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CEOs' Compensation in the Global Systemically Important Banks

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BUSINESS
SCHOOL

Department of Finance

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RESUMO

Este estudo avalia o impacto das características do banco, particularmente, risco, rendibilidade e dimensão, na remuneração dos CEOs nos Bancos Globais Sistemicamente Importantes. Analisamos o impacto da implementação dos *Principles and Standards for Sound Compensation (P&S)* do *Financial Stability Board* na remuneração dos CEOs. Deste modo, tentamos responder a um conjunto de perguntas. A regulamentação sobre a remuneração dos CEOs tem sido bem sucedida? Verifica-se uma diminuição na sensibilidade da sua remuneração face ao desempenho do curto prazo? Verifica-se um aumento na sensibilidade da remuneração face ao risco? O nosso modelo é estimado com dados de 35 bancos de 13 países durante 2011, 2014 e 2017. Concluímos que a sensibilidade da remuneração variável do CEO em relação ao risco está significativamente mais (negativamente) correlacionada durante o período entre 2014 e 2017 para a variável Rácio de Crédito Malparado. A sensibilidade da remuneração variável do CEO foi menos positivamente correlacionada com o desempenho de curto prazo apenas durante o período entre 2011 e 2014. Estas conclusões indicam que as mudanças nas práticas de remuneração não estão totalmente alinhadas com os P&S. Há inconsistência de resultados entre as variáveis de risco e a compensação variável. O Rácio de Crédito Malparado tem uma relação negativa e a Volatilidade dos Retornos das Ações tem uma relação positiva, o que pode indicar que a transmissão das informações contabilísticas para o mercado pode não ser a mais adequada. Por fim, a dimensão do banco, medida em Total de Ativos, está negativamente correlacionada com a remuneração variável.

Palavras-chave: Banca; Remuneração; Regulamentação; Supervisão
Classificação JEL: G21, G28

ABSTRACT

This study assesses the impact of bank's characteristics, particularly, risk, profitability, and firm size, in compensation for Chief Executive Officers (CEOs) in the Global Systemically Important Banks. We analyze the impact of the implementation of the Financial Stability Board's (FSB) Principles and Standards for Sound Compensation (P&S) in CEO compensation. Thus, we try to answer a set of questions. Has the regulation on CEO compensation been successful? Do we observe a decrease in the sensitivity of their compensation to short-term performance? Do we see an increase in the sensitivity of compensation to risk? Our model is estimated with data on 35 banks from 13 countries during 2011, 2014, and 2017. We find that the sensitivity of CEO variable compensation concerning risk is significantly more (negatively) correlated during the period between 2014 and 2017 for the variable Nonperforming Loans Ratio. CEO variable compensation's sensitivity has been less positively correlated with short-term performance only during the period between 2011 and 2014. These conclusions indicate that the changes in compensation practices are not totally in line with the P&S. There is an inconsistency of results between the risk variables and the variable compensation. The Nonperforming Loans Ratio has a negative relationship, and the Stock Returns Volatility has a positive relationship, which may indicate that the transmission of the accounting information to the market may not be the most adequate. Lastly, the firm size, measured by Total Assets, is negatively correlated with CEO variable compensation.

Keywords: Banks; Compensation; Regulation; Supervision
JEL Classification: G21, G28

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GLOSSARY

AIG – American International Group

BCBS – Basel Committee on Banking Supervision

BIS – Bank for International Settlements

CDS – Credit Default Swap

CEBS – Committee of European Banking Supervisors

CEO – Chief Executive Officer

CGFS – Committee on Global Financial System

CPMI – Committee on Payments and Market Infrastructures

ER – Efficiency Ratio

EU – European Union

FDIC – Federal Deposit Insurance Corporation

FHLMC – Federal Home Loan Mortgage Corporation

FNMA – Federal National Mortgage Association

FSA – Financial Services Authority

FSB – Financial Stability Board

FSF – Financial Stability Forum

GDP – Gross Domestic Product

G-SIBs – Global Systemically Important Banks

IAIS – International Association of Insurance Supervisors

IASB – International Accounting Standards Board

IMF – International Monetary Fund

IOSCO – International Organization of Securities Commissions

LITP – Long-Term Incentive Plan

MRT – Material Risk Takers

NPL – Non-performing Loans Ratio

OECD – Organization for Economic Cooperation and Development

PPS – Pay-Performance Sensitivity

ROA – Return on Assets

ROCE – Return on Common Equity

SRV – Stock Returns Volatility

TA – Total Assets

TC – Total Compensation

Tier1 – Tier 1 Capital Ratio

TLTD – Total Loans over Total Deposits

TSTA – Total Securities over Total Assets

VC – Variable Compensation

VCTC – Variable Compensation over Total Compensation

UK – United Kingdom

US – United States

1 Introduction

Executive compensation has been a topic with considerable interest in the literature over the past decades. However, only after the 2007-2008 financial crisis, it has begun to be into the spotlight because, since the classic agency theory does not apply to banks and other financial institutions, their compensation requires more attention (Zalewska, 2016).

Chief Executive Officers' (CEOs) compensation packages vary notably between countries, and are incredibly complex, particularly in their variable components. Due to their significant influence in determining the top managers' appetite for risk, it is important to have a great knowledge of their determinants and understand how they might affect the top managers' risk-taking. This is crucial for regulators and financial authorities to build an effective regulation (Cerasi et al., 2020).

Mismanagement of CEO compensation of large financial institutions is considered one of the many causes that led to the start of the 2007-2008 financial crisis. Nevertheless, there is no consensus among all authors (Hulbert, 2009). Some authors consider that the financial institutions took excessive risks even though that some prudent risk management policies were already in place. According to the Financial Stability Forum (2009), *"Multiple surveys find that over 80 percent of market participants believe that compensation practices played a role in promoting the accumulation of risks that led to the current crisis"* (p. 4). In contrast, other studies find evidence that CEOs were uninformed of the financial crisis since they had significant investments in their institutions during the financial crisis (Fahlenbrach & Stulz, 2011; Hayes et al., 2012). Moreover, Cerasi & Oliviero (2015) indicate that, at certain banks, the combination between higher variable compensation for CEOs and negligent regulation was associated with a weaker financial performance during the financial crisis.

Given that CEOs are responsible for the incentive to pursue risk in banking, has the regulation on their compensation been successful? Do we observe a decrease in the sensitivity of their compensation to short-term performance? Do we see an increase in the sensitivity of compensation to risk? These are questions that we try to answer in this study.

In 2011, to align compensation practices with prudent risk-taking, especially at the systemically financial institutions, the Financial Stability Board (FSB) published the Principles for Sound Compensation Practices and their Implementation Standards (Principles and Standards, P&S). Their implementation was targeted to all critical financial institutions headquartered in FSB and European Union (E.U.) jurisdiction.

Following a similar approach from Cerasi et al. (2020), we analyze the impact of the bank's characteristics in CEO compensation, particularly, the risk, profitability, and size. We use a sample of 35 banks, known as Global Systemically Important Banks (G-SIBs), from 13 countries, during 2011, 2014, and 2017. We analyze the variations in CEO compensation caused by the implementation of the P&S. We use a method whereby we estimate a model that incorporates measures from banks' balance sheets, market information, and macroeconomic conditions. Using it, we can study the sensitivity of CEO variable compensation to risk and profitability and test the success of regulation of bankers' pay.

The main results of this study are as follows. Although it is not statistically significant, the firm size, measured by Total Assets (TA), is negatively correlated with CEO variable compensation. In terms of risk, both variables are statistically significant. However, there is inconsistency within the results. The Nonperforming Loans Ratio (NPL) is negatively correlated with the variable compensation, and the Stock Returns Volatility (SRV) is positively correlated. This may indicate that the transmission of the accounting information to the market may not be more adequate. The sensitivity of CEO variable compensation concerning risk is significantly more (negatively) correlated during 2014 and 2017 for NPL. CEO variable compensation's sensitivity has been less positively correlated with short-term performance only during the period between 2011 and 2014.

The following sections are organized as follows. Firstly, we will identify papers related to executives' compensation in banking, making the relationship between this topic with regulation and the 2007-2008 financial crisis. In the next section, we define the hypothesis that will be tested. Section 4 describes the data, the variables used in the analysis, and the methodology. Section 5 presents both descriptive and econometric analysis, including the results of the regressions. Section 6 is dedicated to the robustness of the findings. Lastly, we present a summary of the main conclusions and a possible future extension of this paper.

2 Literature Review

The topic of corporate governance, in particular, executives' compensation, has received considerable attention in the last decades, especially after the 2007-2008 financial crisis. Despite the academic literature on this subject is extensive, executive compensation is not yet fully understood, mainly due to the divergence of studies already published. This is due to the different ways of studying and analyzing the subject.

