and are more prudent (Pucheta-Martínez et al., 2018). Moreover, gender diversity may mitigate agency costs and conflicts of interest between directors and shareholders (Jurkus et al., 2011) because female directors improve the board's control and monitoring (Adams and Ferreira, 2009; Carter et al., 2003). Thus, women on the

[10] Denoted "APE" in Table 3.6, under heading "Impact of gender diversity on the marginal effect of political connections".

Boards of Directors reduce opportunistic behaviors (Pucheta-Martínez et al., 2017) and contribute to fair remunerations. They can be more assertive when political connections are reduced, because women are less power-oriented (Adams and Funk, 2012). When political connections are higher, women will have to exercise more power, which is not intrinsic to them, and for this reason the positive effect of gender diversity on the negative relationship between political connections and remuneration is lower.

Regarding the impact of ECB's gender quota and Directive 2013/36/EU on remuneration, we find a positive and statistically significant at 1% level effect only for total remuneration (coefficient of $D1$). As this Directive defines the principles of corporate governance, promotes diversity in board composition, defines the structure of remuneration policies, discouraging excessive risk-taking behavior, we believe that the restrictions on variable remuneration based on board member performance caused an increase in fixed remuneration, as documented by de Andrés et al. (2019). The increase in gender diversity will also increase directors' remuneration because, as discussed earlier women bring more fair remuneration.

Regarding the impact of control variates on remuneration, first we note the negative impact of the education level and the remuneration. The higher the ratio of elements with MsC's and PhD's in the boards, the lower the total and average remuneration, because members with MsC's and PhD's are more risk-averse (Berger et al., 2014), which can affect remuneration policies. Leverage also has a negative and statistically significant impact on both remuneration measures. Thus, it is believed that banks with higher leverage ratios, i.e., lower capital ratios, being less resilient, may have lower remuneration for their board members. A high debt level is not a sign of solvency for the market (Tran et al., 2016). Regarding efficiency, the impact of $NINC$ on remuneration is positive and only statistically significant at 1% for total remuneration,

suggesting that the greater the bank's efficiency, the higher the remuneration. The relationship between corruption control and remuneration shows that the greater this control, the greater the remuneration of board members, which can be explained by the fact that countries with greater corruption control, have banks with higher returns (Chen et al., 2018) which may be taken into account in remuneration policies.

In all the estimated models described in Table 3.6, the lagged dependent variable's estimated coefficient is positive and statistically significant. This finding confirms the adopted models' dynamic character, under which past remuneration positively affects current remunerations.

In conclusion to the present subsection, we note that all adopted models seem correctly specified, for the following reasons: i) there is no evidence of second-order error autocorrelation ($m2$ statistic) at acceptable levels; and, ii) there is no clear evidence of a correlation between instruments and error terms (Hansen statistic), since the null hypothesis that instruments are valid is not rejected at the 1% level.

3.4.4. Robustness Checks

In order to assess the robustness of our results we re-estimated the various models now changing the proxy for gender diversity, using WBO instead of SIN. The corresponding estimation results are displayed in Table B3.2 in the Appendix B.

These new estimation results confirm the main conclusions drawn in the previous subsection. In our view, the slight differences do not undermine our previous conclusions. In particular, the main relationship between political connections and remuneration remains negative for the full sample and for the subsamples under analysis ($D2 = 0$ and $D2 = 1$), and derivatives at specific points remain negative, except for both remunerations when $D2 = 1$ and political connections are high, in which case the

estimate is no longer statistically significant. The impact of gender diversity on the marginal effect of political connections remains positive except for the estimate at a high level of political connections for total remuneration, in which case it is positive but not statistically significant. The education level has a negative estimated parameter, although not statistically significant, and the variables $D1$ and $NINC$ become statistically significant at 1% level when analyzing average remuneration. Once again, the dynamic nature of the model is confirmed and all the specification tests used provide an empirical clearance of the adopted regression.

3.5. Conclusion

This study seeks to contribute to a better understanding of the effect of political connections on remuneration and of the impact of gender diversity on this relationship. Our results indicate a negative effect of political connections on remuneration, and this effect is more negative before the beginning of the ECB assessment of the probity of board candidates. These findings are in line with the notion that members with political connections seek other benefits at the expense of high remuneration, because in the future they may have other political positions, not wanting to be associated with high remuneration. Also, their usual lack of experience in the banking sector and the fact that they may belong to more than one board can hinder higher remunerations. Furthermore, shareholders can mitigate agency costs derived from political connections' personal interests through the remuneration policy. The fact that the estimated impact of political connections is less negative as of 2014, under direct supervision by the ECB, may be indication that the latter has succeeded in promoting ethical concerns with regard to remuneration, not valuing the political connections' second intentions.

In what regards the influence of gender diversity on the negative relationship between political connections and remuneration, we find that gender diversity mitigates this impact, i.e., more women lead to higher remuneration. For having more ethical concerns and being more compliant with rules, women contribute to more appropriate remuneration in the boards, reducing the interests of members with political connections. Nonetheless, this mitigating impact is weaker when the board has high political connections, which means that in these cases women have to use more power, a feature that is not the more innate to them.

When we analyze the effect of the implementation of the CRD IV and the ECB's gender quota on remuneration, we find that these measures led to a positive impact, which means that the Directive may have increased the fixed remuneration of the boards, and that the presence of more women, due to their differentiating characteristics, may have brought about a greater degree of morality with regard to remunerations.

Our study contributes to the growing literature on political connections and gender diversity, providing a greater understanding of remuneration determinants for bank board members. These results may be useful for the Regulator as a means to better understand the possible limitations and benefits of its two impositions. In addition, the results obtained may be useful to assess whether the Regulator's emanations are being beneficial (or not) for a sector as important to the economy as the banking sector. Besides, they may also be a source of knowledge for the European Union, about the assessment of Directive 2013/36/EU (CRD IV).

Nonetheless, the study is not exempt from some limitations, namely because of the lack of available data. For the latter reason, we did not take into consideration either the separation of remuneration into its different components or additional controls of boards' characteristics. Furthermore, as a matter of choice, our study only considers banks

affected by ECB regulations and supervision; in a future study, it would be interesting to consider a quasi-natural experimental design, with a control group of banks, examine the impact of political connections and gender diversity on the components of director remuneration (e.g., cash, bonuses, options) and control other board characteristics. This analysis can also prove of interest to other sectors of activity, not just the banking sector.

Appendix B

Table B3.1 - Harris-Tzavalis Unit Root Test

Variable	Test Statistic
REM	0.3133 ***
$REMAV$	0.2607 ***
$POLBO$	0.4272 ***
SIN	0.5164 ***
WBO	0.6076 ***
EDU	0.5826 ***
LEV	-0.0208 ***
$NINC$	0.0253 ***
CIN	0.5503 ***

Notes
Null hypothesis, H_0: presence of unit root; rejection of H_0 indicates stationarity.
*: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.
Check Table 3.3 for description of variables.

Table B3.2 - Estimation results for model (3.1)*; Gender diversity covariate:* WBO

Dependent variable ($REMU_t$):	REM_t	$REMAV_t$	REM_t	$REMAV_t$
Parameters' Estimates and Specification Tests				
Parameters' Estimates				
$REMU_{t-1}$	0.996***	0.995***	0.966***	0.962***
$POLBO$	-0.445***	-0.380*	-0.595***	-0.321*
$POLBO^2$	1.937***	2.841***	2.906***	3.521***
WBO	0.317***	0.536***	0.374***	0.737***
$WBO \cdot POLBO$	0.101	1.837***	1.500***	3.440***
$WBO \cdot POLBO^2$	-6.489***	-15.080***	-12.373***	-23.178***
$D1$	0.136***	0.102***	0.106***	0.085***
$D2$	-0.114***	-0.090***	-0.120***	-0.133***
$D2 \cdot POLBO$	0.040	0.052	0.111	0.039
$D2 \cdot POLBO^2$	0.903*	-0.314	0.355	-0.729
EDU			-0.051	-0.085
LEV			-0.007***	-0.010***
$NINC$			0.005***	0.004***
CIN			0.722***	0.823***
Specification Tests				
Z	3.94e+09 (0.000)	1.49e+08 (0.000)	6.58e+08 (0.000)	9.38e+07 (0.000)
m_1	-4.730 (0.000)	-5.000 (0.000)	-4.670 (0.000)	-4.910 (0.000)
m_2	-0.430 (0.667)	-0.900 (0.370)	0.060 (0.953)	-0.580 (0.564)
$Hansen$	51.240 (0.690)	52.330 (0.651)	51.850 (0.519)	49.790 (0.600)
Estimates of Marginal Effects				
Marginal effect of political connections on remuneration ($\partial REMU/\partial POLBO$)				
APE, full sample period (2011-2019)	-0.488***	-0.417***	-0.636***	-0.513***
APE, subsample with $D2 = 0$ (2011-2013)	-0.472***	-0.461***	-0.712***	-0.594***
APE, subsample with $D2 = 1$ (2014-2019)	-0.494***	-0.402***	-0.610***	-0.486***
Derivative at $D2 = 0$, high $POLBO$, $WBO \approx 0$	-0.213**	0.034	-0.243**	0.106
Derivative at $D2 = 0$, low $POLBO$, $WBO \approx 0$	-0.851***	-0.895***	-1.199***	-1.041***
Derivative at $D2 = 1$, high $POLBO$, $WBO \approx 0$	-0.063***	0.049*	-0.089	0.057
Derivative at $D2 = 1$, low $POLBO$, $WBO \approx 0$	-1.003***	-0.775***	-1.162***	-0.847***
Impact of gender diversity on marginal effect of political connections ($\partial^2 REMU/\partial GD\partial POLBO$)				
APE	0.106	1.847***	1.509***	3.456***
Derivative at high $POLBO$	-0.683***	0.013	0.004	0.637***
Derivative at low $POLBO$	1.479***	5.040***	4.128***	8.364***

Notes
p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.
Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.
Check Table 3.3 for description of variables.

4

Chapter 4 – The Effect of Earnings Management on Bank Efficiency: Evidence from ECB-supervised Banks

4.1. Introduction

The 2008 financial crisis and the consequent debt crisis in Europe called into question the current regulation and supervision of the financial system (Pinto and Ng Picoto, 2018). Regulators have tried to mitigate bank risk mainly through more demanding capital requirements (Chalermchatvichien et al., 2014) and greater transparency and market discipline (Vauhkonen, 2012). This is visible in the transparency and quality required in banks' financial reports (Pinto and Ng Picoto, 2018).

This crisis also showed that well-managed banks are crucial to the smooth functioning of the business fabric, as they promote the efficient allocation of resources in the economy (Pathan and Faff, 2013). However, efficiency is not achieved if institutions are involved in activities that compromise their integrity and that of the sector (Ujah et al., 2017). One example of these practices, identified in the literature as one of the motives behind the 2007/2008 financial crisis, was the less transparent earnings management (Alhadab and Al-Own, 2019), through, for instance, the creation of excessive loan loss provisions (LLP), by reserving amounts of financial resources beyond those that are deemed reasonable to deal with credit risk and the associated risk of default by borrowers. The literature has shown that bank administrations frequently use these provisions (which are dependent on their judgment) for earnings management, with the aim of, for example, obtaining remuneration benefits, increasing share prices (Alhadab and Al-Own, 2019), changing capital levels and decreasing results (Elnahass et al., 2018).

The relationship between earnings management and bank efficiency has been sparsely studied. To the best of our knowledge, the few exceptions are found in the studies by Ab-Hamid et al. (2018) and Wu et al. (2016). These studies, addressing the effect of earnings management on the efficiency of banks in Asian countries, have shown that excessive LLP have a negative impact on the efficiency of banks, as measured through

either Data Envelopment Analysis (DEA) (Wu et al., 2016) or Stochastic Frontier Analysis (SFA) (Ab-Hamid et al., 2018) methods. The justification for this relationship stems from the fact that excessive LLP prevent banks from efficiently transforming their inputs (e.g., capital, labor and deposits) into outputs (e.g., loans and investments).

These studies, however, do not take into account the fact that LLP encompass two important components: discretionary provisions and non-discretionary provisions. The discretionary component is associated with earnings management practices in order to smooth income, manage capital or signal to stakeholders. Non-discretionary provisions, in turn, are due to legal obligations (Frankel et al., 2002). Beatty and Liao (2014), in a literature review on earnings management in banking sector, identified the difference between the two components and stressed the importance of understanding how bank efficiency is affected by earnings management.

