

**ERASMUS UNIVERSITY ROTTERDAM**  
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**Pay Inequalities within the Board of Directors**

**Firm performance and need for monitoring effects**



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## **PREFACE AND ACKNOWLEDGEMENTS**

This thesis is the outcome of a long and challenging process with a lot of barriers. Throughout this period, I was feeling lost many times, striving to reach to the outcome after reading a lot of papers and changing many times the sample and the dataset. Now at the end of this process I feel stronger and more confident for the next step in my career, full of ambitions and energy to achieve more. The reason why I chose this topic thrives from the Advanced Corporate Finance and Governance lectures at the Erasmus University in Rotterdam where I was inspired by Dr. Patrick Verwijmeren, Professor of Corporate Finance at the Erasmus School of Economics (Erasmus University Rotterdam). Some of the very interesting topics of this course were the ownership and executive compensation, the board of directors and the importance of corporate governance in the firm. I knew even from the first block that I will work on something related to this field and especially in the board of directors as there is a shortage of evidence regarding this topic in the existing literature which until now concisely and critically presents the CEOs' compensation but not the compensation of the individual members within the board of directors specifically. It is a very interesting topic, in my opinion, as it is related directly with the structure and the wellness of the company and its employees. I felt I was a real researcher and I believe that my paper will contribute to the pool of articles related to income inequality within the firm and more specifically between the higher levels of employees.

I would like to express my honest thanks to my first supervisor Mr. Yuhao Zhu, who provided me with all the information and knowledge regarding this topic during the period he was a PhD candidate of Financial Economics at the Erasmus University in Rotterdam. Moreover, I am extremely grateful to Dr. Jan (J.J.G) Lemmen, Lecturer and Researcher in Financial Economics at the Erasmus School of Economics (Erasmus University Rotterdam) who accepted to supervise me in the middle of the year after Mr. Zhu finished his contract with the University and for letting me work on this topic as I wanted, without putting me into strict lines.

At this point, I would like to show my complete indebtedness to my family who has always been by myside to all the difficult parts of this process and their support. Their love and kind words were always a therapy and a reason to not give up. My heartfelt gratitude goes to my fellow master student Anna-Maria Pavlidou for her valuable assistance and continuous contribution to my entire study experience in the Netherlands.

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## **ABSTRACT**

Using a proprietary dataset of public S&P listed U.S. firms in a contemporaneous period (2007-2017), this paper gives a better understanding on the wage inequalities within the Board of Directors, and their impact on the firm performance, valuation and need for monitoring. The result is that these pay disparities are not related to the performance and valuation of the firm and that they decrease when the CEOs hold more equity. Firm size, on the other hand, affects the pay disparities, mostly between the inside and outside directors.

**Keywords:** Director Compensation, Pay Inequality, Firm Performance, Firm Valuation, Need for Monitoring

**JEL Classification:** G11, G23

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## **1 Introduction**

While executive pay has been extensively researched, the issue of the director compensation is a topic that attracts the attention of the financial regulators and media in recent years as a new focus on the compensation of the high-level employees. An article posted on Business Insider in 2014 raised the concerns regarding the reasonable pay for directors and executives. As it is stated, the lawsuit filed against Facebook in Maryland and claims that the Directors of the company award themselves up to \$156 million each in stock, stating that the compensation is excessive and wasteful. Bloomberg also reveals that the average package, worth \$461.000, is 43% greater than that of the peer workers within the industry. In my paper I will focus on the pay disparities within the board of directors and on how these are related to firm's operating performance, valuation and need for monitoring.

Prior literature has worked mainly on the CEOs' annual salary and how this relates to firm performance. However, as my main goal is to identify whether the compensation of the Board members affect the firm performance and their behavior regarding the shareholders' interests, it would be a limitation in my research to collect data and work mostly on the CEOs' compensation, as it is not only the CEOs that are included in the Board of Directors. Because of that, my data are focused on all the directors, providing information on the board affiliation and the employment title (CEOs and other members). The Board of Directors is a group of individuals which includes executive and non-executive directors, CEOs, Heads of committees such as audit committee, compensation committee etc. The Securities Exchange Act of 1934 (Dodd-Frank Wall Street Reform and Consumer Protection Act, 2011) established the compensation committee within the Board of Directors to include only non-executive directors for better monitoring.