In this chapter, we present previous studies related to executives' compensative in banking. This topic will also be analyzed in terms of regulation and linked to the 2007-2008 financial crisis.

2.1 Executives' Compensation

One of the first studies related to management compensation in banking finds that, amidst other things, the change in CEO compensation depends on performance measured by stock returns and accounting earnings (Barro & Barro, 1990).

Similarly, Houston & James (1995) conducted one of the most important studies related to risk discussed in executive compensation. They use a sample of 134 commercial banks during 1980 and 1990 and divide it into "banks" and "non-banks." The main conclusion of this study is that there is no evidence that executive compensation is structured to promote risk-taking. Furthermore, the authors document other important findings: CEOs in the banking receive, on average, less cash compensation and less equity-based compensation than non-bank executives. This might be explained by the differences in investment opportunities and other firm characteristics, such as the firm's asset mix, because they contribute to agency problems. Another important finding is that CEOs in banks have fewer growth options and hold fewer stock options than CEOs in non-banks.

Guerra (2010) uses the approach conducted by the study presented above. However, it is used data of 2008 related to 2007, and 153 U.S. companies in the banking industry. This study finds that larger companies, also known as "too big to fail," do not rely on equity-based incentives. These companies also rely more on options rather than cash compensation, since there is a positive relationship between these companies and the value of options granted. Compensation in these companies is structured to promote risk-taking since there is a strong relationship between "too big to fail" companies and equity-based incentives. Nonetheless, this

does not happen when we consider the salary plus bonus. Comparing this study with Houston & James (1995), differences are detected in the structure and level of compensation, but these differences are more rooted in the structured compensation packages.

On the other hand, other studies focus their analysis not only on CEO compensation but also on other top managers' compensation. Ang, Lauterbach, & Schreiber (2002) analyze the compensation structure of top management teams using a sample composed of 166 U.S. banks between 1993 and 1996. They find that compensation structures are different between CEOs and non-top executives: CEOs receive more and have significantly higher incentive features concerning performance than non-top executives.

Many studies also relate executive compensation with agency problems. Bebchuk & Fried (2003) defend that executive compensation should be treated as part of the agency problem itself and not only as an instrument to deal with this problem. The authors also argue that managers have a tremendous impact when designing their compensation structures and that this can be unwholesome to the company.

In the literature, the number of works related to the shareholder-management problem and the risk-shifting problem between debtholders and shareholders is scant. Notwithstanding, there are some exceptions, such as the study performed by T. John & John (1993). They adopt a perspective in which CEO compensation is used to mitigate risk-shifting incentive, besides its capacity to align executives' incentives with shareholders' interests. One of their main conclusions is that there is a negative relationship between leverage and pay-performance sensitivity (PPS). As the leverage increases, the optimal PPS decreases in order to cancel out the increase in risk-shifting incentive.

K. John et al. (2010) analyze CEO compensation in banking using a framework that is optimally structured to reduce the costs of both agency problems: the shareholder-management problem and the risk-shifting problem between debtholders and shareholders. The authors suggest that the first agency problem might be weakened by tying managerial compensation to shareholder wealth. However, in levered firms, this solution can intensify the second problem: "*managers who are aligned with shareholders will have the risk-shifting incentive, i.e., the incentive to undertake excessive risk at the expense of debtholders*" (K. John et al., 2010, p. 383).

The study above also extends the analysis performed by T. John & John (1993) by introducing outside monitoring as another mechanism to control agency problems. They state that outside monitoring supports higher PPS. This can be explained because, if the outside

monitoring is used in the company's risk choice, and this company's risk-shifting incentives, the costs of the alignment of interests between shareholders and CEOs will decrease.

2.1.1 Summary of previous studies and models on Executives' Compensation

The following tables' main goal is to summarize some studies and models with the same purpose of the present study, in order to understand the impact of the bank's characteristics in executives' compensation.

Table 2.1 Summary of studies related to the executives' compensation and bank's characteristics

Authors and Year of Publication	Market	Sample Description	Main Results
Barro & Barro (1990)	U.S.	Data between 1982 and 1987 for large commercial banks	Changes in CEO compensation depends on performance, as measured by stock returns and accounting earnings.
Cerasi et al. (2020)	36 countries	Data between 2006 and 2014 for 173 banks	CEO compensation in banking changed after the introduction of the P&S. In the affected commercial banks, the share of variable compensation was more (negatively) correlated with the banks' risk but less (positively) correlated with the profits. By contrast, in the affected investment banks, there was no significant effect on the correlation with the short-term profits, but the banks' risk-taking was affected.

Authors and Year of Publication	Market	Sample Description	Main Results
Gilson & Vetsuypens (1993)	U.S.	Data between 1981 and 1987 for 77 publicly traded firms either filed for bankruptcy or privately restructured	In financial distress, that is, firms with high leverage ratios, the PPS decreases. After the financial distress, the PPS increases.
Gregg et al. (2012)	FTSE 350 Stock Market Index	Data between January 1994 to December 2006 for 415 companies (including 59 firms in the financial sector)	The firm size has a significant impact on the level of executive compensation. Although the pay of the highest director was relatively high in the financial sector, there was no significant difference in the PPS between the financial sector and other sectors.
Hall & Liebman (1998)	U.S.	Data between 1980 and 1994 for 426 companies	The sensitivity of CEO compensation to firm performance and its compensation have increased significantly during the years of the study. The value of changes in CEO holdings of stocks and stock options are the main determinants of the compensation structure's PPS.
Houston & James (1995)	U.S.	Data between 1980 and 1990 for 134 commercial banks and 134 non-banking firms	There is no evidence that executive compensation is structured to promote risk-taking. On average, CEOs in banking receive less cash compensation and less equity-based compensation than non-bank executives.

Authors and Year of Publication	Market	Sample Description	Main Results
K. John & Qian (2003)	U.S.	Data between 1992 to 2000; Banks: 607 CEO-years; Manufacturing firms: 5,659 CEO-years	The PPS in firms decreases with the firm size, the debt ratio, and the leverage. Banks are highly leveraged firms, have higher debt ratios, and, in this sample, they are larger, which all implies a lower PPS. Most of the sensitivity can be attributed to options and stock holdings.
K. John et al. (2010)	U.S.	Data between 1993 to 2007; 1017 CEO-years for 143 bank holding companies	The PPS of CEO compensation in banking decreases with the leverage ratio. It increases with the intensity of outside monitoring on the bank's risk structure realized by regulators and subordinated debtholders.
Schaefer (1998)	U.S.	Data between 1991 and 1995 for large American firms	It analyzes the relationship between firm size and PPS and concludes that CEOs' PPS is approximately inversely related to the firm size.
Shah et al. (2017)	U.S.	Data between 2002 and 2008 for 287 firm-year observations and 2009 and 2013 for 389 firm-year observations	During the pre-financial crisis (2002-2008), the conclusions indicate a negative relationship between CEO bonuses and the banks' risk. In the post-financial crisis period (2009-2013), the bonuses also decrease the banks' risk.

Table 2.2 Summary of models related to the executives' compensation and bank's characteristics

Authors and Year of Publication	Main Findings
Chaigneau (2013)	Regulators must reduce PPS to weaken the incentive for risk-shifting within banks. In this way, regulators should set a minimum level for PPS preventing shareholders from giving a contract with PPS below the best level. That may reduce the CEO effort, the bank's equity value, and, consequently, incentive for investments in risky projects.
K. John et al., (2000)	This model shows that it may not be adequate to control risk-taking using bank regulation on bank capital ratios. Alternatively, they propose a mechanism using the Federal Deposit Insurance Corporation[1] (FDIC) insurance premium that consolidates incentive features of compensation. Thus, bank owners choose an optimal compensation structure that maximizes the bank's value.
T. John & John, (1993)	The optimal compensation structure depends not only on the relationship between shareholders and managers but also on debtholders. This model shows that there is a negative relationship between leverage and PPS. As the leverage increases, the optimal PPS decreases in order to cancel out the increase in risk-shifting incentive.

It is important to refer that this is a topic widely studied in the literature. Hence, many other studies and models were not mentioned. Many of them have even served as a base study for the papers described above.

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[1] The FDIC is an agency created by the U.S. Congress that has the primary goal of maintaining stability in the financial system, providing insurance to U.S. depository institutions.

2.2 Executives' Compensation and regulation in banking

Another important topic discussed in executive compensation is the one about regulation. A bank's most careless behavior can affect a country's entire banking system and even the economy itself. This is what happened with the 2007-2008 financial crisis when all the society suffered from its consequences, and taxpayers had to pay large sums of money for rescue packages. Zalewska (2016) states that more considerable attention needs to be paid to the banking system and regulators' involvement in determining the executives' compensation so that there is a short-term balance in banking performance with economic interests in the long-run.