Taking this distinction as a starting point, the present study's objective is twofold. Firstly, it examines the efficiency of significant banks in the Eurozone from 2013 to 2017, a period following the sovereign debt crisis, preparatory to the International Financial Reporting Standard 9 (IFRS 9), which came into force in 2018. Secondly, the effects of earnings management practices on the efficiency of these banks are analyzed, taking into account the distinction between discretionary and non-discretionary LLP. To the best of our knowledge, the received literature only includes studies that either examine the impact of total LLP, as a whole, on efficiency (e.g., Ab-Hamid et al., 2018; Wu et al., 2016), or analyze the determinants of discretionary LLP (e.g., Alhadab and Al-Own, 2019; Kolsi and Grassa, 2017).

The present study may present relevant contributions, both academic and for practitioners, be they investors, managers or regulators. Firstly, the study focuses on the banking sector, which is extremely important for countries' economic development

(Condosta, 2012) and macroeconomic stability (Bhatia et al., 2018), due to its role as a financial intermediary (Ebrahimnejad et al., 2014; Pathan and Faff, 2013), its contribution to the payment and liquidity system (Fama, 1985), and for being a transmission channel for monetary policy (Dimitras et al., 2018). Furthermore, unlike other sectors, banking has a regulatory and legal environment that encourages efficiency and risk-taking management (Bhatia et al., 2018). This regulated environment also enables an accurate assessment of earnings management, which can be gauged through bank LLP (Alhadab and Al-Own, 2019).

Secondly, the study is based on a sample of 70 banks supervised by the European Central Bank (ECB) (significant banks) during the period 2013-2017, corresponding, as already mentioned, to the preparatory period for the application of IFRS 9 which replaced the International Accounting Standard 39 (IAS 39) and includes procedures for recognizing and measuring LLP. IFRS 9 was published in July 2014 by the International Accounting Standards Board (IASB) and its implementation is mandatory in banking as of January 1st, 2018 (European Central Bank, 2017b). With regard to LLP, the main change between IFRS 9 and IAS 39 was the replacement of the "incurred" loan loss model with the "expected" loan loss model (Elnahass et al., 2018). The present study also covers the period of Basel III, adopted by European banking as of 2014 (Alhadab and Al-Own, 2019). Thus, we can produce an up-to-date account of current earnings management, as it relates to the efficiency of significant banks, in the period after the implementation of the Basel III agreement and before the implementation of IFRS 9.

Thirdly, as already mentioned, the present study aims at a deeper understanding of the impact of earnings management on efficiency, as gauged through the discretionary component of provisions made by banks' Boards. As detailed in later sections, our results indicate a nonlinear negative impact of discretionary LLP on banks' economic, allocative

and technical efficiency. Meanwhile, as also detailed ahead, we find that total LLP has a positive impact on allocative efficiency. This finding reinforces the general notion that it is important to discern discretionary LLP from total loan provisions when studying the effect of earnings management on banking efficiency.

Finally, in our view, the study of these relationships can be a fruitful source of knowledge for the Regulator (ECB), as well as investors and bank leaders. The results to which we were led may be used by ECB to assess the efficiency of banks and the occurrence, or not, of abusive earnings management practices. As already mentioned, the study stresses the importance of calculating discretionary LLP, which, therefore, should be reported by banks in their reports. In addition, our results can be relevant for both bank leaders and investors: the former can find here a useful knowledge base in order to improve bank efficiency; the latter can make more informed investment decisions, by taking into account earnings management practices in their risk analysis.

The remainder of the paper is organized as follows. Section 4.2. presents a theoretical background to our research questions. Section 4.3. describes the sample, data and methodology used in the study. Section 4.4. presents and comments on the empirical results. Finally, Section 4.5. summarizes the main conclusions of the study, referring to its main limitations and suggesting future related research.

4.2. Theoretical Background

According to Fiordelisi et al. (2010), inefficient banks present a high risk for the entire financial system due to the measures they tend to adopt. Thus, it is crucial to analyze banking efficiency as it is of special interest to regulators, managers and investors (Sulaeman et al., 2019). Efficiency, in general, is defined as the ability of an organization to produce certain outputs by minimizing the use of inputs in this production (Sulaeman

et al., 2019). Equivalently, a bank is said to be efficient when it is able to maximize its outputs using inputs that are limited (Goswami et al., 2019).

In the recent literature, some studies carry out an analysis in two steps: firstly, they calculate bank efficiency, identifying the most efficient banks, and secondly they analyze the determinants of this efficiency (e.g., Banna et al., 2019; Goswami et al., 2019; Nair and Vinod, 2019; Sulaeman et al., 2019). Regarding the first stage, the literature analyzes and compares the changes, or not, in efficiency, in light of different contexts. For example, Dell'Atti et al. (2015), using a sample of Italian, French, German, English and Spanish banks, examine bank efficiency levels in the pre- and post-2007/2008 financial crisis periods, noting that the impact of the crisis did not manifest itself uniformly across the different countries, having a greater impact on efficiency in French and German banks. This type of comparative analysis is also carried out by Banna et al. (2019) for Indian banking. Other studies, like Dell'Atti et al. (2015) and Sufian and Kamarudin (2015), study banking efficiency in a comparative way. Sufian and Kamarudin (2015) compare the efficiency of domestic and foreign Islamic banks and Dell'Atti et al. (2015), segmenting the sample according to banks' size, conclude that larger banks attain higher than average efficiency levels.

With regard to the study of the determinants of banking efficiency, the literature includes two major research strands. One includes studies that do not focus on any internal (bank-specific) and/or external (macroeconomic) determinants in particular, but adopt a global analytical perspective, considering banks from different geographical areas. For instance, from India (Goswami et al., 2019), Hong Kong (Phan et al., 2018), Indonesia (Sulaeman et al., 2019), Africa (Banya and Biekpe, 2018), or Pacific (Sharma et al., 2015). One other strand comprises studies that focus on the impact of a particular factor on banking efficiency (while controlling other variables)—for instance, geographic

location (Banna et al., 2019; Wu et al., 2016), market competition (Nair and Vinod, 2019), type of ownership (public versus private) (Goswami et al., 2019) and earnings management (Ab-Hamid et al., 2018; Wu et al., 2016).

The present study on the effect of earnings management on bank efficiency is naturally aligned with the second group of studies. Earnings management refers to accounting practices that distort the financial performance of companies, by not reflecting their true financial position (Fan et al., 2019). These practices can occur during periods of financial difficulties, but also in periods when this is not the case, so as to decrease reported profits, creating hidden reserves which can be used in the less favorable periods of the institution's life (Vishnani et al., 2019). Earnings management can thus result in the smoothing of profits (Ujah et al., 2017) or their increase (Fan et al., 2019), so financial statements can be unreliable. In addition to studying the impact of these practices on efficiency, the recent literature has examined their impact on: i. the regulatory and risk management environments (Barth et al., 2017; Jin et al., 2018; Magnis and Iatridis, 2017; Shen and Huang, 2013); ii. the structure of the Boards of Directors (Fan et al., 2019); iii. executive pay (e.g., Alhadab and Al-Own, 2019; Fan et al., 2019; Lee and Hwang, 2019); iv. audit quality (e.g., Persakis and Iatridis, 2016) and, iv. ownership structure (e.g., Lassoued et al., 2017).

The earnings management construct has been produced using various indicators. Among these, LLP has assumed an increasing importance in recent literature (e.g., Elnahass et al., 2018; Ozili, 2017; Vishnani et al., 2019). LLP correspond to the sum of discretionary and non-discretionary provisions, with interested parties only having access to its entirety (Kang and Sivaramakrishnan, 1995). Discretionary provisions are associated with earnings management practices to smooth earnings, manage capital or signal to stakeholders (Frankel et al., 2002). Nonetheless, there is a lack of consensus

about which models should be employed to gauge this discretionary component and, to the best of our knowledge, these different models have not been tested and validated—as evinced by Beatty and Liao (2014). Some studies measure earnings management using a dummy variable (equal to 1 if the bank has a reduced return on assets—e.g., Jin et al., 2018; Magnis and Iatridis, 2017), following the general understanding that earnings management occurs when banks have high returns (Malik et al., 2019).

The few studies that analyze the impact of earnings management, measured by LLP, on banking efficiency conclude that LLP have a negative impact on efficiency, be it assessed through DEA (Ab-Hamid et al., 2018) or SFA (Wu et al., 2016). This negative effect is justified by the fact that earnings management practices prevent banks from ideally transforming their inputs (e.g., capital, labor and deposits) into outputs (e.g., loans and investments). Thus, when inputs are not allocated in the best way, bank efficiency is reduced.

Other studies examine the efficiency effect of total LLP, not as an earnings management measure but as a proxy for risk. The conclusions reached by these studies are not uniform with regard to the direction of this effect: while some studies suggest a positive impact (e.g., Banya and Biekpe, 2018; Nair and Vinod, 2019; Sharma et al., 2015; Sufian, 2009a, 2009b), other studies either reach the opposite conclusion (reporting a negative effect—Nair and Vinod, 2019; Sufian, 2009a; Sufian and Abd. Majid, 2007; Sufian and Habibullah, 2010; Sufian and Noor, 2009) or find no evidence of any significant effect (e.g., Sufian, 2009b; Sufian and Kamarudin, 2015). The following arguments have been used to sustain a positive effect of risk on bank efficiency: i. the high volume of provisions is a part of the bank's strategy, which intends to reduce short term operating costs in order to intensify loan monitoring activities in the future (Sufian, 2009a); ii. banks can adopt a conservative strategy, allocating more provisions than those

that are prudently necessary, raising their confidence in lending to such an extent that the benefits of lending are greater than the spending on provisions (Sharma et al., 2015); iii. the validity of the "skimping hypothesis" (Berger and DeYoung, 1997), under which bank administrations decide not to spend sufficient resources on credit risk, making efficiency higher, even with a high level of non-performing loans (Banya and Biekpe, 2018); and, iv. there may be a decrease in LLP in the period under study due to accelerated economic growth and development of the banking sector, which may mean an incorrect classification of assets, that will not affect actual efficiency (Nair and Vinod, 2019).

A negative effect of provisions on bank efficiency has found its main justification in the argument that the existence of low quality loan portfolios (high LLP) implies additional costs in the monitoring and execution of loan payments, which decreases bank efficiency (Sufian and Habibullah, 2010; Sufian and Kamarudin, 2015; Sufian and Noor, 2009). In addition, a negative effect may also reflect the "bad management" hypothesis mentioned by Berger and DeYoung (1997), under which bank administrators do not practice adequate monitoring and controls.

The current state of research remains somehow inconclusive and the impact of LLP on banking efficiency deserves further investigation. In addition, to our best knowledge of the literature, both the analysis of the efficiency of Eurozone banks and the effect of earnings management, measured through discretionary LLP, on banking efficiency, remain to be studied. In this regard, the present study seeks to answer the following research questions: i. What was the evolution of the economic, allocative and technical efficiency, from 2013 to 2017, in banks directly supervised by the ECB? ii. What is the impact of earnings management on banking efficiency? iii. What is the differentiated impact of discretionary LLP and, on the other hand, of total LLP on banks' economic, allocative and technical efficiency?

4.3. Sample, Variables and Method

4.3.1. Sample

The sample used in the study comprises 70 banks supervised by ECB, from the 19 countries that adopted the Euro currency (117 entities on Jan 1, 2019 — European Central Bank, 2019a). Banks supervised directly by ECB represent 82% of banking assets in the Eurozone (European Central Bank, 2018b) and the banks included in the sample corresponded, in 2017, to 81% of the total assets of banks supervised by the ECB (i.e., significant banks). These entities are considered significant considering criteria such as asset size, economic importance, cross-border activities and direct public financial assistance (European Central Bank, 2018c). Of the total number of banks directly supervised by the ECB, all those with available data for the variables to be studied were considered. Table 4.1 compares, across country, the population (banks supervised by the ECB) and our sample.

Table 4.1 - Banks included in the sample by country

Country	Country abbreviation	List of supervised entities by country	Banks in the sample by country
Austria	AT	6	2
Belgium	BE	7	4
Cyprus	CY	3	1
Germany	DE	21	13
Estonia	EE	3	3
Spain	ES	12	10
Finland	FI	3	1
France	FR	12	8
Greece	GR	4	2
Ireland	IE	6	1
Italy	IT	12	7
Lithuania	LT	2	2
Luxembourg	LU	6	2
Latvia	LV	2	2
Malta	MT	3	3
Netherlands	NL	6	3
Portugal	PT	3	2
Slovenia	SI	3	2
Slovakia	SK	3	2
Total		**117**	**70**

The period under analysis spans from 2013 to 2017—the preparatory period for the application of IFRS 9, replacing IAS 39, where procedures for recognizing and measuring LLP are identified. IFRS 9 was published in July 2014 by the IASB and its implementation is mandatory as of January 1st 2018 by the European banking sector (European Central Bank, 2017b). This period also coincides with the introduction of the Basel III agreement, which was adopted by the European banking sector in 2014 (Alhadab and Al-Own, 2019). The period of our study thus allows us to assess the effect of earnings management on the efficiency of significant banks between two important milestones: before the implementation of IFRS 9 and after the implementation of the Basel III agreement.