The related bibliography and articles have mainly provided the relationship between the firm size, and the performance with the CEOs' compensation, with some of them to include the wage of the average workers. Moreover, there are some additional external variables that may affect the overall performance of the firm, such as the employee morale and productivity. It is shown that large pay inequalities may act as an incentive for board members to exert more effort and improve the performance of the company. In addition, it may increase the monitoring incentives as directors who belong to the upper pay levels feel obliged to the shareholders and they want to remain at the same position. On the other hand, the large pay inequalities may show that directors are entrenched, and they care only for their compensation and not the benefits of the company and the monitoring in general. Relative to that, the evidence shows that some directors jeopardize their positions and compensation (Dah and Frye, 2017). Looking into the news feed, "High pay disparities inside a company can hurt the employee morale and productivity, and have a negative impact on a company's



overall performance”, states Julie Fox Gorte, the Vice President of sustainable investing PAX World Management (2013), on her behalf to support the U.S. Securities and Exchange Commission proposal regarding the disclosure of the CEO-to-worker pay ratio as adopted by the Section 953(b) of the Dodd-Frank Wall Street Reform and Consumer Protection Act.. On the top of that, a recent article on Business Insider (Rachel Premack, 2018) reveals that more than 80% of people were willing to pay money to prevent an email informing five of their peers how much they earn to be sent.

There is a limited amount of previous studies that have examined the relationship between the director’s pay disparities and the overall performance of the firm. Siegel and Hambrick (2005) worked on top management compensation and found that large pay inequalities among the executives have detrimental effects on the collaboration mostly in the high-technology companies and as a result in their performance. In contrast, Mueller, Ouimet and Simintzi (2017) support that firms with higher pay inequalities especially among the top pay levels (hierarchy levels where managerial talent is important) are larger and have better operating performance. Dah and Frye (2017) developed a model to predict the expected and normal director compensation and found that most of the directors are overcompensated and that firms with entrenched boards extract greater cash compensation which is negatively related to monitoring, as the board members are interested more in their wellbeing rather than the benefit of the company. Based on this article I collect the data for the director compensation and I focus on the wage dispersion within the board by dividing it in three categories: the independent or outside directors, the inside directors (they are also called employees in some papers), and the other directors (those that are linked to the company or are not ascertainable). To be more specific, the first category refers to the individuals who are members of the board, but they are not related in any manner to the company. These directors, as it is discussed in the literature review part, are not executive directors which means that they don’t participate in the day-to-day operations of the company, but their only purpose is to maintain an unbiased advice. The inside director, on the other hand, is a member of the board who is part of the company, a, chief executive officer or direct stakeholder. These people act for the benefit of the entity’s stakeholders and most of the times have special knowledge of the inner workings of the company. The “others” category contains all the other members of the board who are neither outsiders nor insiders, those who have been appointed by a shareholder, but they are not obliged to participate in the firm’s operation on a daily basis.

Recent regulations have required some companies to increase the number of the outside directors on the board to improve the performance, as it is found that the size of board independence protects firms from corporate misconduct. Companies and policy makers aim to increase the board independence within firms as a governance mechanism to deter the corporate scandals, such as the Volkswagen emission case. The company’s decision to suggest a long-serving executive as a chairman created a “conflict of interest” and was a root cause of the diesel-emissions scandal. It is mentioned that more

and more countries have focused on the board independence. India, Hungary, Korea and the U.S. require that boards include mostly independent directors whereas Japan continues to keep no independent ones. Other countries, such as New Zealand and Luxembourg, maintain a balance on the number of the independent and inside directors. Neville, Byron, Post, and Ward (2018) support that the board independence is synonymous with the good governance and can assist in avoiding the corporate misconduct, claiming that this type of directors can monitor the firm managers and focus on the shareholders' interests more effectively. It is worth to notice, though, that there are some scholars who still try to find out whether the board independence is the solution to the problem of corporate misconduct.