According to Zalewska (2016), knowing that "*in the case of the banking sector, remuneration may be a source of type III agency conflict, i.e., the conflict between shareholders and other stakeholders,*" (p. 331) and that this sector has some particular characteristics, such as asymmetric information and systematic risk, compensation is an issue that should not be left solely to shareholders' hands.

Systematic risk in the banking sector is not reduced if shareholders' value is increased. Recent regulations try to limit the risk of investment strategies. However, these limits may not be following the shareholders' objectives and, consequently, the shareholder-propensity to the existing theories of corporate governance is inadequate.

According to K. John & Qian (2003), one crucial tool for establishing effective regulation is understanding the compensation structure that motivates banks' executives' decisions. For example, when the bank executives' and shareholders' interests are aligned, the executives will have incentives to undertake high-risk investments. K. John et al. (2000) defend that capital regulation to improve risk-shifting incentives is less effective than the regulation of the executives' incentives.

Before the 2007-2008 credit crisis, the United Kingdom's (U.K.) Corporate Governance Code established a set of requirements for the structure of executives' compensation used in a considerable number of corporate governance reports during the 1990s. Nonetheless, the Walker Report (Walker, 2009a) considered that the measures implemented by the Code were not correctly applied.

The Walker Report (Walker, 2009b, 2009a), together with the U.K.'s regulators in Financial Services Authority (FSA), identified a set of problems with the executives' compensation in banking and suggested a series of changes. Financial Service Authority (2009)

identifies failures in compensation structures in banking. It states that executive compensation was focused on short-term profits, leading to a lack of consideration of the risk exposure. Walker (2009b) suggests, as recommendations, such as the deferral of incentive payments, the compensation committees having the responsibility for the alignment of compensation and its risks, and that the performance should be tight to long-term profitability.

According to Gregg et al. (2012), compensation policies, at the international level, have been carried out through two leading organizations: the Committee of European Banking Supervisors (CEBS) and the Financial Stability Forum (FSF), later renamed FSB.

There has been an intense political pressure on both sides of the Atlantic (U.S. and E.U.) to regulate executive pay in the banking sector because pay levels were too generous, given the disastrous performance of various institutions during the crisis. Ferrarini & Ungureanu (2011a) study which political conditions led to the creation of P&S in financial institutions and examined their implementation on both sides of the Atlantic. They find that banking regulations on compensation are less flexible and more detailed in Europe than in the U.S., despite knowing that the 2007-2008 financial crisis started in the U.S., and the bankers' compensation was undoubtedly higher. They also find that the compensation practices of large banks in the U.S. have converged to the international Principles far beyond what is required.

Both U.S. and E.U. practices regarding the compensation of large banks generally converge, indicating that international principles have been useful. In the case of less complex banks that do not have significant international activity, the compensation structure is more divergent. Notwithstanding, this does not mean that harmonizing the compensation practices at an international level is always beneficial. For example, it can make compensation structures more rigid, and it can also deprive compensation committees and boards of drawing up new arrangements. Furthermore, if most jurisdictions do not adopt the same reform, it is unlikely to be successful. The reform adopted by only a few countries - unilateral reforms - cannot prevent contagion by countries that choose not to regulate the compensation of the financial sector. This type of reform can even compromise a country's competitive position, which may lead to a flow of headquarters of companies and their executives to other countries to adopt a more liberal approach to executive compensation (Ferrarini & Ungureanu, 2011a).

In addition to discussions about the bankers' compensation and the new regulatory policies, other studies try to understand the effects of regulation on executive compensation and company performance. One of those studies analyzes how bank CEO compensation practices have changed after issuing new guidelines on compensation in 2011 by the FSB. Since the

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regulation was not applied to all banks, they split them into two samples: "affected" group (financial institutions headquartered in FSB and E.U. jurisdiction), and an "unaffected" control group, which includes financial intermediaries in other jurisdictions. This study allowed us to know that the regulation had a significant impact on the CEO's compensation in banking of the countries affected by the introduction of the P&S. However, the consequences were different between the affected investment banks and the affected commercial banks, being more visible in the investment banks. In the last ones, there was no significant effect on the correlation with the short-term profits. Nonetheless, the banks' risk-taking was affected. In the case of the affected commercial banks, the share of variable compensation was negatively correlated with the banks' risk but positively correlated with the profits. Hence, after the crisis, the banks had a worse performance: a lower CEO fixed compensation and a lower CEO variable compensation, that is, lower cash compensation and lower stock awards (Cerasi et al., 2020).

2.2.1 Financial Stability Board (FSB)

In 1999, the G7[2] Finance Ministers and Central Bank Governors followed the recommendations of the Deutsche Bank's president, Hans Tietmeyer, and founded the FSF. The main intention was to create new structures to strengthen the cooperation between national and international supervisory bodies and in that way to stimulate international financial stability. In April 1999, in Washington, the FSF was convened for the first time.

In November 2008, the FSF membership was expanded to strengthen its effectiveness and face any eventual vulnerabilities. Finally, in 2009, the FSB was established, succeeding the FSF. The Heads of State and the G20[3] Government defined the objectives and the organizational structure of the FSB at the Pittsburgh Summit.

The FSB's role was crucial in carrying out a reform in the finance system in terms of supervision and regulation. Nevertheless, in 2011 a reform was needed. At the G20 Cannes Summit, the FSB's members agreed to strengthen its capacity, resources, and governance, and, in 2012, the report G20 Los Cabos Summit established new steps to achieve the goals.

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[2] The G7, also known as the Group of 7, corresponds to a group of the seven largest developed economies: Canada, France, Germany, Italy, Japan, the U.K., and the U.S.
[3] The G20, also known as the Group of 20, corresponds to a group of Central Bank Governors and Finance Ministers from the world's 19 largest economies. It was founded in 1999 to promote global economic growth, the regulation of financial markets, and international trade.

Currently, the FSB is constituted by 68 member institutions. It includes 25 member jurisdictions (comprising supervisory and regulatory authorities, Central Banks and Ministries of Finance), 4 International Financial Institutions (International Monetary Fund (IMF), World Bank, Bank for International Settlements (BIS), Organization for Economic Cooperation and Development (OECD)) and, finally, International Standard-Setting and Other Bodies (Basel Committee on Banking Supervision (BCBS), International Association of Insurance Supervisors (IAIS), International Organization of Securities Commissions (IOSCO), International Accounting Standards Board (IASB), Committee on Global Financial System (CGFS) and Committee on Payments and Market Infrastructures (CPMI)).

2.2.2 Principles for Sound Compensation (P&S)

After the 2007-2008 financial crisis, new guidelines for executive compensation in banks were ordered by the G20 Finance Ministers and Central Bank Governors. For this reason, in 2009, the FSB's P&S were published aiming to decrease the incentives for excessive risk-taking in financial institutions, that could arise from the compensation of the Material Risk Takers[4] (MRTs). After the P&S publication, regulators have directed significant attention to guarantee the alignment between compensation practices with the risk of financial institutions.

The P&S correspond to nine principles and are organized into three categories: corporate governance, compensation, and supervision (Financial Stability Forum, 2009).

Corporate Governance: Includes three principles that state how the banks should set their managerial compensation, knowing that there is no single way to do that.

- Principle 1: CEO and management team must not influence their compensation. The board members should have independence when determining the compensation structure.

- Principle 2: The board of directors must regularly monitor performance and risk measures to confirm that the system functions as expected.

- Principe 3: The risk managers must be independent to avoid setting risk targets that meet insiders' interests.

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[4] This concept is not uniform among the literature. However, in general, it includes CEOs, members of the executive board, and all the employees that have functions with an impact on the risk profile and financial soundness of the institution.

Compensation: Includes four principles that state the main rules when structuring the managerial compensation, defining that each bank can freely choose their compensation structure as long as it respects the regulation.

- Principle 4: There must be heterogeneity in compensation; each manager must be compensated, taking into account its contribution to the bank's risk. The compensation committee should treat two managers who generate the same profits in different ways but take different amounts of risk.

- Principle 5: Compensation must vary symmetrically with risk outcomes; that is, incentive payments should be linked to the overall company performance. Bonuses may increase or decrease depending on the company outcomes.

- Principle 6: The variable part of compensation should be sensitive to the time needed for risk to be materialized.

- Principle 7: In order to control the excessive risk-taking, there must be an optimal mix of equity, cash, and other forms of compensation.

Supervision: It includes two principles that state the supervisors' main tasks and the main rules of disclosing the banks' information, introducing new items for disclosure as criteria for risk-adjustment and share-based incentives.