4.3.2. Variables

4.3.2.1. Dependent Variables

The economic efficiency of a banking institution comprises two dimensions: technical efficiency and allocative efficiency (Farrell, 1957; Sulaeman et al., 2019). Banking 'production' is considered efficient if it is not possible to produce more using the same level of inputs or, equivalently, if it is not possible to reduce inputs in order to produce the same level of output (Resti, 1997). In this case, we are in the presence of operational efficiency or technical efficiency (Nair and Vinod, 2019). Furthermore, efficiency is achieved by allocating inputs in such a way that production costs are minimized or profits are maximized (allocative efficiency), considering the market prices of inputs (Sulaeman et al., 2019). In the banking sector, this form of efficiency can be attained, for example, through the relationship between risk and return on deposits (Nair and Vinod, 2019). Thus, technical efficiency is related to management issues, while allocative efficiency is related to regulatory factors (Isik and Hassan, 2002).

Efficiency refers to banks' ability to transform inputs into financial products and services (Tecles and Tabak, 2010). The attribute 'bank efficiency' can be estimated using non-parametric methods, such as DEA, and parametric methods, such as SFA (San-Jose et al., 2014). The DEA method sees banks as Decision Making Units (DMU), calculating efficiency through inputs (resources used) and outputs (goods and services obtained) (Ebrahimnejad et al., 2014).

The measurement of efficiency is based on the identification of inputs and outputs (Kao and Liu, 2014). For this purpose, four methodologies have been used: production, intermediation, profit and assets. An analysis of the most recent literature (e.g., Ab-Hamid et al., 2018; Banna et al., 2019; Banya and Biekpe, 2018; Goswami et al., 2019; Nair and Vinod, 2019; Sulaeman et al., 2019) allows us to conclude that intermediation is the most used approach. In the case of the banking sector, it allows the inclusion of interest expenses, which normally represent between half to two thirds of the total costs of banks (Berger and Humphrey, 1997). In addition, this approach is intended to minimize all costs (e.g., interest expenses, interest-free expenses, personnel expenses) and not just production costs (Banna et al., 2019).

In this study, economic efficiency is calculated, together with its technical and allocative dimensions, through the DEA method, following Banna et al. (2019), Nair and Vinod (2019), Phan et al. (2018) and Sulaeman et al. (2019). The approach used is that of intermediation, where outputs correspond to total loans, liquid assets and other earning assets, and the inputs are interest expenses, personnel expenses and operational expenses. Efficiency is scored between zero and 1, with 1 representing full efficiency.

4.3.2.2. Explanatory Variables

4.3.2.2.1. Variables of Interest

The literature has used different proxies in order to measure the earnings management attribute—in particular, total LLP (e.g., Ab-Hamid et al., 2018; Elnahass et al., 2018; Pinto and Picoto, 2018; Vishnani et al., 2019; Wu et al., 2016), or just its discretionary component, i.e., the component that is managed/manipulated and is not innate (e.g., Desta, 2017; Elyasiani et al., 2017). LLP correspond to expenses recognized in a given period of time due to a given loan; these provisions may be of a generic nature (a percentage of the total loan portfolio) or they may be specific, considering the associated collateral and the time period in default, following the precepts of IAS 39 and the loan loss model incurred.

In the present study, three different measurements of earnings management are used. In line with the recent literature (Desta, 2017; Kolsi and Grassa, 2017; Alhadab and Al-Own, 2019—see Table 4.2), the first measure refers to the discretionary element of LLP and is obtained as the estimation residual of the panel data random effects model,

$$LLP_{it}/TL_{i,t-1} = \alpha_0 + \alpha_1 NPL_{it}/TL_{i,t-1} + \alpha_2 \Delta NPL_{it}/TL_{i,t-1} + \alpha_3 \Delta TL_{it}/TL_{i,t-1} + \epsilon_{it}, \quad (4.1)$$

where $\alpha_0, \ldots, \alpha_3$ denote parameters, i and t are, respectively, unit- and time-indices, ϵ denotes the error, and the meaning of the remaining terms is as follows: LLP—Loan Loss Provisions; TL—Total Loans; NPL—Non-performing Loans. A proxy for the discretionary component of provisions is provided by the estimation residual from this model—denote this as RD.

The second measure, denoted as RDS, follows the proposal of Fan et al. (2019) and consists of RD scaled by the ratio of total loans to total assets: $RDS_{it} = RD_{it}(Loans_{it}/Assets_{it})$. Finally, in the line with Ab-Hamid et al. (2018) and Wu et al.

(2016), the third measure of earnings management used in the study is defined as the ratio of total LLP to total loans; denote this as $LLPTL$.

4.3.2.2.2. Control Variables

Both internal (bank-specific) and external determinants are used as control variables of bank efficiency. Internal variables are those that are influenced by management decisions and external variables are those that, although outside the bank's control, reflect the economic and legal environment that affects the functioning of financial institutions (Athanasoglou et al., 2008). Thus, the first type of variables concerns the characteristics of banks and the second set includes macroeconomic determinants.

In line with previous studies (see Table 4.2), the following were used as internal determinants: bank size (TA), net interest margin (NIM), and revenue diversification (DIV). The following macroeconomic variables were used: wealth produced by the country, measured by the logarithm of GDP *per capita* ($lnGDPPC$) and unemployment rate (UR).

Table 4.2 - Operationalization of variables

Variable	Codename	Formula	Signal	Authors
1. Dependent variables				
Efficiency	*CE:* Cost efficiency *TE:* Technical efficiency *AE:* Allocative efficiency	Efficiency scores using DEA Intermediation approach Inputs: 1) interest expenses 2) personnel expenses 3) operational expenses Outputs: 4) total loans 5) liquid assets 6) other earning assets Inputs prices: 1) interest expenses/total deposits 2) personnel expenses/total assets 3) operational expenses/total assets	N.A.	Banna et al. (2019); Nair and Vinod (2019); Phan et al. (2018); Sulaeman et al. (2019)

Table 4.2 - Operationalization of variables (cont.)

Variable	Codename	Formula	Signal	Authors
2. Explanatory variables				
Earnings Management	*RD*	Discretionary component of LLP measured by the estimation residuals of Model (4.1).	+/-	Alhadab and Al-Own (2019); Desta (2017); Kolsi and Grassa (2017)
	RDS	RD standardized: $(RD_{it} * Loans_{it})/Assets_{it}$.	+/-	Fan *et al. (*2019)
	LLPTL	LLP_{it}/TL_{it}.	+/-	Ab-Hamid et al. (2018); Wu et al. (2016)
Size	*TA*	The natural logarithm of Total Assets	+/-	Ab-Hamid et al. (2018); Banna et al. (2019); Goswami et al. (2019); Phan et al. (2018)
Net interest margin	*NIM*	(Interest received - interest paid)/Total assets	+/-	Banna *et al. (*2019); Nair and Vinod (2019); Sulaeman et al. (2019)
Revenue diversification	*DIV*	Non-interest income/ Total income	+/-	Phan et al. (2018); Sufian (2009b)
Economic growth	*lnGDPPC*	The natural logarithm of Gross Domestic Product *per capita*	-	Dell'Atti et al. (2015)
Unemployment rate	*UR (%)*	Unemployed/Civilian Labor Force	+/-	Nair and Vinod (2019)

Table 4.3 presents descriptive statistics for each of the variables used in the study. Section 4.4. presents a summary of the efficiency measures object of calculation. Financial data on banks come from Moody's Analytics BankFocus and Orbis Europe database and data on macroeconomic covariates were obtained from the World Bank.

It is noted that the sample includes inefficient banks, with efficiency scores close to zero. When considering both the discretionary and non-discretionary components of LLP ($LLPTL$), LLP average 1% of total loans, with some banks with a ratio of 21% (the maximum value). Regarding the net interest margin, we can see that some banks have negative margins, paying more interest to depositors than what is received via loans; total assets evince the fact that banks differ in size and diversification data shows that some banks in the sample do not exhibit revenue diversification. As for macroeconomic variables, the minimum and maximum of GDP *per capita* are close, with little differences

between countries in the sample. However, the same cannot be said for the unemployment rate, with rates varying between 3.74% and 27.46%, for a sample average of 10.56%.

Table 4.3 - Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
CE	350	0.4700143	0.2886539	0.061	1
TE	350	0.7429714	0.2605188	0.164	1
AE	350	0.6411371	0.2841516	0.061	1
RD	341	-5.87E-10	0.013644	-0.09869	0.102963
RDS	341	9.19E-05	0.008879	-0.07558	0.080863
LLPTL	350	0.009026	0.020574	-0.06601	0.213008
TA	350	18.05647	1.737388	13.2488	21.45455
NIM	350	1.5788	0.87303	-0.06	4.09
DIV	350	40.56163	30.95894	-147.99	319.51
lnGDPPC	350	10.16512	0.411247	9.220638	11.30408
UR	350	10.56278	6.186315	3.7455	27.4662

Notes
Obs: Observations, Std. Dev.: Standard Desviation; Min: minimum; Max: Maximum.
Check Table 4.2 for description of variables.

4.3.3. Method

In line with previous studies (e.g., Banna et al., 2019; Goswami et al., 2019; Nair and Vinod, 2019; Sulaeman et al., 2019), the present study adopts a two-stage approach. In the first stage, efficiency is measured using the DEA method and in the second step the efficiency measures estimated in the first step are expressed as a function of earnings management (using each of the three measures described above—see Section 4.3.2.2.1.) and a set of control variables. As noted by Pastor (2002), this dual approach is advantageous in that it is easy to implement and enables the use of determining variables without increasing the number of efficient units. Nonetheless, Simar and Wilson (2007) show that there may be problems of endogeneity when using determinants in the second stage that were previously used as inputs or outputs of the first stage. To overcome this limitation, in the second stage the panel model is estimated through generalized method moments (GMM), following Nair and Vinod (2019).

4.3.3.1. First Stage

As previously mentioned, DEA is a non-parametric performance evaluation method which sees banks as Decision-making units (DMU), calculating efficiency through inputs (resources used) and outputs (goods and services obtained) (Ebrahimnejad et al., 2014). DEA identifies a bank, or peer banks, and estimates the efficiency of that bank in relation to the most efficient bank, which is assigned an efficiency score of 100% or 1 (Phan et al., 2018).

This method was first introduced by Farrell (1957) and further developed by Charnes et al. (1978) (CCR model) and by Banker et al. (1984) (BCC model). The CCR model assumes constant returns to scale, not considering the economies and diseconomies of scale that a DMU may have. In the BCC model, variable returns to scale (VRS) are used (Goswami et al., 2019). Both models can be oriented through inputs or outputs. In the first case, efficiency is calculated by minimizing the inputs, keeping outputs constant; in the second case, efficiency is calculated by maximizing the outputs keeping inputs constant (Dell'Atti et al., 2015).

The corresponding literature on the banking sector has considered VRS and orientation through inputs (e.g., Banna et al., 2019; Dell'Atti et al., 2015; Goswami et al., 2019; Nair and Vinod, 2019). The rationale for this choice comes from the fact that banks have no control over the services required by customers, that is, it is easier for banks to change inputs (change in interest rates) than to change outputs (change in the amount of loans), because these depend on third party decisions (Goswami et al., 2019). In addition, as the DMU in this study face different environmental factors (such as imperfect competition and regulatory environments) that may prevent banks from operating at their optimal scale, the BCC model with VRS was chosen (Delis and Papanikolaou, 2009).

Following Banna et al. (2019) and Delis and Papanikolaou (2009), the DEA-VRS procedure can be expressed as: $\min EFF$, subject to

$$\sum_{k=1}^{N} \varphi_k x_{ik} \leq x_{i0} EFF \quad i = 1, \dots, r; \quad \sum_{k=1}^{N} \varphi_k y_{jk} \geq y_{j0} \quad j = 1, \dots, s; \sum_{k=1}^{N} \varphi_k = 1; \; \varphi_k \geq 0 \quad k = 1, \dots, N$$

where EFF denotes the efficiency score (if $EFF = 1$ bank$_0$ is on the frontier, i.e., it is efficient and if $EFF < 1$ bank$_0$ represents an inefficient bank), N is the number of banks (DMU), bank$_0$ represents one of the N banks, x_{ik} is the level of input i that DMU k consumes in order to produce the level of output j, y_{jk}, and φ is the activity vector denoting the intensity levels at which each the S observations are conducted.

The efficiency score, EFF, results, as mentioned, from one of three definitions of efficiency: economic efficiency (score denoted as CE), technical efficiency (score: TE) and allocative efficiency (score: AE). For each bank in the sample, the corresponding values of CE, TE and AE were obtained through DEA; following Desta (2016), they were computed with the software DEAP 2.1.

4.3.3.2. Second Stage

In order to address our research questions, we specified the dynamic panel data model

$$EFF_{it} = \beta_1 EFF_{i,t-1} + \beta_2 EM_{it} + \beta_3 EM_{it}^2 + \sum_{j=1}^{J} \gamma_j X_{it}^j + \nu_i + \varepsilon_{it} \,, \tag{4.2}$$

where Greek letters denote parameters, i and t are, respectively, individual- (bank-) and time-indices, EFF denotes the efficiency score, EM represents earnings management and $X^j, j = 1, \dots, J$, denote control variates. Following the customary panel data approach, the error is assumed composed of two uncorrelated terms, ν_i, denoting an individual (bank-specific, time-invariant) unobserved effect, and ε_{it}, representing remaining unobservables that affect EFF_{it} and are uncorrelated with the model's explanatory variables.

The efficiency score, EFF, results, as mentioned, from one of three definitions of efficiency, yielding CE, TE and AE. The covariate EM is measured through each of the three alternative indicators described in the previous sub-section: RD, RDS and $LLPTL$; each of these alternative measurements represents the earnings management covariate in each of the resulting alternative regression models for efficiency. Finally, the set of control variables (X^j) in these regressions was described in the previous section.

The model allows for a nonlinear (quadratic) functional relationship between EFF and the earnings management measure, EM—which seems to be a prudent choice, namely in view of the disparity of results reported in the literature, with some studies suggesting a positive linear impact of EM on efficiency (e.g., Banya and Biekpe, 2018; Nair and Vinod, 2019) whereas others report a negative linear effect (e.g., Ab-Hamid et al., 2018; Wu et al., 2016).

Each model was estimated by two-step system GMM, an estimator developed by Blundell and Bond (1998). This method was chosen for two fundamental reasons. Firstly, it is consistent under endogeneity, which, in the present case, can arise due to the possible simultaneous determination of the dependent variable and some explanatory variables. For example, EM can, to some extent, depend on efficiency, as banks' higher/lower level of efficiency can lead to more/less earnings management practices. Secondly, by using lagged regressors as valid instruments, the estimator allows for dynamics in the model, while controlling individual unobserved heterogeneity (unlike other simultaneous equations estimation methods like maximum likelihood and two- or three-stage least squares, which are inconsistent is this case)—see, e.g., García-Meca and García (2015). To avoid the risk of inconsistency, the individual effect, v_i, is eliminated through first differencing of the variables. The method is particularly recommended for short panels (few temporal observations) and when the dependent variable has a high degree of

persistence (here, strong correlation between present and past efficiency)—see Blundell and Bond (1998).

The two-step system GMM estimator combines the initial equation in levels—equation (4.2)—where the variables in first differences are used as instruments, with the equation in first differences, where variables in levels are used as instruments:

$$EFF_{it} - EFF_{i,t-1} = \beta_1(EFF_{i,t-1} - EFF_{i,t-2}) + \beta_2(EM_{it} - EM_{i,t-1}) + \beta_3(EM_{it}^2 - EM_{i,t-1}^2) + \sum_{j=1}^{J} \gamma_j(X_{it}^j - X_{i,t-1}^j) + w_{it}, \quad (4.3)$$

where $w_{it} = \varepsilon_{it} - \varepsilon_{i,t-1}$. For the levels equation—equation (4.2)—we use as instruments EM differences, lagged one, two and three periods; for the difference equation—equation (4.3)—we use as instruments EM lagged one, two and three periods.

In order to validate the adopted specification, two statistical procedures were used, following Moon (2018), Nair and Vinod (2019) and Rumler and Waschiczek (2016). Firstly, error serial correlation was assessed, with the $m1$ and $m2$ test statistics proposed by Arellano and Bond (1991), for which the null hypothesis is no autocorrelation. It is noted that, in accordance with Arellano and Bond (1991), the GMM estimator is inconsistent under second-order error autocorrelation. A second specification test corresponds to the Hansen test, which assesses the null hypothesis of no correlation between instruments and error term, i.e., the hypothesis that the instruments are valid.

4.4. Empirical Results

As mentioned in the previous section, the present study is carried out in two steps. In a first stage, the efficiency scores, CE, TE and AE, for the 70 banks in the sample are computed and their evolution is examined during the preparatory period for the implementation of IFRS 9 (2013-2017). In a second stage, the determinants of the different efficiency measures are analyzed, with a special focus on earnings management.

4.4.1. Efficiency Analysis

4.4.1.1. Economic/Cost Efficiency

Tables 4.4 and 4.7 display the CE estimates per bank in the five years under analysis, and the average of this efficiency over five years for banks in the same country, respectively. As can be seen in Table 4.4, the average CE increased from 0.455 (2013) to 0.518 (2017), with a global average (for all banks and the entire period) of 0.470. Thus, on average, the European banking sector does not appear to have used the minimum possible amount of inputs to produce the outputs, and the proportion of inputs did not guarantee the minimum possible costs. At the end of the analyzed period, the average CE was 51.8%, indicating potential cost savings of 48.2%. It should also be noted that the number of efficient banks (for which $CE = 1$) decreased, with four banks remaining always efficient in the period 2013 to 2017 (French banks BNP Paribas and Credit Agricole, German Dekabank and Estonian Luminor).

With regard to country averages (see Table 4.7), most banks exhibit levels of inefficiency (efficiency scores less than 1). France is the country where banks have the highest average CE level, followed by the Netherlands. Thus, French banks as a whole are the ones with the greatest capacity to make their operations profitable. On aggregate, countries where banks perform worst are Ireland, Slovakia and Slovenia (efficiency levels below 0.30).

Table 4.4 - Economic efficiency by DMU

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
1	AB SEB BANKAS	LT	0.582	0.509	0.440	0.958	0.773	0.652
2	ABANKA D.D	SI	0.198	0.155	0.245	0.277	0.300	0.235
3	AS SEB PANK	EE	0.361	0.454	0.359	0.635	0.643	0.490
4	BANCA CARIGE SPA	IT	0.245	0.226	0.142	0.469	0.310	0.278
5	BANCA POPOLARE DI SONDRIO SOCIETA COOPERATIVA PER AZIONI	IT	0.375	0.295	0.188	0.688	0.640	0.437

Table 4.4 - Economic efficiency by DMU (cont.)

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
6	BANCO BILBAO VIZCAYA ARGENTARIA SA	ES	0.626	0.607	0.706	0.657	0.543	0.628
7	BANCO COMERCIAL PORTUGUES, SA	PT	0.207	0.199	0.155	0.781	0.581	0.385
8	BANCO de SABADELL SA	ES	0.423	0.415	0.662	0.932	0.770	0.640
9	BANCO SANTANDER SA	ES	1.000	1.000	1.000	1.000	0.829	0.966
10	BANK of VALLETTA PLC	MT	0.429	0.380	0.366	0.741	0.536	0.490
11	BANKINTER SA	ES	0.346	0.281	0.196	0.796	0.590	0.442
12	BANQUE DEGROOF PETERCAM SA	BE	0.101	0.104	0.061	0.086	0.092	0.089
13	BANQUE et CAISSE D'EPARGNE de L'ETAT LUXEMBOURG	LU	0.515	0.380	0.335	0.646	0.544	0.484
14	BANQUE INTERNATIONALE A LUXEMBOURG SA	LU	0.217	0.175	0.123	0.494	0.418	0.285
15	BAYERISCHE LANDESBANK	DE	0.453	0.393	0.362	0.395	0.346	0.390
16	BELFIUS BANQUE SA/NV	BE	0.335	0.364	0.291	0.697	0.678	0.473
17	BFA TENEDORA de ACCIONES SAU	ES	0.670	0.664	0.396	0.760	0.763	0.651
18	BNG BANK N.V.	NL	1.000	1.000	1.000	0.098	0.063	0.632
19	BNP PARIBAS SA	FR	1.000	1.000	1.000	1.000	1.000	1.000
20	BPCE SA	FR	0.822	0.819	0.723	0.776	0.683	0.765
21	BPER BANCA S.P.A.	IT	0.221	0.161	0.094	0.416	0.400	0.258
22	BPIFRANCE FINANCEMENT SA	FR	0.651	0.326	0.263	0.392	0.296	0.386
23	CAIXA GERAL de DEPOSITOS	PT	0.221	0.193	0.143	0.593	0.556	0.341
24	CAIXABANK, S.A.	ES	0.642	0.651	0.581	0.905	0.841	0.724
25	COMMERZBANK AG	DE	0.763	0.694	0.667	0.764	0.700	0.718
26	COOPERATIEVE RABOBANK U.A.	NL	1.000	1.000	1.000	1.000	0.969	0.994
27	CREDIT AGRICOLE S.A.	FR	1.000	1.000	1.000	1.000	1.000	1.000
28	CREDITO EMILIANO HOLDING	IT	0.161	0.104	0.070	0.253	0.226	0.163
29	DEKABANK DEUTSCHE GIROZENTRALE	DE	1.000	1.000	1.000	1.000	1.000	1.000
30	DEUTSCHE APOTHEKER- UND AERZTEBANK EG	DE	0.318	0.250	0.182	0.675	0.632	0.411
31	DEUTSCHE BANK AG	DE	1.000	1.000	0.707	0.699	0.643	0.810
32	DEUTSCHE PFANDBRIEFBANK AG	DE	0.191	0.179	0.150	0.172	0.128	0.164
33	DEXIA SA	BE	0.145	0.181	0.146	0.135	0.100	0.141
34	ERSTE GROUP BANK AG	AT	0.354	0.257	0.304	0.611	0.588	0.423
35	HAMBURG COMMERCIAL BANK AG	DE	0.144	0.136	0.114	0.201	0.123	0.144
36	HELLENIC BANK PUBLIC COMPANY LIMITED	CY	0.316	0.408	0.345	0.415	0.272	0.351
37	HSBC BANK MALTA PLC	MT	0.368	0.455	0.323	0.549	0.393	0.418
38	HSBC FRANCE SA	FR	1.000	1.000	0.848	1.000	1.000	0.970
39	IBERCAJA BANCO SA	ES	0.352	0.211	0.064	0.588	0.351	0.313
40	ICCREA BANCA SPA - ISTITUTO CENTRALE DEL CREDITO COOPERATIVO	IT	1.000	1.000	0.769	1.000	1.000	0.954
41	ING GROEP NV	NL	0.388	0.407	0.424	0.524	0.368	0.422
42	KBC GROEP NV/ KBC GROUPE SA	BE	0.395	0.416	0.443	0.763	0.751	0.554
43	KUTXABANK SA	ES	0.209	0.204	0.131	0.457	0.291	0.258
44	LA BANQUE POSTALE	FR	0.447	0.442	0.456	0.613	0.588	0.509
45	LANDESBANK BADEN-WUERTTEMBERG	DE	0.127	0.169	0.163	0.200	0.217	0.175

Table 4.4 - Economic efficiency by DMU (cont.)