- Principle 8: Supervisors are responsible for ensuring the correct implementation of the principles within banks in the same countries and among different countries to avoid regulatory arbitrage.

- Principle 9: The disclosure of compensation must be assured to satisfy the needs of stakeholders and supervisors.

The principles focus on long-term incentives to avoid focusing on short-term incentives. Also, they increase the power of supervisors, making payments subject to land-based supervision.

According to Ferrarini et al. (2009), although the disclosure of compensation was already practiced before the crisis, it often did not meet the desired standards. After the crisis, it was concluded that the disclosure, besides to be beneficial to shareholders, must encompass other stakeholders such as creditors and employees.

Therefore, these principles' ultimate objective is to avoid excessive risk-taking by reducing the incentives that lead to such events. Ferrarini & Ungureanu (2011a) states that one of the principles' greatest assets is flexibility, which allows it to accommodate differences between

managers of the same institution and the institution itself. They also allow for flexibility in its implementation. If, for example, there is a specific principle that can have negative consequences for a particular institution, it can depart.

Nevertheless, the implementation's success depends a lot on how the principles are implemented and practiced at a national level since the regulation of each country can improve or limit its flexibility. When the discussion of the implementation took place at the national level, some conflicts arose again. This happened not only due to the banks' role in the financial system and the relative weight of the groups involved, but also due to issues of traditional governance, culture, and ethical values (Ferrarini & Ungureanu, 2011a).

2.3   Executives' Compensation and the 2007-2008 Financial Crisis

The 2007-2008 financial crisis is considered the most severe crisis since the Great Depression. This crisis was so catastrophic that even the exorbitant amounts spent were insufficient to resolve it. For example, Congress approved a value of $700 billion, and the Federal Reserve spent about $ 1.3 trillion on investments in risky assets, such as collateralized debt obligations and loans to bankrupt titles, in order to rescue institutions and markets. Besides these massive amounts, $900 billion were proposed to lend to large institutions (A. Murphy, 2008).

It all started with a subprime mortgage lending crisis that expanded to a global banking crisis when many banks failed, even the banks considered as "too big to fail," which was the case of Lehman Brothers bank, a major global investment bank, in September 2008 (Singh, 2019). This bank lost 40 percent of its market value in just one day. This event is considered the start of the global financial crisis and the largest bankruptcy in U.S. history.

The failures of several institutions, such as Lehman Brothers, Bear Stearns, Federal Home Loan Mortgage Corporation (FHLMC), Federal National Mortgage Association (FNMA), and American International Group (AIG) were related to investments in debt contracts. The values of these investments fell during the crisis. This caused the values of these banks' liabilities to be higher than the market value of its assets – liquidity crisis. For example, in the case of Bear Stearns, the liabilities' market value on its vast portfolio of Credit Default Swaps (CDS) has risen immensely. Thus, the counterparty demanded additional collateral against payment on the CDS (A. Murphy, 2008).

The financial crisis has had catastrophic consequences worldwide, with European banks and markets suffering as much as those in the U.S. Asia also did not escape the effects of the

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financial crisis even though it knew that it had stronger banks than Europeans and Americans (Poole, 2010).

Some papers argue that executives' compensation of financial institutions was not the leading cause of the 2007-2008 financial crisis (Fahlenbrach & Stulz, 2011; Ferrarini & Ungureanu, 2011b). Initially, some politicians indicated that it was short-term incentives that caused managers and traders to have irresponsible behavior, which led to the failure of many financial institutions (Solomon & Paletta, 2009). Some also criticized that it was the overpayment in financial institutions that led to excessive risk-taking. Nonetheless, there is no evidence to prove that compensation practices, before the crisis, were focused on the short term and that the incentives created led to excessive risk-taking.

The following studies suggest that compensation was not the principal cause of the crisis:

- In the U.S. and E.U., executive compensation in banking included long-term incentives. Furthermore, there was almost no difference between the banks that received State support and those that did not (Ferrarini & Ungureanu, 2010);

- Even in the financial institutions that paid vast amounts of bonus to their executives, it was not possible to prove that the shot-term monetary incentives led to excessive risk-taking (Bebchuk et al., 2010);

- Furthermore, it is necessary to consider non-monetary incentives because there may have been pressure on managers from institutional investors to achieve specific short-term results (Cheng et al., 2015);

- There may also have been poor risk management, possibly due to organizational failures and bank risk misperception (Stulz, 2008).

2.4   Global Systemically Important Banks (G-SIBs)

Since 2011, the FSB, together with national authorities and the BCBS, has identified the G-SIBs. These banks are also known as "too big to fail" banks, and their failure may cause a financial crisis.

During the financial crisis, a public sector intervention was needed to recover financial stability. In this way, it is necessary to implement measures to decrease the financial and economic costs of these interventions. Moreover, it is also essential to reduce the impact of the problems resulting from the G-SIBs' failure.

After the crisis, the BCBS proposed a series of measures to strengthen the banking sector, such as the necessary capital increase in the system and the improvement of risk coverage. Although significant, these measures may not be sufficient and adequate to halt possible ample spillover risks of G-SIBs. Any problem with these banks affects the economy nationally and across borders (Basel Committee on Banking Supervision, 2013). Therefore, the main goal of these measures is to reduce the probability and impact of the failure of G-SIBs, improve the resolution structures, and increase the capacity of loss absorbency.

In order to address these goals, the BCBS developed a methodology based on an indicator-based measurement approach to evaluate the importance of the G-SIBs. According to the Basel Committee on Banking Supervision (2013), *"global systemic importance should be measured in terms of the impact that a bank's failure can have on the global financial system and wider economy, rather than the risk that a failure could occur"* (p. 5). Thereby, they selected five categories of systematic importance: Cross-jurisdictional activity, Complexity, Interconnectedness, Size, Substitutability/financial institution infrastructure.

Cross-jurisdictional activity: This category's objective is to measure the global impact of the bank beyond its national jurisdiction. The BCBS uses two indicators in this category: the cross-jurisdictional claims and the cross-jurisdictional liabilities.

Complexity: The complexity of a bank increases the resources needed to resolve it. In terms of indicators, this category involves three: the number of over-the-counter derivatives, the level 3 assets, and, finally, the number of trading and available-for-sale securities.

Interconnectedness: Due to the network structure between financial institutions, a problem in one may increase the probability of a problem in another. The three indicators used in this category are intra-financial system assets and liabilities and the number of securities outstanding.

Size: If the bank's activities constitute a significant share of global activity, that is, it has a larger size, the probability of breaking the financial system is significant. The indicator used in this category is the total exposures used in the Basel III leverage ratio.

Substitutability/financial institution infrastructure: The disruption of services and the flow of market liquidity caused by a bank's distress will be all the greater the bank's role in its business line. The three indicators used in this category are the assets under custody, the payments activity, and the amount of underwritten transactions.

3   Hypothesis

This section defines the hypothesis that will be tested to understand the relationship between profitability, risk, and firm size with CEOs' variable compensation in the G-SIBs, considering the presented studies in the literature review.

Hypothesis 1: The sensitivity of CEO variable compensation is negatively correlated with bank's risk.

In agreement with the studies presented in the literature review, there is a consensus relatively to the fact that the PPS of CEO's compensation decreases with the bank's risk (Gilson & Vetsuypens, 1993; K. John et al., 2010; K. John & Qian, 2003; T. John & John, 1993; Shah et al., 2017). Hence, we expect to see a negative relationship between the sensitivity of CEO variable compensation and the bank's risk.

Hypothesis 2: The sensitivity of CEO variable compensation concerning risk has been increasing.

According to the 6th Principle of the P&S policy, the variable part of compensation should be sensitive to the time needed for risk to be materialized. Payments should not be concluded during short periods in which risks are finalized in the long periods. Since the P&S policy has the main objective to mitigate risk-taking in financial institutions, we expect to see an increase in the correlation between compensation and risk variables. If this holds, so the norms contained in the P&S policy have been effective. However, it is necessary to take into account that the implementation of the P&S was not the only change in regulation on executive compensation that happened during the years of this study. In 2014, in the European countries, the new capital Requirement Directive 575/2013, also known as CRD IV[5], was adopted.

Hypothesis 3: The sensitivity of CEO variable compensation concerning short-term performance has been less positively correlated.

According to Chaigneau (2013), the ultimate goal of a regulator that wants to decrease banks' risk-taking incentives is to reduce the level of pay-performance of CEO compensation.

The 5th Principle of the P&S policy declares that CEO compensation must be more sensible to inferior outcomes; that is, it should decrease if the performance measures dwindle. Therefore,

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[5] The Capital Requirements Regulation 575/2013 is a supervisory framework for the E.U. that intends to decrease banks' insolvency probability. This Directive has been in force since January 2014.

after the implementation of the P&S policy, we expect to see a decrease in the sensitivity of the short-term performance concerning the share of variable compensation.