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
46	LANDESBANK HESSEN-THUERINGEN GIROZENTRALE - HELABA	DE	0.459	0.364	0.297	0.461	0.536	0.423
47	LANDESKREDITBANK BADEN-WUERTTEMBERG - FORDERBANK	DE	0.280	0.281	0.162	0.208	0.242	0.235
48	LIBERBANK SA	ES	0.322	0.217	0.111	0.362	0.328	0.268
49	LUMINOR BANK AS	EE	1.000	1.000	1.000	1.000	1.000	1.000
50	MDB GROUP LIMITED	MT	0.467	0.454	0.307	0.495	0.531	0.451
51	MEDIOBANCA SPA	IT	0.289	0.283	0.266	0.633	0.618	0.418
52	MUNCHENER HYPOTHEKENBANK EG	DE	0.247	0.236	0.191	0.170	0.116	0.192
53	NATIONAL BANK of GREECE SA	GR	0.149	0.161	0.131	0.557	0.407	0.281
54	NORDDEUTSCHE LANDESBANK GIROZENTRALE NORD/LB	DE	0.206	0.202	0.165	0.246	0.257	0.215
55	NOVA LJUBLJANSKA BANKA D.D.	SI	0.139	0.104	0.089	0.240	0.206	0.156
56	NRW.BANK	DE	0.172	0.184	0.115	0.164	0.179	0.163
57	OP OSUUSKUNTA	FI	0.237	0.222	0.217	0.465	0.581	0.344
58	PIRAEUS BANK SA	GR	0.199	0.179	0.122	0.679	0.525	0.341
59	RAIFFEISEN BANK INTERNATIONAL AG	AT	0.261	0.153	0.167	0.452	0.469	0.300
60	RCI BANQUE SA	FR	0.258	0.244	0.213	0.449	0.435	0.320
61	SEB BANKA AS	LV	0.631	0.445	0.419	0.522	0.594	0.522
62	SLOVENSKA SPORITEL'NA AS	SK	0.156	0.104	0.103	0.301	0.247	0.182
63	SOCIETE GENERALE SA	FR	0.776	0.811	0.836	0.848	0.728	0.800
64	SWEDBANK AB	LT	0.497	0.480	0.527	0.835	0.741	0.616
65	SWEDBANK AS	EE	0.462	0.398	0.341	0.603	0.540	0.469
66	SWEDBANK AS Latvia	LV	0.444	0.491	0.442	0.583	0.603	0.513
67	TATRA BANKA A.S.	SK	0.095	0.100	0.091	0.192	0.179	0.131
68	ULSTER BANK IRELAND DAC	IE	0.362	0.269	0.149	0.255	0.251	0.257
69	UNICAJA BANCO SA	ES	0.515	0.263	0.151	0.568	0.423	0.384
70	UNICREDIT SPA	IT	0.928	0.928	0.903	0.782	0.995	0.907
	Mean		0.455	0.426	0.381	0.570	0.518	0.470
	Number of more efficient banks		10	10	7	8	6	4

4.4.1.2. Technical Efficiency

Operational, or technical, inefficiency is present when it is possible to produce more using the same inputs or, equivalently, it is possible to reduce inputs keeping production unchanged (Nair and Vinod, 2019). Table 4.5 displays TE estimates for the banks considered in the study. The obtained results show that, from 2013 to 2017, the number of efficient banks (for which $TE = 1$) increased from 20 to 31, and that the average of this score increased from 0.668 (2013) to 0.855 (2017), with a global average of 0.743.

These results suggest that banks, in their intermediation role, could, on average, have achieved the same amount of outputs using only 74.3% of the inputs, thus recording a 25.7% input waste.

Of the 70 banks analyzed, 16 were always efficient over the period 2013–2017, with four French banks standing out in this group, as well as all Dutch and Estonian banks included in the sample (three banks in each country). The remaining six efficient banks come from Belgium (one of four banks), Germany (two of thirteen), Spain (one of ten) and Italy (two of seven).

From the analysis of the average efficiency of banks by country (see Table 4.7), it is concluded that Estonian and Dutch banks in the sample have always remained efficient in the five years under observation, that is, they have managed, through their inputs, to produce the maximum output or, equivalently, managed to minimize the level of inputs, given their output level. Most banks in the sample have an average efficiency of over 0.6 in this period. The countries where banks have the lowest level of technical efficiency (motivated by low efficiency levels in 2013-2015) are Cyprus, Greece, Luxembourg, Finland, Portugal and Slovenia.

Table 4.5 - Technical efficiency by DMU

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
1	AB SEB BANKAS	LT	0.718	0.755	0.627	1.000	1.000	0.820
2	ABANKA D.D	SI	0.233	0.322	0.339	0.572	1.000	0.493
3	AS SEB PANK	EE	1.000	1.000	1.000	1.000	1.000	1.000
4	BANCA CARIGE SPA	IT	0.440	0.422	0.338	0.543	0.400	0.429
5	BANCA POPOLARE DI SONDRIO SOCIETA COOPERATIVA PER AZIONI	IT	0.506	0.515	0.526	0.985	0.985	0.703
6	BANCO BILBAO VIZCAYA ARGENTARIA SA	ES	0.753	0.812	0.889	0.716	0.652	0.764
7	BANCO COMERCIAL PORTUGUES, SA	PT	0.299	0.303	0.305	0.851	0.735	0.499
8	BANCO de SABADELL SA	ES	0.490	0.559	0.988	1.000	1.000	0.807
9	BANCO SANTANDER SA	ES	1.000	1.000	1.000	1.000	1.000	1.000
10	BANK of VALLETTA PLC	MT	0.473	0.460	0.471	0.754	0.552	0.542
11	BANKINTER SA	ES	0.502	0.556	0.629	1.000	1.000	0.737

Table 4.5 - Technical efficiency by DMU (cont.)

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
12	BANQUE DEGROOF PETERCAM SA	BE	1.000	1.000	1.000	1.000	0.929	0.986
13	BANQUE et CAISSE D'EPARGNE de L'ETAT LUXEMBOURG	LU	0.577	0.393	0.350	0.908	0.788	0.603
14	BANQUE INTERNATIONALE A LUXEMBOURG SA	LU	0.222	0.246	0.278	0.556	0.477	0.356
15	BAYERISCHE LANDESBANK	DE	0.997	0.856	0.834	1.000	1.000	0.937
16	BELFIUS BANQUE SA/NV	BE	0.554	0.449	0.352	1.000	1.000	0.671
17	BFA TENEDORA de ACCIONES SAU	ES	0.677	0.696	0.941	1.000	1.000	0.863
18	BNG BANK N.V.	NL	1.000	1.000	1.000	1.000	1.000	1.000
19	BNP PARIBAS SA	FR	1.000	1.000	1.000	1.000	1.000	1.000
20	BPCE SA	FR	0.887	0.962	0.835	0.864	0.791	0.868
21	BPER BANCA S.P.A.	IT	0.623	0.608	0.612	0.738	0.639	0.644
22	BPIFRANCE FINANCEMENT SA	FR	0.656	0.338	0.268	1.000	1.000	0.652
23	CAIXA GERAL de DEPOSITOS	PT	0.268	0.250	0.215	0.658	0.628	0.404
24	CAIXABANK, S.A.	ES	0.701	0.688	0.681	0.966	0.920	0.791
25	COMMERZBANK AG	DE	0.775	0.749	0.776	0.811	0.785	0.779
26	COOPERATIEVE RABOBANK U.A.	NL	1.000	1.000	1.000	1.000	1.000	1.000
27	CREDIT AGRICOLE S.A.	FR	1.000	1.000	1.000	1.000	1.000	1.000
28	CREDITO EMILIANO HOLDING	IT	0.681	0.764	0.770	0.817	0.744	0.755
29	DEKABANK DEUTSCHE GIROZENTRALE	DE	1.000	1.000	1.000	1.000	1.000	1.000
30	DEUTSCHE APOTHEKER- UND AERZTEBANK EG	DE	0.512	0.554	0.552	0.946	0.968	0.706
31	DEUTSCHE BANK AG	DE	1.000	1.000	1.000	1.000	0.886	0.977
32	DEUTSCHE PFANDBRIEFBANK AG	DE	0.381	0.251	0.183	0.950	0.887	0.530
33	DEXIA SA	BE	1.000	1.000	1.000	1.000	1.000	1.000
34	ERSTE GROUP BANK AG	AT	0.617	0.831	0.615	0.735	0.690	0.698
35	HAMBURG COMMERCIAL BANK AG	DE	0.172	0.166	0.164	0.495	0.462	0.292
36	HELLENIC BANK PUBLIC COMPANY LIMITED	CY	0.348	0.545	0.477	0.559	0.510	0.488
37	HSBC BANK MALTA PLC	MT	0.619	0.981	0.754	1.000	1.000	0.871
38	HSBC FRANCE SA	FR	1.000	1.000	1.000	1.000	1.000	1.000
39	IBERCAJA BANCO SA	ES	0.445	0.422	0.437	0.833	0.801	0.588
40	ICCREA BANCA SPA - ISTITUTO CENTRALE DEL CREDITO COOPERATIVO	IT	1.000	1.000	1.000	1.000	1.000	1.000
41	ING GROEP NV	NL	1.000	1.000	1.000	1.000	1.000	1.000
42	KBC GROEP NV/ KBC GROUPE SA	BE	0.412	0.464	0.516	0.790	0.769	0.590
43	KUTXABANK SA	ES	0.731	0.744	0.809	1.000	1.000	0.857
44	LA BANQUE POSTALE	FR	1.000	1.000	1.000	1.000	1.000	1.000
45	LANDESBANK BADEN-WUERTTEMBERG	DE	0.686	0.635	0.543	0.644	0.859	0.673
46	LANDESBANK HESSEN-THUERINGEN GIROZENTRALE - HELABA	DE	0.540	0.404	0.330	0.926	1.000	0.640
47	LANDESKREDITBANK BADEN-WUERTTEMBERG - FORDERBANK	DE	1.000	0.788	0.779	1.000	1.000	0.913
48	LIBERBANK SA	ES	0.377	0.400	0.479	0.761	0.824	0.568
49	LUMINOR BANK AS	EE	1.000	1.000	1.000	1.000	1.000	1.000
50	MDB GROUP LIMITED	MT	0.677	0.517	0.313	0.582	0.671	0.552

Table 4.5 - Technical efficiency by DMU (cont.)

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
51	MEDIOBANCA SPA	IT	0.325	0.287	0.271	0.747	0.672	0.460
52	MUNCHENER HYPOTHEKENBANK EG	DE	0.410	0.422	0.463	1.000	1.000	0.659
53	NATIONAL BANK of GREECE SA	GR	0.299	0.278	0.435	0.834	0.668	0.503
54	NORDDEUTSCHE LANDESBANK GIROZENTRALE NORD/LB	DE	0.523	0.387	0.367	0.769	0.816	0.572
55	NOVA LJUBLJANSKA BANKA D.D.	SI	0.210	0.256	0.306	0.404	0.397	0.315
56	NRW.BANK	DE	1.000	1.000	1.000	1.000	1.000	1.000
57	OP OSUUSKUNTA	FI	0.275	0.246	0.256	0.738	0.779	0.459
58	PIRAEUS BANK SA	GR	0.343	0.337	0.276	0.709	0.641	0.461
59	RAIFFEISEN BANK INTERNATIONAL AG	AT	0.520	0.489	0.321	0.565	0.586	0.496
60	RCI BANQUE SA	FR	0.262	0.245	0.217	0.894	0.877	0.499
61	SEB BANKA AS	LV	1.000	0.971	0.951	0.856	0.905	0.937
62	SLOVENSKA SPORITEL'NA AS	SK	0.588	0.638	0.742	0.755	0.799	0.704
63	SOCIETE GENERALE SA	FR	0.780	0.878	0.843	0.852	0.747	0.820
64	SWEDBANK AB	LT	0.761	0.922	0.834	0.996	1.000	0.903
65	SWEDBANK AS	EE	1.000	1.000	1.000	1.000	1.000	1.000
66	SWEDBANK AS Latvia	LV	0.828	0.976	1.000	0.950	0.946	0.940
67	TATRA BANKA A.S.	SK	0.794	0.788	0.991	0.909	0.956	0.888
68	ULSTER BANK IRELAND DAC	IE	0.649	0.668	0.743	1.000	1.000	0.812
69	UNICAJA BANCO SA	ES	0.635	0.363	0.292	0.686	0.685	0.532
70	UNICREDIT SPA	IT	1.000	1.000	1.000	1.000	1.000	1.000
	Mean		0.668	0.665	0.661	0.866	0.855	0.743
	Number of more efficient banks		20	18	19	30	31	16

4.4.1.3. Allocative Efficiency

Table 4.6 displays AE estimates per bank. Results indicate that the average AE score decreased from 0.694, in 2013, to 0.617, in 2017, and the number of efficient banks (for which $AE = 1$) decreased from ten, in 2013, to six, in 2017. Only four banks were always efficient during the period 2013-2017: BNP Paribas, Credit Agricole, Dekabank and Luminor. The AE global average in the sample is 0.641. Regarding country averages (see Table 4.7), these reveal levels of inefficiency (AE always below 1). French banks, as a whole, are the ones with best average AE, which means that they, better than others, succeeded in bringing costs actually incurred closer to the minimum production costs,

given the output produced. The banks with the lowest average AE level are those from Ireland, Slovakia and Belgium (levels below 0.50).