Hypothesis 4: The sensitivity of CEO compensation is negatively correlated with bank size.

In line with the studies in the literature, we expect to see a negative relationship between firm size and CEO compensation (K. John & Qian, 2003; Schaefer, 1998). Gregg et al. (2012) also state that this relationship is significant.

4 Data and Method

This study was developed following a deductive approach. Hence, in the last section, we defined the hypothesis that will be tested based on the existing literature. Now we design a research strategy to test them and understand if they are in line with the literature review.

Therefore, in this section, we define the sample, the variables' description, and the method. We also present the matrix correlation.

4.1 Sample

The present study used a sample of 35 banks in 13 countries in America, Europe, and Asia (*Annexe A*). To perform this analysis, we focus on three years: 2011, 2014, and 2017. We start the sample in 2011 because this was the first year the FSB has started to identify the G-SIBs. Consequently, the list of our banks is only constituted by G-SIBs, which changes every year. The list of the G-SIBs comprises 30 banks in 2014 and 2017. In 2011, it comprises 29 banks.

Information on CEO level variables is sourced from banks' annual reports, while the information related to bank-level variables is sourced from Bloomberg. The values for the control variable are collected from the World Bank website.

Although disclosure of information relative to CEO compensation is common among the listed and the largest banks, there are some cases where this does not happen because the disclosure is not obligatory everywhere.

Our analysis had to consider the average of the compensation for the following banks: Sumitomo Mitsui FG, Mizuho FG, and Belfius Bank AS. These banks did not have the information relative to CEO compensation available for all years.

In the cases where we have more than one CEO per year, we computed the compensation's average. For example, if in one particular year, a new CEO is appointed, we did the average compensation between the CEO leaving and the one appointed. We could not work with a sample with a different number of years among the variables in terms of panel data.

In the case of the Chinese banks, they have the particularity of having more than one director per year. Thereby, in these cases, we consider just the current directors because their compensation is more determinant than the ones that are leaving.

4.2 Variables description

The CEOs' compensation incorporates different components, such as fixed compensation, cash bonus, long-term benefits, and equity-based compensation. K. Murphy (1999) divides compensation into two parts: cash compensation, which combines the fixed salary and the annual bonuses (non-equity incentives), and total compensation, which combines equity incentives, such as long-term incentive plans (LTIPs) and stock options. Considering that the variable part of compensation varies substantially among CEOs and is relatively complex, we decided to focus our analysis on this part. We compute the values for variable compensation by subtracting the fixed compensation from the total annual compensation.

Consistently with the existing literature, the firm size is considered the most crucial determinant of compensation level. Thus, we use the value of the Total Assets (TA) for the firm size. As an alternative, we could consider the value of market capitalization. However, it is likely correlated with the total shareholders' return (Gregg et al., 2012).

We consider the following variables to measure the banks' risk: the Nonperforming Loans Ratio (NPL) and the Stock Returns Volatility (SRV). In terms of profitability, we use the Return on Common Equity (ROCE). To measure the capital ratios' impact on compensation, we use the variable Tier1 Capital Ratio (Tier1).

We also try to control the effect of each country's economic environment where the bank is located. Consistent with the literature, we measure the economic environment using the variable Gross Domestic Product (GDP).

In *Table 4.1*, we summarize the variables used to perform this analysis.

Table 4.1 Variables description

Explanatory Variable	Description	Source
Total Compensation (TC)	Cash and non-cash compensation paid to bank's CEO	Banks' Annual Reports
Variable Compensation (VC)	Total compensation minus fixed compensation	Banks' Annual Reports
Variable Compensation over Total Compensation (VCTC)	Ratio between variable compensation over total compensation	Banks' Annual Reports

Explanatory Variable	Description	Source
Efficiency Ratio (ER)	Ratio between Expenses and Revenue	Bloomberg
Nonperforming Loans Ratio (NPL)	Ratio between Nonperforming Loans and Total Loans	Bloomberg
Total Assets (TA)	Total Assets reported on bank's balance sheet	Bloomberg
Return on Common Equity (ROCE)	Ratio between Net Income and Average Common Equity	Bloomberg
Return on Assets (ROA)	Ratio between Net Income and Total Assets	Bloomberg
Tier 1 Capital Ratio (Tier1)	Ratio between Core Capital and Risk Weighted Assets	Bloomberg
Total Loans to Total Deposits (TLTD)	Ratio between Total Loans and Total Deposits	Bloomberg
Stock Returns Volatility (SRV)	Standard deviation of banks' weekly Stock Returns over the year	Bloomberg
Trading Securities over Total Assets (TSTA)	Ratio between Trading Securities and Total Assets	Bloomberg
Control Variable	Description	Source
Gross Domestic Product (GDP)	Gross Domestic Product of the country where the bank is located	The World Bank website

It is relevant to mention that the variables used in this study were the same as those used in the paper carried out by Cerasi et al. (2020).

4.3 Method

This study uses a regression model to analyze the relationship between the explanatory variables related to banks' characteristics, such as profitability, risk, and firm size, and the dependent variable, Variable Compensation over Total Compensation (VCTC). Therefore, the

primary purpose is to understand whether variations on the explanatory variables can predict variations on the dependent variable. To do so, the basic model used to analyze the data is the following:

$$Y_{it} = \beta_0 + x'_{it}\beta + \varepsilon_{it} \qquad i = 1, 2, \ldots, N \text{ and } t = 1, 2, \ldots, T \tag{1}$$

The model above represents the standard linear regression model, where i designates the cross-section dimension, and t designates time. In this model, the intercept term β_0 and the slope coefficient β are always the same regardless of individuals and time. The error term represented by ε_{it} captures the unobservable factors that affect the dependent variable and varies over individuals and time (Verbeek, 2012).

We performed an F-test on the significance of the fixed effects, and since we reject the null hypothesis, the Fixed Effects model is more appropriate than the OLS model. We also compare the Fixed Effects model and the Random Effects model, running a Hausman test, which analyzes whether the unique errors are correlated with the regressors or not. Since we do not reject the null for this test, the Random Effects model is more appropriate.

The explanatory variable TA was included in log form to reduce the effect of outliers in firm size, following the approach in K. Murphy (1999). This approach was also applied to the control variable GDP. In the Econometric Analysis, we chose to use ROCE instead of ROA. Since the two variables are strongly correlated, we were only able to select one of them.

Thus, the models tested in this study are represented in Eq.(2) and Eq.(3). Using both models, we can explain *Hypothesis 1* and *Hypothesis 4*.

$$\begin{aligned} VCTC_{it} = {} & \beta_0 + \beta_1 ER_{it} + \beta_2 NPL_{it} + \beta_3 \log(TA)_{it} + \beta_4 ROCE_{it} + \beta_5 TIER1_{it} \\ & + \beta_6 TLTD_{it} + \beta_7 SRV_{it} + \beta_8 TSTA_{it} + \beta_9 \log(GDP)_{it} + \varepsilon_{it} \end{aligned} \tag{2}$$

$$\begin{aligned} VCTC_{it} = {} & \beta_0 + \beta_1 ER_{it} + \beta_2 NPL_{it} + \beta_3 \log(TA)_{it} + \beta_4 ROA_{it} + \beta_5 TIER1_{it} \\ & + \beta_6 TLTD_{it} + \beta_7 SRV_{it} + \beta_8 TSTA_{it} + \beta_9 \log(GDP)_{it} + \varepsilon_{it} \end{aligned} \tag{3}$$

To study the relation between the explanatory variables and the dependent variable in each year of the sample, we use the OLS model. To do so, we use the following basic model to analyze the data:

$$Y_i = x_i'\beta + \varepsilon_i \qquad i = 1, 2, \ldots, N \tag{4}$$

The model in Eq.(4) represents the standard linear regression model where Y_i and x_i represent the observable variables, ε_i represents an error term, and β represents the parameters to estimate that explain the variations in the dependent variable (Verbeek, 2012). In Eq.(5) and Eq.(6), we represent the models that analyze the relationship between the dependent variable and banks' characteristics for each analysis year. Using both equations, for each year of analysis, we are able to explain *Hypothesis 2* and *Hypothesis 3*.

$$VCTC_i = \beta_0 + \beta_1 ER_i + \beta_2 NPL_i + \beta_3 \log(TA)_i + \beta_4 ROCE_i + \beta_5 TIER1_i$$
$$+ \beta_6 TLTD_i + \beta_7 SRV_i + \beta_8 TSTA_i + \beta_9 \log(GDP)_i + \varepsilon_i \tag{5}$$

$$VCTC_i = \beta_0 + \beta_1 ER_i + \beta_2 NPL_i + \beta_3 \log(TA)_i + \beta_4 ROA_i + \beta_5 TIER1_i$$
$$+ \beta_6 TLTD_i + \beta_7 SRV_i + \beta_8 TSTA_i + \beta_9 \log(GDP)_i + \varepsilon_i \tag{6}$$

4.4 Variables Correlation

In this last section, we analyze the correlation matrix, presented in *Annexe B*, among the variables during the three periods of analysis before discussing the results.

What emerges from this result is that CEOs' variable compensation is positively correlated with the profitability measures: ROCE and ROA. However, the coefficient for ROA is the only that is significant. In terms of risk measures, the variables have a coefficient statistically significant. Nevertheless, just the variable NPL is negatively correlated with variable compensation. The SRV and the Tier1 are positively correlated with CEO variable compensation. The variable TA that measures the firm size has a negative correlation with the variable compensation.

In general, the explanatory variables do not present significantly high correlations that could cause multicollinearity problems in model estimation.

5 Data Analysis

5.1 Descriptive Analysis

This section presents the descriptive statistics of our sample regarding banks' characteristics and their CEO's compensation. As mentioned before, we had to make some adjustments in some variables because the information was not available. As a result, we computed the average for missing values.

Table 5.1 Descriptive Statistics for CEO level variables

Total compensation and variable compensation are annual and measured in million dollars.

	Units	No. obs.	Mean	SD	Min	Max
CEO level variables						
Total Compensation (TC)	U.S. Dollars	105	7.318	7.421	0.082	28.322
Variable Compensation (VC)	U.S. Dollars	105	5.863	7.133	0.000	26.822
VC over TC		105	0.574	0.288	0.000	1.000

Table 5.1 reports descriptive statistics for CEO level variables. On average, total compensation is $7.318 million, while the variable compensation is, on average, $5.863 million of a CEO's total compensation. JPMorgan Chase is the bank with the maximum value for total compensation and variable compensation, respectively, $28.322 million and $26.822 million, both values in 2017. The bank with the lowest value for total compensation is the Agricultural Bank of China in 2014. The lowest value for variable compensation is 0 because of the non-achievement of performance goals or because the Compensation for Management Board members decided that compensation is based exclusively on a fixed element, with no performance conditions.

In *Figure 5.1*, we plot the evolution of CEOs' compensation over the three years of analysis. Total compensation increases on average from $6 million in 2011 to $7.8 million in 2017. On average, variable compensation represents 55 percent of a CEO's total compensation in 2011, increasing to 61 percent in 2014.
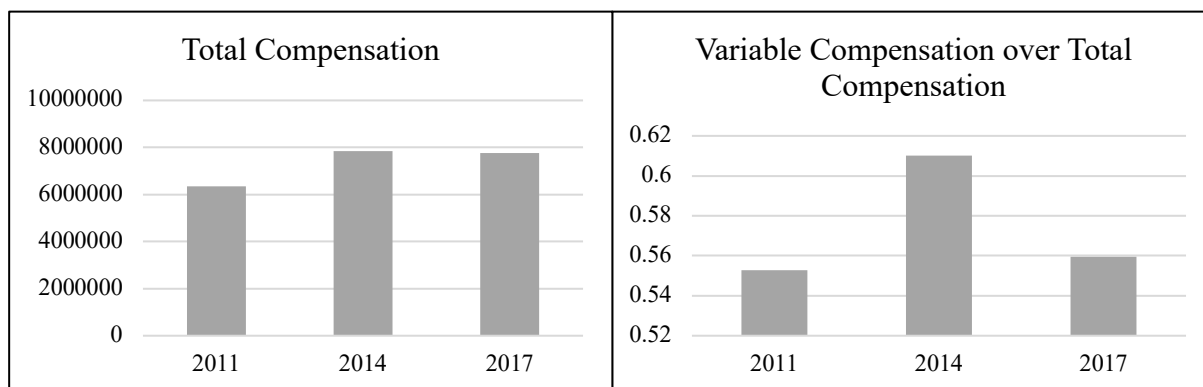
Figure 5.1 Compensation level and composition in the G-SIBs
(TC and VC are annual and measured in dollars)

Table 5.2 Descriptive Statistics for bank level variables

TA is measured in billions and GDP is measured in trillions.

	Unit	No. obs.	Mean	SD	Min	Max
Bank level variables						
Efficiency Ratio		105	0.674	0.168	0.281	1.512
Nonperforming Loans Ratio		105	0.031	0.049	0.000	0.452
Total Assets	U.S. Dollars	105	1.573	0.832	0.201	4.006
Return on Common Equity		105	0.071	0.074	-0.315	0.234
Return on Assets		105	0.005	0.005	-0.010	0.015
Tier 1 Capital Ratio		105	0.136	0.025	0.093	0.223
Total Loans to Total Deposits		105	0.870	0.362	0.064	1.791
Stock Returns Volatility	U.S. Dollars	105	2.698	3.879	0.000	23.541
Trading Securities over Total Assets		105	0.085	0.075	0.000	0.395
Control variable						
Gross Domestic Product	U.S. Dollars	105	6.822	6.494	0.503	19.485

Table 5.2 reports descriptive statistics for bank-level variables. The bank with the highest value of TA is the Industrial and Commercial Bank of China, with a value of $4.006 billion, in 2017. In contrast, the bank with the lowest value of TA is the Belfius Bank AS, with a value of $0.201 million in 2017. The bank that most closely matches the average value of TA is the Société Générale with $1.583 billion in 2014.

In terms of risk, the bank with the highest value of NPL is the Royal Bank of Canada, with 45.2 percent in 2014. This bank left the list of G-SIBs in 2015 and returned in 2017. In contrast, State Street has 0 percent of NPL in 2017 and 2014. For the SRV, the highest value belongs to Goldman Sachs in 2011, with a value of $23.54. The bank closest to the mean is the Sumitomo Mitsui FG in 2014, with a value of $2.665.

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The Tier1's minimum value belongs to the UniCredit Group, with a 9.3 percent value in 2011. The Nordea has a value of 22.3 percent of the Tier1 in 2017, and in 2018 this bank abandoned the list of G-SIBs. The Citigroup in 2011 has a Tier1 value that coincides with an average of 13.6 percent.

Regarding profitability, the bank with the highest value for ROCE is the Industrial and Commercial Bank of China Limited, with 23.4 percent in 2011. The minimum value belongs to the Belfius Bank AS in 2011, with -31.5 percent. Relatively to the ROA, the China Construction Bank reached a value of 1.5 percent in 2011, and the UniCredit Group -1 percent in 2011.

The bank with the lowest value for ER belongs to the Industrial and Commercial Bank of China Limited, with 28.1 percent in 2017. The bank with the highest value is the Belfius Bank AS, with 151.2 percent in 2011. This considerable amount may be due to the resolution process. In 2008, this bank was the first considerable casualty of the European Sovereign debt crisis and suffered a resolution process that began in October 2011 to avoid bankruptcy. This bank was known as Dexia Bank Belgium up until March 1st 2012. In our sample, it only appeared in the lists of G-SIBs in 2011.

For the ratio TLTD, the bank with the lowest ratio is the State Street in 2011 with a value of 6.4 percent, and the bank with the highest value is the Nordea in 2017 with a value of 179.1 percent. The bank that most closely matches the average is Barclays, with an 86.3 percent ratio in 2017. For the ratio TSTA, the maximum value belongs to Morgan Stanley, which achieved 39.5 percent in 2011.

Finally, the country in the sample with the highest GDP is the United States with $19.485 trillion in 2017, and the one with the lowest value is Belgium with $0.503 trillion in 2017.

5.2   Econometric Analysis

The following section aims to analyze the econometric model results based on the previously defined hypothesis. Thereby, the estimated coefficients were acquired using *RStudio*[6]*,* and the regression method used was the Random Effects Model and the OLS model.

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[6] *RStudio* is an integrated development environment for *R*.

5.2.1 Regressions Results

Table 5.3 Regression using the Random Effects Model

Standard errors are in parentheses. We run the regression substituting the ROCE for the ROA. The results are the same, except that the ROA coefficient is not statistically significant. Significant codes: 0.001 '**' 0.01 '*' 0.05 '.'.

Dependent Variable:	Variable over Total Compensation
Intercept	-0.440
	(1.045)
ER	**0.496** *
	(0.211)
NPL	-0.119
	(0.354)
Log(TA)	**-0.104 .**
	(0.059)
ROCE	**0.838** *
	(0.403)
Tier1	0.488
	(0.832)
SRV	0.006
	(0.007)
TLTD	0.023
	(0.128)
TSTA	-0.078
	(0.380)
Log(GDP)	**0.131** **
	(0.048)
Total Sum of Squares	2.103
Residual Sum of Squares	1.708
R-Squared	0.188
Adj. R-Squared	0.111
Chisq	21.961 on 9 DF p-value: 0.009
Observations	105

Table 5.3 reports the estimates of our primary regression model represented in Eq.(2) during the years 2011, 2014, and 2017. Since we are dealing with the Random Effects Model, the coefficients' interpretation includes the following effects: the between-entity and the within-entity effects.