Table 4.6 - Allocative efficiency by DMU

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
1	AB SEB BANKAS	LT	0.810	0.675	0.702	0.958	0.773	0.784
2	ABANKA D.D	SI	0.848	0.481	0.725	0.485	0.300	0.568
3	AS SEB PANK	EE	0.361	0.454	0.359	0.635	0.643	0.490
4	BANCA CARIGE SPA	IT	0.558	0.535	0.421	0.864	0.776	0.631
5	BANCA POPOLARE DI SONDRIO SOCIETA COOPERATIVA PER AZIONI	IT	0.740	0.573	0.358	0.698	0.649	0.604
6	BANCO BILBAO VIZCAYA ARGENTARIA SA	ES	0.831	0.748	0.795	0.918	0.833	0.825
7	BANCO COMERCIAL PORTUGUES, SA	PT	0.693	0.657	0.507	0.917	0.790	0.713
8	BANCO de SABADELL SA	ES	0.863	0.742	0.670	0.932	0.770	0.795
9	BANCO SANTANDER SA	ES	1.000	1.000	1.000	1.000	0.829	0.966
10	BANK of VALLETTA PLC	MT	0.908	0.826	0.777	0.983	0.971	0.893
11	BANKINTER SA	ES	0.689	0.505	0.311	0.796	0.590	0.578
12	BANQUE DEGROOF PETERCAM SA	BE	0.101	0.104	0.061	0.086	0.099	0.090
13	BANQUE et CAISSE D'EPARGNE de L'ETAT LUXEMBOURG	LU	0.893	0.967	0.958	0.711	0.690	0.844
14	BANQUE INTERNATIONALE A LUXEMBOURG SA	LU	0.979	0.710	0.442	0.888	0.875	0.779
15	BAYERISCHE LANDESBANK	DE	0.454	0.459	0.435	0.395	0.346	0.418
16	BELFIUS BANQUE SA/NV	BE	0.605	0.811	0.827	0.697	0.678	0.724
17	BFA TENEDORA de ACCIONES SAU	ES	0.989	0.955	0.421	0.760	0.763	0.778
18	BNG BANK N.V.	NL	1.000	1.000	1.000	0.098	0.063	0.632
19	BNP PARIBAS SA	FR	1.000	1.000	1.000	1.000	1.000	1.000
20	BPCE SA	FR	0.926	0.851	0.867	0.898	0.864	0.881
21	BPER BANCA S.P.A.	IT	0.354	0.265	0.154	0.564	0.625	0.392
22	BPIFRANCE FINANCEMENT SA	FR	0.991	0.966	0.981	0.392	0.296	0.725
23	CAIXA GERAL de DEPOSITOS	PT	0.824	0.772	0.666	0.902	0.885	0.810
24	CAIXABANK, S.A.	ES	0.915	0.947	0.852	0.937	0.915	0.913
25	COMMERZBANK AG	DE	0.985	0.926	0.860	0.941	0.892	0.921
26	COOPERATIEVE RABOBANK U.A.	NL	1.000	1.000	1.000	1.000	0.969	0.994
27	CREDIT AGRICOLE S.A.	FR	1.000	1.000	1.000	1.000	1.000	1.000
28	CREDITO EMILIANO HOLDING	IT	0.236	0.136	0.091	0.310	0.303	0.215
29	DEKABANK DEUTSCHE GIROZENTRALE	DE	1.000	1.000	1.000	1.000	1.000	1.000
30	DEUTSCHE APOTHEKER- UND AERZTEBANK EG	DE	0.620	0.450	0.330	0.713	0.652	0.553
31	DEUTSCHE BANK AG	DE	1.000	1.000	0.707	0.699	0.725	0.826
32	DEUTSCHE PFANDBRIEFBANK AG	DE	0.500	0.711	0.818	0.181	0.144	0.471
33	DEXIA SA	BE	0.145	0.181	0.146	0.135	0.100	0.141
34	ERSTE GROUP BANK AG	AT	0.573	0.309	0.494	0.832	0.851	0.612
35	HAMBURG COMMERCIAL BANK AG	DE	0.838	0.820	0.697	0.406	0.266	0.605

Table 4.6 - Allocative efficiency by DMU (cont.)

DMU	Bank	Country	2013	2014	2015	2016	2017	Mean
36	HELLENIC BANK PUBLIC COMPANY LIMITED	CY	0.909	0.749	0.724	0.742	0.532	0.731
37	HSBC BANK MALTA PLC	MT	0.595	0.464	0.429	0.549	0.393	0.486
38	HSBC FRANCE SA	FR	1.000	1.000	0.848	1.000	1.000	0.970
39	IBERCAJA BANCO SA	ES	0.790	0.499	0.146	0.706	0.438	0.516
40	ICCREA BANCA SPA - ISTITUTO CENTRALE DEL CREDITO COOPERATIVO	IT	1.000	1.000	0.769	1.000	1.000	0.954
41	ING GROEP NV	NL	0.388	0.407	0.424	0.524	0.368	0.422
42	KBC GROEP NV/ KBC GROUPE SA	BE	0.959	0.898	0.857	0.965	0.977	0.931
43	KUTXABANK SA	ES	0.286	0.273	0.161	0.457	0.291	0.294
44	LA BANQUE POSTALE	FR	0.447	0.442	0.456	0.613	0.588	0.509
45	LANDESBANK BADEN-WUERTTEMBERG	DE	0.185	0.266	0.300	0.311	0.252	0.263
46	LANDESBANK HESSEN-THUERINGEN GIROZENTRALE - HELABA	DE	0.851	0.901	0.899	0.497	0.536	0.737
47	LANDESKREDITBANK BADEN-WUERTTEMBERG - FORDERBANK	DE	0.280	0.357	0.207	0.208	0.242	0.259
48	LIBERBANK SA	ES	0.855	0.542	0.232	0.476	0.398	0.501
49	LUMINOR BANK AS	EE	1.000	1.000	1.000	1.000	1.000	1.000
50	MDB GROUP LIMITED	MT	0.691	0.878	0.981	0.849	0.791	0.838
51	MEDIOBANCA SPA	IT	0.889	0.984	0.981	0.847	0.920	0.924
52	MUNCHENER HYPOTHEKENBANK EG	DE	0.603	0.560	0.412	0.170	0.116	0.372
53	NATIONAL BANK of GREECE SA	GR	0.499	0.579	0.302	0.667	0.609	0.531
54	NORDDEUTSCHE LANDESBANK GIROZENTRALE NORD/LB	DE	0.393	0.522	0.451	0.320	0.315	0.400
55	NOVA LJUBLJANSKA BANKA D.D.	SI	0.664	0.406	0.292	0.594	0.520	0.495
56	NRW.BANK	DE	0.172	0.184	0.115	0.164	0.179	0.163
57	OP OSUUSKUNTA	FI	0.861	0.905	0.847	0.629	0.746	0.798
58	PIRAEUS BANK SA	GR	0.580	0.530	0.441	0.958	0.819	0.666
59	RAIFFEISEN BANK INTERNATIONAL AG	AT	0.502	0.312	0.520	0.800	0.801	0.587
60	RCI BANQUE SA	FR	0.987	0.996	0.984	0.502	0.496	0.793
61	SEB BANKA AS	LV	0.631	0.458	0.441	0.611	0.656	0.559
62	SLOVENSKA SPORITEL'NA AS	SK	0.266	0.163	0.139	0.399	0.310	0.255
63	SOCIETE GENERALE SA	FR	0.994	0.924	0.991	0.995	0.976	0.976
64	SWEDBANK AB	LT	0.653	0.521	0.632	0.839	0.741	0.677
65	SWEDBANK AS	EE	0.462	0.398	0.341	0.603	0.540	0.469
66	SWEDBANK AS Latvia	LV	0.536	0.503	0.442	0.614	0.637	0.546
67	TATRA BANKA A.S.	SK	0.120	0.126	0.092	0.212	0.188	0.148
68	ULSTER BANK IRELAND DAC	IE	0.557	0.402	0.201	0.255	0.251	0.333
69	UNICAJA BANCO SA	ES	0.811	0.725	0.515	0.828	0.617	0.699
70	UNICREDIT SPA	IT	0.928	0.928	0.903	0.782	0.995	0.907
	Mean		0.694	0.648	0.584	0.663	0.617	0.641
	Number of more efficients banks		10	10	7	8	6	4

Table 4.7 - Economic, Technical and Allocative efficiencies by country (mean values of the period 2013-2017)

Country/Efficiency	*CE*	*TE*	*AE*
Austria	0.362	0.597	0.599
Belgium	0.314	0.812	0.472
Cyprus	0.351	0.488	0.731
Deutschland	0.388	0.745	0.538
Estonia	0.653	1.000	0.653
Finland	0.344	0.459	0.798
France	0.719	0.855	0.857
Greece	0.311	0.482	0.598
Ireland	0.257	0.812	0.333
Italy	0.488	0.713	0.661
Latvia	0.517	0.938	0.553
Lithuania	0.634	0.861	0.730
Luxembourg	0.385	0.480	0.811
Malta	0.453	0.655	0.739
Netherlands	0.683	1.000	0.683
Portugal	0.363	0.451	0.761
Slovakia	0.157	0.796	0.202
Slovenia	0.195	0.404	0.532
Spain	0.527	0.751	0.686

Notes
CE = Cost efficiency; TE = Technical efficiency; AE = Allocative efficiency.

4.4.1.4. Summary

In summary, a comparative analysis of the average levels of efficiency reveals that banks perform better in terms of technical efficiency, followed by allocative and, finally, cost efficiency. Given that the latter results from a combination of technical and allocative efficiency (Sulaeman et al., 2019), our results indicate that the greatest source of cost inefficiency comes from allocative efficiency, in line with the conclusion by Batir et al. (2017). This finding suggests that, in the present banking context, inefficiency stems more from the optimum incorrect choice of inputs than from underutilization/waste of resources. In addition, these results also suggest a varying banking behavior, depending on the country where each bank has its headquarters.

4.4.2. Estimations Results

After estimating the different types of efficiency for the banks included in our sample, we now turn to the analysis of the determinants of their efficiency, placing, as mentioned, a special emphasis on the role of earnings management. In this sub-section, we present and comment on the estimation results for the different variants of regression model (4.2), combining each of the three efficiency scores as dependent variable (TE, CE or AE), with, respectively, each of the three alternative measurements of the earnings management covariate (RD, RDS or $LLPTL$). Tables 4.8, 4.9 and 4.10 display the estimation results for these models, grouped in each table with respect to the earnings management covariate employed. As the base model is quadratic in this covariate, marginal effects of the latter are not constant but depend on its level. Therefore, marginal effects were estimated by computing average partial effects (APE), given, as well known, by the sample average of partial effects (with respect to the EM covariate) across all banks for all periods. In addition, as in Law and Singh (2014), we also computed marginal effects at the maximum and minimum values of the EM covariate. Below, we discuss the estimation results for each group of models, closing the section with general comments on the whole set of results.

4.4.2.1. Earnings Management Covariate: RD

In the first group of regression models, the earnings management covariate is represented by the variable RD. For each alternative dependent variable, denoting a different efficiency score (CE, TE or AE, estimated in stage 1), three nested specifications were adopted, with increasing number of explanatory variables: model A only includes the covariates RD and RD^2; model B nests model A, adding bank characteristics (TA, NIM and DIV) as explanatory variables; model C nests the first two, introducing

macroeconomic covariates ($lnGDPPC$ and UR). In this way we hope to obtain a clearer, more robust, picture of the effect of RD on each efficiency score. Estimates for the resulting nine models are displayed in Table 4.8.

Table 4.8 - Results for the different specifications of the base model

	Model A			**Model B**			**Model C**		
Dependent variable	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***
CE/TE/AE lagged 1	1.008***	0.874***	0.966***	0.274***	0.527***	0.324***	0.196***	0.531***	0.287***
RD	-0.879***	-0.674***	-2.064***	-1.792***	-1.048***	-1.399***	-1.971**	-1.076***	-1.507***
RD^2	-12.251***	14.152***	-34.043***	-40.464***	-22.518***	-29.889***	-31.445***	-26.517***	-25.321***
TA				0.023***	0.021***	0.025***	0.064***	0.015***	0.043***
NIM				-0.019***	-0.003	0.001	-0.0002	-0.006**	0.008
DIV				-0.001***	-0.00003	-0.0008***	-0.0009***	-0.0002	-0.0008***
lnGDPPC							-0.070***	0.013***	-0.031**
UR							-0.002	-0.001	0.0006
Z	503823.42 (0.000)	117237.81 (0.000)	645009.88 (0.000)	39374.53 (0.000)	395667.44 (0.000)	376796.01 (0.000)	50488.81 (0.000)	780499.76 (0.000)	336604.51 (0.000)
m_1	-5.020 (0.000)	-4.870 (0.000)	-4.760 (0.000)	-5.070 (0.000)	-4.880 (0.000)	-4.590 (0.000)	-5.050 (0.000)	-4.920 (0.000)	-4.520 (0.000)
m_2	0.910 (0.364)	-0.890 (0.376)	0.190 (0.847)	1.860 (0.063)	-0.260 (0.795)	2.310 (0.021)	1.970 (0.049)	-0.220 (0.825)	2.280 (0.023)
$Hansen$	46.980 (0.054)	46.920 (0.055)	37.090 (0.286)	44.190 (0.092)	51.960 (0.019)	45.420 (0.074)	45.640 (0.070)	46.970 (0.054)	44.850 (0.082)
Marginal effects									
APE	-0.855***	-0.702***	-1.998***	-1.713***	-1.004***	-1.340***	-1.910***	-1.024***	-1.457***
At EM min	1.538***	-3.467***	4.654***	6.193***	3.396***	4.500***	4.234***	4.157***	3.490***
At EM max	-3.402***	2.239***	-9.075***	-10.125***	-5.685***	-7.554***	-8.447***	-6.537***	-6.721***

Notes

p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.

Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.

Check Table 4.2 for description of variables.

The estimated coefficients of RD and RD^2 are both negative and statistically significant at the 1% level, under all three models for both CE and AE, as well as under models B and C with TE as dependent variable. In this latter case, the coefficients of RD and RD^2 in model A are estimated to be negative and positive, respectively, both significant at the 1% level. Thus, in models A, B and C for CE and AE, and models B and C for TE, the relationship between efficiency and RD is represented by an inverted *U*-shaped curve, whereas, under model A for TE the relationship is represented by a *U*-shaped curve.

The APE's are negative across the different models, a result that supports the general conclusion that, as the level of earnings management increase, efficiency decreases. More in particular: i) earnings management negatively affects the bank's ability to make its operations profitable (economic/cost efficiency); ii) earnings management practices prevent banks from using fewer resources (for a given output) or, equivalently, to produce more with given resources (technical efficiency); and, iii) earnings management causes costs actually incurred by the bank to be above the minimum costs given the level of output produced (allocative efficiency).

A negative relationship between efficiency and earnings management was already suggested in the literature (e.g., Ab-Hamid et al., 2018; Li et al., 2016), although in a linear regression framework (assuming a constant marginal effect). Our results are supported by the existence of low quality loan portfolios (high levels non-performing loans), which can lead to additional loan monitoring and execution costs (Sufian and Abd. Majid, 2007; Sufian and Noor, 2009; Sufian and Habibullah, 2010; Sufian and Kamarudin, 2015). In fact, the 2013 average ratio of non-performing loans to total loans was 10.2% and in 2017 it was 8%, at levels that can be considered rather high (European Central Bank, 2017c). One other factor that helps justify the negative relationship

between earnings management and efficiency is the fact that excess provisions, above what is prudently necessary (discretion), do not favor confidence in lending to banks, in such a way that the benefits of this lending surpass the expenses with provisions (Sharma et al., 2015). In addition, bank administrations do not appear to be practicing adequate monitoring and controls and exhibit excess operational expenses ("bad management"), which further exacerbates inefficiency. Indeed, in the period under review and for the inputs considered, operational expenses from 2013 to 2017 increased 1.36% and personnel expenses grew 3.06%.

As mentioned, marginal effects of RD were also computed at the minimum and maximum sample values. These effects are positive and negative under, respectively all three models for CE and AE, and models B and C for TE. For a low level of RD, a positive impact of RD on efficiency can be supported by the "skimping hypothesis" (Berger and DeYoung, 1997), under which bank administrations decide not to spend sufficient resources on credit risk analysis, nearing efficiency even with a high level of non-performing loans (Banya and Biekpe, 2018). Under model A with TE as dependent variable, we obtained a negative marginal effect estimate at the sample minimum of RD and a positive effect estimate at its sample maximum. This result, however, should not call into question the overall indication of a negative impact of RD, in view of the negative sign of the APE's across all nine models.

With regard to the impact of all the control variates on the different efficiency measures (model C), banks' size has a positive and statistically significant impact on the three types of efficiency, in line with the results of Nair and Vinod (2019). This means that the larger the bank, the higher CE, TE and AE, as a result of economies of scale attained by larger banks. The net interest margin has a negative impact on TE. A high net interest margin is indicative of the bank's greater exposure to risk, with reflections on its

efficiency—in line with the conclusions of Nair and Vinod (2019). Our results also show a negative effect of revenue diversification on CE and AE, meaning that banks with a greater revenue diversification are less efficient, as non-traditional activities are less efficient—in line with the conclusions by Phan et al. (2018). Finally, $lnGDPPC$ has a negative marginal effect on CE and AE and a positive effect on TE and the unemployment rate appears generally irrelevant.

In all the estimated models described in Table 4.8, the estimate of the coefficient of the lagged dependent variable is positive and statistically significant. This finding confirms the dynamic character of the adopted models, under which past efficiency (measured as CE, TE or AE) positively affects current efficiency scores.

To conclude this section, we note that the adopted models were not rejected by the specification checks mentioned in Section 4.3.3.2: i) there is no evidence of second-order error autocorrelation ($m2$ statistic), as the corresponding null hypothesis is not rejected at the 1% level; ii) there is no strong evidence of correlation between instruments and error terms (Hansen statistic), as the null hypothesis that the instruments are valid is not rejected at the 1% level.

4.4.2.2. Earnings Management Covariate: RDS

In the second group of models, the earnings management covariate is represented by the variable RDS consisting of RD scaled by the ratio of total loans to total assets. For each dependent variable, we follow the same procedure as in the previous section, estimating three models: model A with covariates RDS and RDS^2; model B, adding bank characteristics (TA, NIM and DIV) to model A; and model C, nesting the first two with the addition of macroeconomic covariates ($lnGDPPC$ and UR). As before, by considering several model variants, we aim at a more robust understanding of the effect of the earnings

management covariate on each efficiency score. Estimates for the resulting nine models are displayed in Table 4.9.

Table 4.9 - Results for the different specifications of the model with RDS as interest variable

	Model A			**Model B**			**Model C**		
Dependent variable	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***
CE/TE/AE lagged 1	1.017***	0.911***	0.970***	0.304***	0.517***	0.334***	0.223***	0.525***	0.311***
RDS	-1.962***	-0.992***	-4.779***	-4.022***	-2.842***	-2.369***	-4.188***	-3.036***	-2.645***
RDS^2	-37.487***	12.386***	-89.908***	-94.304***	-56.341***	-67.964***	-80.454***	-62.173***	-65.707***
TA				0.023***	0.022***	0.025***	0.064***	0.015***	0.040***
NIM				-0.027**	-0.004	-0.001	-0.004	-0.005	0.0003
DIV				-0.0008***	-0.00003	-0.0007***	-0.0007***	-0.0001	-0.0006**
lnGDPPC							-0.072***	0.014**	-0.025*
UR							-0.002	-0.001	0.0003
Z	989766.64	1.19e+06	721546.12	57917.22	1.02e+06	296673.02	62321.59	1.88e+06	273792.50
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
m_1	-5.030	-4.890	-4.800	-5.070	-4.810	-4.660	-5.080	-4.890	-4.630
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
m_2	0.940	-0.950	0.330	2.380	0.010	2.310	2.390	0.070	2.350
	(0.346)	(0.344)	(0.742)	(0.017)	(0.989)	(0.021)	(0.017)	(0.944)	(0.019)
$Hansen$	45.320	46.190	37.080	41.640	47.610	45.020	42.460	46.990	44.200
	(0.075)	(0.063)	(0.286)	(0.144)	(0.048)	(0.079)	(0.125)	(0.054)	(0.092)
Marginal effects									
APE	-1.923***	-1.004***	-4.686***	-3.924***	-2.784***	-2.299***	-4.104***	-2.972***	-2.577***
At EM min	3.703***	-2.864***	8.811***	10.232***	5.674***	7.904***	7.972***	6.361***	7.287***
At EM max	-8.024***	1.011***	-19.319***	-19.274***	-11.955***	-13.361***	-17.199***	-13.091***	-13.272***

Notes

p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.

Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.

Check Table 4.2 for description of variables.

We found similar results to those highlighted in the previous section, given the signs of the estimated coefficients of RDS and RDS^2: in models A, B and C for CE and AE, and models B and C for TE, the estimated relationship between efficiency and RDS corresponds to an inverted *U*-shaped curve, whereas, under model A for TE the relationship is represented by a *U*-shaped curve.

The APE's remain negative across the different models, and the marginal effects of RDS at its minimum and maximum sample values have the same sign as before. Thus, the economic significance of the results explained in the previous section carries over to the present set of models.

With the exception of the net interest margin covariate, the effects of the control variables remain unchanged, as compared to the previous models. Now, net interest margin covariate is no longer statistically significant under model C for TE. Furthermore, the coefficient of the lagged dependent variable remains positive and statistically significant, confirming the dynamic nature of the model. All the models, in addition, passed the two specification checks already utilized in the previous section.

4.4.2.3. Earnings Management Covariate: $LLPTL$

In the third group of models, total LLP, denoted $LLPTL$, is used as an earnings management proxy, following Ab-Hamid et al. (2018), Wu et al. (2016). This variable corresponds to the sum of discretionary and non-discretionary provisions. This variable has also been used in the literature as a proxy for bank's risk, the management of which is inherent to the banking business.

In view of the statistical significance of all the control variables in models C (Table 4.10), the latter seem to be the ones that yield the most reliable parameters' estimates. This conviction is reinforced by the contrast in the estimated coefficients of

$LLPTL$ and $LLPTL^2$ in models A (without control variates) and models C. Under model C, with any of the three alternative dependent variables, the estimated coefficients of $LLPTL^2$ are negative and statistically significant at the 1% level; the coefficients of $LLPTL$ are insignificant for CE, negative and statistically significant at the 1% level for TE and positive and statistically significant at 1% for AE. The relationship between efficiency and $LLPTL$ is, thus, represented by an inverted *U*-shaped curve. However, analyzing the APE's, we find that these are negative for CE and TE, and positive for AE. The marginal effects of $LLPTL$ were also computed at the minimum and maximum sample values; under model C for CE, TE and AE, these effects are always positive and negative, respectively.

A nonlinear inverted *U*-shaped relationship finds support in the two hypotheses already highlighted in Section 4.4.2.1.: i. a positive impact (for low levels of earnings management) is supported by the "skimping hypothesis"; and, ii. a negative effect is caused by the "bad management" hypothesis. Overall, we obtained a negative estimated marginal effect of $LLPTL$ on CE and TE (negative APE), that is, the greater the volume of total provisions, the lower the level of these types of efficiency. This relationship, however, does not occur in the regression for AE, for which we obtain a positive APE, from which we can infer that an increase in $LLPTL$ causes costs actually incurred by the bank to be below the minimum costs, given the level of output produced.

The estimated parameters of the control variables in models B and C are similar to those of the previous sets of models, with the exception of the net interest margin, now irrelevant in all models, and the unemployment rate that has a negative marginal effect on TE. As in the first two cases (Sections 4.4.2.1. and 4.4.2.2.), the coefficient of the lagged dependent variable is positive and statistically significant, confirming the dynamic

nature of the efficiency scores processes. Also, the nine models again all passed the two specification tests already utilized in the previous two sections.

Table 4.10 - Results for the different specifications of the model with LLPTL as interest variable

	Model A			**Model B**			**Model C**		
Dependent variable	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***	***CE***	***TE***	***AE***
CE/TE/AE lagged 1	0.992***	0.990***	0.954***	0.250***	0.530***	0.250***	0.195***	0.516***	0.238***
LLPTL	1.519***	0.335***	2.311***	-0.031	-0.897***	1.143***	-0.242	-0.537***	0.676***
$LLPTL^2$	-17.235***	10.190***	-45.458***	-31.290***	-10.285***	-35.397***	-24.147***	-13.353***	-30.429***
TA				0.022***	0.021***	0.027***	0.067***	0.016***	0.047***
NIM				-0.010	0.001	-0.0004	0.006	0.0001	0.012
DIV				-0.0006***	-0.00001	-0.0005***	-0.0006***	-0.00003	-0.0004***
lnGDPPC							-0.076***	0.012*	-0.037***
UR							-0.001	-0.001**	0.001
Z	152898.00 (0.000)	552156.11 (0.000)	1.56e+06 (0.000)	50811.35 (0.000)	138543.54 (0.000)	91551.09 (0.000)	51301.19 (0.000)	150565.19 (0.000)	115778.69 (0.000)
m_1	-5.020 (0.000)	-5.020 (0.000)	-4.690 (0.000)	-4.930 (0.000)	-4.920 (0.000)	-4.320 (0.000)	-4.840 (0.000)	-4.910 (0.000)	-4.320 (0.000)
m_2	0.800 (0.424)	-0.780 (0.434)	-0.170 (0.869)	2.340 (0.019)	-0.130 (0.893)	2.480 (0.013)	2.360 (0.018)	-0.070 (0.948)	2.410 (0.016)
$Hansen$	44.850 (0.030)	42.000 (0.056)	39.650 (0.085)	46.320 (0.022)	46.260 (0.022)	42.780 (0.048)	47.800 (0.015)	46.080 (0.023)	41.820 (0.058)
Marginal effects									
APE	1.275***	0.479***	1.667***	-0.474***	-1.043***	0.642***	-0.584***	-0.727***	0.245***
At EM min	3.795***	-1.010***	8.313***	4.099***	0.460	5.817***	2.945***	1.225***	4.693***
At EM max	-5.823***	4.676***	-17.053***	-13.362***	-5.279***	-13.936***	-10.530***	-6.226***	-12.287***

Notes

p-values associated with tests statistics in parentheses; *: p-value < 0.10; **: p-value < 0.05; ***: p-value < 0.01.