Although it is not represented in *Table 5.3*, we also run the regression substituting the ROCE variable for ROA, which is represented in Eq.(3). As we can observe in *Annexe B*, these two variables cannot be represented in the same regression because they are strongly correlated. Therefore, we summarize in the note above the table the results from the regression using ROA.

The coefficient of profitability variable, ROCE, indicates that it is positively and significantly correlated to variable compensation over total compensation. The estimate of the

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log(TA) is negatively and significantly correlated to the dependent variable *(Hypothesis 4)*. In terms of risk variables, we have divergent results. The coefficient of NPL is negatively related to the dependent variable *(Hypothesis 1)*. By contrast, the SRV is positively correlated to the dependent variable. However, risk variables are not statistically significant. This may be an effect of bank regulation on executive compensation.

The variable TLTD has a positive and insignificant estimate. On the other hand, the variable TSTA has a negative estimate, which is not significant. The Tier1 is positively correlated to the dependent variable; nevertheless, it is not significant. The coefficient for the control variable, GDP, is positive and statistically significant.

Analyzing the value for the Chi-square test, we can conclude that all the coefficients in the model are different from zero.

Table 5.4 reports the estimates of our regression model in Eq.(5) using the OLS model during the years 2011, 2014, and 2017.

Column (1) estimates the regression results in 2011. This year, the main results are contrary to our predictions. The profitability variable ROCE is negatively correlated with the dependent variable, and the variable SRV has a positive coefficient. The only variable that is according to our predictions is the NPL. However, it is not significant in this year. The Tier1 is positive and statistically significant. This year 2011 was the year of implementation of the P&S policy, and when the Belfius Bank AS suffered a resolution process to avoid bankruptcy, which may explain the contradiction of results.

Column (2) shows the coefficients for the regression results in 2011 without the Belfius AS Bank. As we can see, the estimates are more attractive. In terms of risk variables, NPL and SRV have a negative coefficient. Moreover, the NPL has a statistically significant coefficient.

In Column (3), we have the coefficients for the year 2014. We observe that the sensitivity of variable over total compensation to ROCE is negative and insignificant, not in line with our expectations. The coefficient for NPL is positive and statistically significant contrary to the SRV. This divergence of results this year may be due to regulation. The year 2014 was when the E.U. countries had adopted the P&S policy as part of the CRD IV.

Column (4) shows the coefficients for the regression results in 2017. Although it is not significant, the sign of the profitability variable is positive, and therefore it is consistent with our predictions. The estimate for NPL is negative, being that it is statistically significant. Notwithstanding, we observe the opposite to the variable SRV.

Table 5.4 Regression Model using the Pooled OLS

Columns (1) and (2) refer to 2011. Nonetheless, Column (2) excludes Belfius Bank AS because it suffered a resolution process that began in 2011. Columns (3) and (4) refer to 2014 and 2017, respectively. We run the regression substituting the ROCE for the ROA. The differences are the following: in Column (1), the ROA is positive; in Column (2), the NPL is not statistically significant, the TLTD is statistically significant for a 0.05 significance level, and the SRV and ROA are positive; in Column (3) the NPL and Tier1 are not statistically significant, and the coefficients for ER, log(TA) and ROA are positive; finally, in Column (4) the conclusions are the same. Standard errors are in parentheses. Significant codes: 0.001 '**' 0.01 '*' 0.05 '.'.

Dependent Variable:	Variable over Total Compensation			
	(1)	(2)	(3)	(4)
Intercept	**-3.854 .**	-2.323	**-2.754 .**	0.441
	(1.915)	(2.232)	(1.456)	(1.411)
ER	-0.121	0.217	-0.118	0.521
	(0.678)	(0.719)	(0.703)	(0.451)
NPL	-5.089	**-6.403 .**	**1.377 .**	**-6.360 ∗**
	(3.155)	(3.276)	(0.726)	(3.070)
Log(TA)	0.006	-0.040	-0.013	-0.101
	(0.084)	(0.090)	(0.074)	(0.074)
ROCE	-0.087	-0.777	-1.556	0.070
	(1.499)	(1.574)	(1.694)	(1.084)
Tier1	**8.612 ∗**	4.874	**6.244 .**	-2.656
	(3.467)	(4.485)	(3.270)	(2.717)
SRV	0.004	-0.002	-0.007	**0.034 .**
	(0.010)	(0.011)	(0.024)	(0.019)
TLTD	**0.518 ∗**	0.408	0.004	0.287
	(0.235)	(0.247)	(0.199)	(0.252)
TSTA	0.288	0.245	0.831	1.210
	(0.627)	(0.620)	0.716	(0.808)
Log(GDP)	**0.197 ∗∗**	**0.170 ∗**	**0.185 ∗**	0.088
	(0.065)	(0.067)	0.067	(0.063)
Total Sum of Squares	3.059	2.908	2.583	2.904
Residual Sum of Squares	1.535	1.435	1.329	1.416
R-Squared	0.498	0.506	0.485	0.512
Adj. R-Squared	0.318	0.321	0.300	0.337
F-statistic	2.759	2.735	2.620	2.920
Observations	35	34	35	35

The estimate for the ratio TLTD is positive for all the years of analysis, and it is statistically significant in Column (1). The ratio TSTA has a positive coefficient for all the years, despite not being statistically significant.

In terms of firm size, the log(TA) coefficients are never statistically significant. However, the coefficients' sign is in line with our predictions, except in Column (1), which is positive. Finally, for the control variable GDP, the coefficients are positive and statistically significant, except in 2017.

The coefficient of determination, the R-Squared, indicates the model's reliability and varies between 0 and 1. The closer the value is to 1, the more reliable the model is. In this regression model, the R-Squared is approximately 0.5 for all the years.

In *Tables 5.5 and 5.6*, we report the coefficients of the CEO variable over total compensation concerning profitability and risk. We computed the sensitivities and the relative standard errors using the coefficients from *Table 5.4*. In the last row, we show the correlation's expected sign, taking into account the hypothesis. We expect to see the sensitivity of CEO variable compensation concerning risk more negatively correlated *(Hypothesis 2)*. On the other hand, we expect to see the CEO variable compensation less but positively correlated concerning short-term performance *(Hypothesis 3)*. The tables show the sensitivities for the three years of analysis. In the two last columns, we show the difference between two different periods: $\Delta_1 = 2014 - 2011$ and $\Delta_2 = 2017 - 2014$.

Table 5.5 Sensitivity of variable over total compensation to risk

The sensitivity is derived from the regression in *Table 5.4,* considering the coefficients for risk variables in Columns (1), (3), and (4). Standard errors are in parentheses. Significant codes: 0.001 '∗∗' 0.01 '∗' 0.05 '.'.

	(1)	(3)	(4)	$\Delta_1 = (3) - (1)$	$\Delta_2 = (4) - (3)$
NPL	-5.089	**1.377 .**	**-6.360** ∗	**6.466 .**	**-7.737 .**
	(3.155)	(0.726)	(3.070)	(3.237)	(3.154)
SRV	0.004	-0.007	**0.034 .**	-0.011	0.041
	(0.010)	(0.024)	(0.019)	(0.026)	(0.030)
Expected sign	-	-	-	-	-

Table 5.6 Sensitivity of variable over total compensation to profitability

The sensitivity is derived from the regression in *Table 5.4,* considering the coefficients for the profitability variable in Columns (1), (3), and (4). Standard errors are in parentheses. We run the regression substituting the ROCE for the ROA. The results are the same, except for the Δ_2 sign that is negative. Significant codes: 0.001 '∗∗' 0.01 '∗' 0.05 '.'.

	(1)	(3)	(4)	$\Delta_1 = (3) - (1)$	$\Delta_2 = (4) - (3)$
ROCE	-0.087	-1.556	0.070	-1.469	1.626
	(1.499)	(1.694)	(1.084)	(2.263)	(2.012)
Expected sign	+	+	+	-	-

CEO's variable over total compensation is not significantly correlated with profits in all years of analysis. In *Table 5.6*, during the period between 2014 and 2017, the correlation is positive but not statistically significant. Therefore, we observe that variable compensation did not significantly change in response to profits in both periods.

In *Table 5.5*, the sensitivity of variable over total compensation to risk is significantly negative only for NPL and during the period between 2014 and 2017. The coefficients for risk variables have become significantly larger in absolute value in 2017, especially for NPL.

During the period between 2014 and 2017, the CEO's variable compensation is negatively correlated to a rise in NPL. During this period, we observe that a one percentage point increase in NPL is related to a decrease in the proportion of variable over total compensation of 7.737

percentage points. During 2017, taking into account the profitability variable, a one percentage point increase in ROCE is associated with an increase in the proportion of variable over total compensation of about 0.070.

6 Robustness of the findings

In this section, we perform a robustness check to control the adoption of other regulatory changes during the years of the study, which may have affected CEO compensation structure in the G-SIBs.

6.1 Different regulatory changes

Table 6.1 Regression using the Random Effects Model (excluding 2014)

Standard errors are in parentheses. We run the regression substituting the ROCE for the ROA. The results are the same, except that the ROA coefficient is not statistically significant. Significant codes: 0.001 '∗∗' 0.01 '∗' 0.05 '.'.

Dependent Variable	Variable over Total Compensation
Intercept	-0.081
	(1.179)
ER	0.249
	(0.273)
NPL	**-5.094 ∗∗**
	(1.693)
Log(TA)	-0.101
	(0.061)
ROCE	0.497
	(0.527)
Tier1	0.190
	(1.101)
SRV	**0.016 .**
	(0.009)
TLTD	0.207
	(0.155)
TSTA	-0.212
	(0.472)
Log(GDP)	**0.115 ∗**
	(0.050)
Total Sum of Squares	2.077
Residual Sum of Squares	1.384
R-Squared	0.333
Adj. R-Squared	0.233
Chisq	29.995 on 9 DF p-value: 0
Observations	70

The E.U. countries adopted the P&S policy only in 2014 as part of the CRD IV, which is three years later than the other countries of the FSB. Therefore, we eliminate all the observations for the year 2014 in order to study if this specific event has a particular influence on the structure of CEO compensation.

Table 6.1 shows the coefficients and the relative standard errors of the regression model using the Random Effects Model but excluding the year 2014. Our results are in line with the outputs from *Table 5.3*. They are robust to our predictions except for the variable SRV that still has a positive relationship with the dependent variable. Although the coefficient for firm size is negative, in this case, it is not statistically significant. Comparing with *Table 5.3*, which includes the year 2014, the R-Squared increased. We can conclude that all the coefficients in the model differ from zero, taking into account the Chi-square test.

6.2   Other factors affecting CEOs' compensation

Although the P&S policy was adopted in 2011, other economic events happened during the years of this study. These events may explain the changes that we observe in the outputs for CEOs' compensation. From an econometric perspective, it is not easy to separate these events' effects and those of the P&S policy. Moreover, it is important to refer that these events may not affect all the countries in the same way and at the same timing.

Other factors that may explain the changes in CEOs' compensation could be the supervisory intensity and the anticipation of the introduction of FSB guidelines by banks. The P&S policy was published in 2009, and this event led regulatory attention to be directed to the compensation levels and structure in banking. A large number of banks likely responded to the financial crisis and poor performance with a decrease in compensation levels.

7   Conclusions and Future Extension

The subject of executive compensation has received considerable attention during recent years. Excessive risk-taking in financial institutions is considered one of the events leading to the accumulation of risks during the 2007-2008 financial crisis. Executive compensation arrangements were focused on the short-term profits leading to a lack of consideration of the risk exposure. Compensation packages affect top managers' appetite for risk. Therefore, understanding their determinants is significantly essential to define successful regulation in the banking sector and mitigate risk-taking.

This dissertation aims to analyze the impact of the bank's characteristics in CEOs' compensation, particularly the risk, profitability, and size. The analysis builds on a dataset from banks' annual reports, Bloomberg, and World Bank, which reports information relative to the structure of CEOs' compensation, integrated with banks' balance sheet and other information relative to the macroeconomic environment. We use a dataset of 35 banks, known as G-SIBs, from 13 different countries during the years of 2011, 2014, and 2017.

In terms of risk, both variables are statistically significant. Notwithstanding, there is inconsistency within the results. The NPL is negatively correlated with the variable compensation, and the SRV is positively correlated. This inconsistency may be explained since we are dealing with two different measures of risk. NPL is considered an accounting measure, while the SRV is a market measure of risk. Thereby, the transmission of the accounting information to the market may not be the most adequate.

Regarding the firm size, it is negatively correlated with CEOs' variable compensation. However, it is not statistically significant. We also find that CEOs' variable compensation's sensitivity has been less positively correlated with short-term performance (ROCE) during the period between 2011 and 2014. During 2017 and 2014, the correlation increased. When we consider the ROA variable, the results are in line with our expectations since the correlation has been less positively correlated for both periods of analysis. The sensitivity of CEOs' variable compensation concerning risk is also significantly more negatively correlated during the period between 2014 and 2017 for NPL. Although it is more negatively correlated between 2011 and 2014, the SRV is not statistically significant.

Our study contributes to understanding if the regulation has been or not effective in decreasing the sensitivity of CEOs' compensation to short-term performance and in preventing the excessive risk-taking in the "too big to fail" banks. Our findings indicate that regulation has

been effective in terms of profitability. Nevertheless, concerning risk, there is a gap between the bank's accounting information and the information perceived by the market. Therefore, regulators and financial authorities can use this analysis as a model to improve the current compensation policies in the banking system.

It is possible that this study does not capture all the factors that influence CEOs' compensation due to the complexity of the compensation packages. Moreover, the number of banks in the sample is limited since we are dealing only with the G-SIBs.

Hence, future research could be meaningful to expand this study to another level considering more banks in each country of this analysis. Furthermore, we consider it interesting to do the same analysis but considering the banks' executives and not only CEOs.

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9 Annexes

Annexe A List of the G-SIBs used in the sample

Country	Company Name
Belgium	Belfius Bank AS
Canada	Royal Bank of Canada
China	Agricultural Bank of China
China	Bank of China
China	China Construction Bank
China	Industrial and Commercial Bank of China Limited
France	BNP Paribas
France	Groupe BPCE
France	Groupe Crédit Agricole
France	Société Générale
Germany	Commerzbank
Germany	Deutsche Bank
Italy	UniCredit Group
Japan	Mitsubishi UFJ Financial Group
Japan	Mizuho Financial Group
Japan	Sumitomo Mitsui Financial Group
Netherlands	ING Bank
Spain	BBVA
Spain	Santander
Sweden	Nordea
Switzerland	Credit Suisse
Switzerland	UBS
United Kingdom	Barclays
United Kingdom	HSBC
United Kingdom	Lloyds Banking Group
United Kingdom	Royal Bank of Scotland
United Kingdom	Standard Chartered
United States	Bank of America
United States	Bank of New York Mellon
United States	Citigroup
United States	Goldman Sachs
United States	JPMorgan Chase
United States	Morgan Stanley
United States	State Street
United States	Wells Fargo

Annexe B Correlation Matrix

The table indicates the Pearson correlation coefficients for dependent and independent variables. Significant codes: 0.01 '∗∗∗' 0.05 '∗∗' 0.1'∗'.

	TC	VC	VCTC	ER	NPL	TA	ROCE	ROA	Tier1	TLTD	SRV	TSTA	GDP
Total Compensation (TC)	1.000												
Variable Compensation (VC)	0.992***	1.000											
VC over TC	0.786***	0.794***	1.000										
Efficiency Ratio	0.154	0.114	0.173*	1.000									
Nonperforming Loans Ratio	-0.189*	-0.202**	-0.100	0.034	1.000								
Total Assets	-0.205**	-0.179*	-0.206**	-0.424***	-0.088	1.000							
Return on Common Equity	-0.015	0.029	-0.004	-0.774***	-0.067	0.252***	1.000						
Return on Assets	0.214**	0.267***	0.134	-0.678***	-0.159	0.199**	0.874***	1.000					
Tier 1 Capital Ratio	0.222**	0.194**	0.193**	0.352***	-0.247**	-0.332***	-0.187*	-0.163*	1.000				
Total Loans to Total Deposits	-0.453***	-0.494***	-0.376***	0.061	0.305***	-0.014	-0.306***	-0.462***	-0.131	1.000			
Stock Returns Volatility	0.316***	0.307***	0.225**	0.140	0.075	-0.17*	-0.176*	-0.156	-0.092	-0.114	1.000		
Trading Securities over Total Assets	0.332***	0.319***	0.282***	0.257***	0.023	-0.207**	-0.120	-0.129	0.267***	-0.158	0.395***	1.000	
Gross Domestic Product	0.682***	0.737***	0.480***	-0.179*	-0.306***	0.106	0.204**	0.478***	-0.035	-0.655***	0.252***	0.077	1.000