Z denotes a Wald test statistic for the joint significance of all coefficients; m_i, $i = 1,2$, denotes a serial correlation test of order i, asymptotically distributed as a $\mathcal{N}(0,1)$ random variate under the null hypothesis of no serial correlation; $Hansen$ denotes the value of the test statistic for over-identifying restrictions, asymptotically distributed as a chi-squared random variate under the null hypothesis of no correlation between instruments and error term.

Check Table 4.2 for description of variables.

4.4.2.4. General Comment

We now compare the results obtained considering $LLPTL$ as earnings measurement proxy with the results obtained using the variables RD and RDS (that involve only the discretionary component of LLP). We find that accounting for non-discretionary provisions (the larger fraction of $LLPTL$, resulting from legal obligations) substantively affects the direction of estimated effect of loan provisions on AE: a negative estimate under the first two sets of models (EM proxied by RD or RDS—Tables 4.8 and 4.9), vs. a positive estimate (APE positive) with $LLPTL$ (Table 4.10). From this we can conclude that regulatory factors, affecting non-discretionary provisions, positively affect AE (Isik and Hassan, 2002). Meanwhile, the estimated effect of $LLPTL$ on CE and TE is of the same sign as the impact of the discretionary part of provisions (RD and RDS).

This finding helps stress the importance of discerning discretionary loan provisions within total LLP, when studying the effect of earnings management on banking efficiency. Indeed, earnings management should only include the part of the provisions that is discretionarily handled, excluding those that are imposed by regulations.

4.5. Conclusion

Having as reference the Eurozone banks directly supervised by ECB and the preparatory period for the implementation of IFRS 9, after the implementation of the Basel III agreement (2013 to 2017), the present study sought to answer the following research questions: i. What was the evolution of the economic, allocative and technical efficiency, from 2013 to 2017, in banks directly supervised by the ECB? ii. What is the impact of earnings management on banking efficiency? iii. What is the differentiated impact of

discretionary LLP and, on the other hand, of total LLP on banks' economic, allocative and technical efficiency?

In order to answer the first question, we calculated cost, technical and allocative efficiency scores for each bank in the sample years comparing banks in each country. The main conclusions are that the levels of cost efficiency rose, on average, in the observation period (2013: 0.455; 2017: 0.518), with a global average for all banks and the entire period of 0.470. French and Dutch banks exhibit, on average, the highest levels of cost efficiency, with the strongest capacity to make their operations profitable. Technical efficiency scores also rose, on average (2013: 0.668; 2017: 0.855), with a global average of 0.743. With regard to this type of efficiency, it was found that Estonian and Dutch banks have always been technically efficient. Nonetheless, allocative efficiency scores decreased in the period (2013: 0.694; 2017: 0.617), with a global average of 0.641 in that period. French banks, taken as a whole, were also the ones with the best global averages of allocative efficiency. Our results suggest that the highest levels of efficiency are those technical efficiency, followed by allocative and, finally, cost efficiency. This means that the greatest source of cost inefficiency comes from AE, or equivalently, that inefficiency comes more from the incorrect choice of inputs than from underutilization/waste of resources.

Regarding the second and third research questions, our results suggest that the relationship between earnings management, measured through discretionary provisions (RD), and all efficiency scores (CE, TE and AE) is of an inverted U-shaped form. For each of these scores we obtained negative APE's. In our view, the reasons for the decrease in efficiency when earnings management increases are as follows: i. the high weight of non-profitable loans in these banks is leading to increased monitoring and loan execution costs; ii. the creation of provisions in a discretionary (non-regulatory) manner is not

increasing confidence in the sector; and, iii. bank administrations may not be practicing adequate monitoring and controls ("bad management"). The initial positive impact of earnings management on CE, TE and AE is supported by the "skimping hypothesis" (Berger and DeYoung, 1997), under which bank administrations decide not to spend sufficient resources on credit risk analysis, making efficiency, even with a high level of non-performing loans (Banya and Biekpe, 2018). Overall, these results prove to be robust when the earnings management proxy is changed from RD to RDS.

We also considered, as earnings management proxy, total loan loss provisions, which include both a discretionary and a non-discretionary part. To this effect, the impact of the variable $LLPTL$ on the three efficiency measures was estimated. We find a positive estimate of the impact of $LLPTL$ on allocative efficiency—as opposed to a negative estimate of the effect of discretionary provisions. This finding helps stress the importance of defining earnings management solely as the discretionary component of loan loss provisions, when analyzing the former's effect on banking allocative efficiency.

In view of the above, it appears that the division between discretionary and non-discretionary provisions should be disclosed by banks in their reports. Our study contributes to the literature on this topic, since, to the best of our knowledge, the effect of earnings management, gauged through the discretionary component of LLP, on banking efficiency has not been studied. This study can also prove relevant for the Regulator to analyze these two dimensions in the supervised entities. Furthermore, the present work produced to a "snapshot" for the preparatory period for the implementation of IFRS 9. In the future, it may prove interesting to study the effect of the expected loss model, sanctioned by IFRS 9, on degree of discretion of provisions' management and, consequently, on the management of results. In addition, and as a way of overcoming the

limitation of studying cost efficiency, we can analyze income efficiency, as it enables the identification of inefficiencies in both outputs and inputs (Berger and DeYoung, 1997).

5

Chapter 5 – Concluding Remarks

The aim of the present dissertation lies in the study of banking performance from different perspectives – profitability, risk, remuneration and efficiency – bearing in mind the changes that occurred in the regulatory framework (e.g., Directive 2013/36/EU (CRD IV), the imposition of gender quotas by the ECB, the direct supervision of the ECB and the implementation of IFRS 9). These measures were in part motivated by the need to address the weaknesses of the European banking sector, evinced by the 2007/2008 financial crisis. In order to achieve this general objective, the proposed text comprises three central chapters, addressing each of these different perspectives through which the study of the performance of supervised Eurozone banks directly by the ECB was envisioned.

In the second chapter, we investigate the effect of political connections on banking performance, as measured by profitability and risk, as well as the effect of gender diversity on this relationship. For this purpose, we formulated a model allowing for nonlinearities in the relationships between political connections, gender diversity and banking performance. The proposed model was estimated on the basis of a sample of 83 significant banks, observed from 2013 through 2017, with results indicating that when gender diversity within the board is high (about 14%), the relationship between political connections and, respectively, profitability and risk, is *U*-shaped and inverted *U*-shaped. This means that when the presence of female elements on the Boards of Directors is high, the negative impact of political connections on performance (lower profitability and higher risk) becomes positive (higher profitability and lower risk), when political connections on the board reach 20% (in the analysis of profitability) and 14% (for risk). However, if political connections are lower than these values, gender diversity cannot improve banking performance. Thus, the differentiating characteristics of the female gender (e.g., more ethical behavior and greater risk aversion) help mitigate the negative

effects of political connections on banking performance, safeguarding the banking institutions' interests. In addition, results suggest that a minimum of 14% gender diversity can contribute to greater social justice and beneficial structural change on the board. Finally, the results are robust when using a different proxy to measure gender diversity.

In the third chapter, the influence of gender diversity over the effect of the members of the Boards of Directors' political connections on their remuneration was studied, having as reference the period between 2011 and 2019 and, a sample of 61 significant banks. Estimated results lead to the conclusion that that political connections have a negative effect on the total and average remuneration both in the period before the direct supervision of the ECB and in subsequent years. This negative effect remains for both low and high levels of political connections. Accordingly, the study reaches the likely conclusion that members of the Boards of Directors with political connections want other benefits in detriment of high remunerations, because in the future, they may aspire to have other political positions, not wanting to be associated with high remunerations. Also, their lack of experience in the banking sector and the fact that they may belong to more than one board may be a reason for them to accept a lower remuneration. On the other hand, shareholders can mitigate agency costs derived from personal interests of political connections through the remuneration policy. When considering the effect of gender diversity on the negative relationship between political connections and remuneration, it appears that the former mitigates this impact: that is, the more women on the board, the less the negative impact of political connections on remuneration. Thus, women, who have higher ethical concerns and are more rule compliant, will promote more appropriate remuneration within boards, thereby reducing the consequences of personal interests of members with political connections. However, this effect of gender diversity is weaker when the board has high political connections, which means that

women will have to use more power in these cases, a feature that can be viewed as not strongly innate to the female gender. Finally, we also found that the implementation of the CRD IV Directive and the ECB's gender quota had a positive impact on the remuneration of board members. These results prove to be robust when changing the measure used to measure gender diversity.

Chapter four aimed to analyze banking efficiency during the period from 2013 to 2017; a preparatory period for the implementation of IFRS9 and after the implementation of the Basel III Agreement. In this chapter, we begin by analyzing the evolution of efficiency during that period in its different dimensions (economic, technical, and allocative), from a sample of 70 significant banks in the Eurozone. Subsequently, the impact that earnings management, measured by the LLPs' discretionary component and the total LLP's, on the different efficiency measures quantified in this study's first stage, is analyzed. More specifically, we started by estimating the scores of the three types of efficiency - economic, technical and allocative - verifying that, on average, economic and technical efficiencies increased in the period under analysis and allocative efficiency decreased. This means that the most significant source of economic inefficiency comes from allocative efficiency. In a second stage, the effect on earnings management, measured by discretionary provisions, was estimated in three types of efficiency, concluding that the two variables' relationship has an inverted *U*-shaped. However, and to understand the main directional effect of discretionary provisions on efficiency, the average partial effects (EPA) were calculated. EPA's indicate a negative impact between earnings management, as measured by discretionary provisions, and efficiency. This is indicative that the excess of these provisions is not bringing confidence to the sector, which affects the three types of efficiency. In addition, and in line with the "bad management" hypothesis, directors may not be implementing adequate monitoring and

control mechanisms due to their discretionary practice and value judgments in the provisions they constitute, with an impact on efficiency. However, following the dominant literature, when analyzing the effect of total provisions, we find a positive effect on the allocative efficiency. This conclusion shows the importance of separating discretionary provisions from total provisions when analyzing earnings management.

In studying the effect of political connections, gender diversity and earnings management on the performance of significant banks in the Eurozone, the present Thesis appears, in our understanding, to be a fruitful contribution to the comprehension of banking performance and therefore useful for investors, managers and regulators. Nonetheless, it is not without limitations. First of all, it is important to recognize that gender consideration encompasses more characteristics besides the differentiation between female and male members, as well as the political connections, which can exist through family relationships beyond the direct history in political positions. Secondly, we cannot ignore the fact that, when assessing the suitability of the boards' elements, there will be banks that were assessed earlier than others, taking into account the mandates in force.

This Thesis also opens the door to future research. For example, it would be interesting to study the impact of gender diversity on banking performance as of 2019, to analyze banks with more than 50% female elements on their Boards of Directors. For this purpose, a quasi-experimental study is suggested, with the inclusion of a control group of banks that were not subject to the regulations mentioned, separating remuneration into its various components (e.g., money, shares, bonds), controlling other characteristics of the directors (e.g., age, nationality, experience in the banking sector) and analyzing the effects of the implementation of the IFRS9 on cost and income efficiency.

One other approach that would deserve consideration is the collection of additional information from bank directors (through a questionnaire) in order to build an ethics index accounting for personal characteristics of directors (e.g., gender, education, professional experience, leadership style, personality type, political and social connections) in the framework of deontological and professional conduct characteristics (e.g., analysis of compliance with the permits and prohibitions in force in codes of ethics and behavior). The construction of such an index would allow us to deepen the study of the effect of political connections and gender diversity on banking performance, in its different dimensions, and on earnings management practices.

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