The next paper I chose to combine is the "Within-Firm Pay Inequality" research of Mueller, Ouimet and Simintzi (2017) which explores the relationship between the wage differentials among the top and the bottom level jobs and the firm size, operating performance, and equity returns. This paper was a true inspiration and my best motivation to start working on disparities among the members of the board. After all, I was curious to understand whether the huge wage gap exists only between the top and bottom level employees or within the board as well. Following the methodology of this paper, I employ a proprietary data set of American companies in which directors' pay is collected from Compustat as the total director compensation which is reported in SEC filings. The three categories of the board of directors are grouped into 3 pay ratios, allowing me to measure how wage disparities between these pay levels vary across firms. For instance, the first pay ratio, IO, includes the wage of the other directors versus the independent ones, comparing the two least engaged directors within the company. IE, on the other hand, includes the salary of the insiders relative to the independent directors, and OE is the wage of the insiders relative to the other directors. To examine how pay inequalities, affect the monitoring, I am going to test how the four determinants of director compensation, leverage, assets in place, capital expenditures and CEO ownership are related to the pay inequality within the board.

Relative to the scope of my thesis I train on a representative sample of 243 organizations, for a period of 2007 to 2017, comparing the results preceded and followed by the 2008 financial and real estate crisis in the USA, for several public companies in the North America that are included in the S&P 500 index. In addition, prior to 2005, public companies had to disclose only narrative description of director compensation. The disclosure requirements have changed since 2006, so to increase the robustness of my results I will investigate this 10 year-period starting from 2007.

My main research question is listed below:

***‘Is the pay inequality within the board of directors detrimental for the firm’s operating performance and need for monitoring?’***

To provide the answer to my main research question, I aim to structure some hypotheses that will reflect all the variables I want to investigate on board pay inequality within each firm. The four hypotheses are:

1. Firms with high pay inequality within the boards are larger.
2. Higher pay inequality within the boards is associated with better operating performance.
3. Higher pay inequality within the boards is associated with greater firm valuations.
4. Larger firms with higher leverage, lower liquidity and less total assets are more difficult to be monitored by the board.

Having presented all the hypotheses and background of the research topic, let me briefly provide you the results of my thesis. Overall, larger firms exhibit more pay inequality within the board of directors with more intense results to those directors who have a strong affiliation and relationship with the daily operations of the company relative to those who work independently without being employed by a shareholder or have limited relationships with them, whereas there is no effect in the firm performance and valuation. In terms of the monitoring need, it is found that the CEOs decrease the pay inequalities when they hold more equity of the firm.

The remainder of this paper is organized as follows. Section 2 provides the theoretical framework which covers theories and previous research around corporate governance, executive pay and psychology fields. In section 3 I provide my data and the variables I am going to use in order to test the hypotheses whereas the methodology design and the empirical investigation are introduced in sections 4 and 5. Section 6, concludes and points out the limitations of this paper for future research.

## **2 Literature Review**

### **2.1 Literature Review**

In the first chapter of this section, I provide a broad overview of the existing literature regarding the most important components of the board of directors, their compensation and its relation to firm performance and need for monitoring, as well as some interesting studies that add value to my research such as the employee morale and productivity, the tournament theory and the equity fairness. In the second chapter, I provide the conceptual framework and the hypotheses that are going to be analysed.

#### **2.1.1 Corporate Governance**

##### **➤ Agency Theory**

The Agency theory (also known as agency dilemma or agency problem) casts a very long shadow over the social sciences, that has been firstly developed by Jensen and Meckling (1976) and Fama and Jensen (1983). This so-called “contractual view of the firm” describes the relationship between the action of the owners (CEOs) of the company and the interests of the principal (shareholders), showing the importance in the separation of management and finance or, in other words, of ownership and control. It refers to difficulties that the shareholders have when they invest their money in the company and want to make sure that they are not wasted on “bad” projects as the agents are motivated to act in their own best interests and they are in contrast with the interests of the principal. This is also known as the “moral hazard” problem.

The Agency problem is one crucial topic not only because of monetary incentives of the managers but also due to the reputation of the company that may influence its image in the near future. In most cases, the two parts sign a contract which clearly specifies how the manager allocates the funds and divides the returns to him and the financiers. However, this is something difficult to be done as it is hard to describe and forecast the exact amounts. As a result, the manager and the financier allocate residual control rights - the rights to take decisions when something is not clear in the contract (Grossman and Hart, 1986). This can be described by the theory of ownership which seems to be the core issue in the corporate governance literature. From the firm’s perspective, ownership structure improves the performance of the firm as it determines the profitability and it is a mechanism to reduce the agency costs and protect the property rights (Barbosa and Louri, 2002). In order to overcome all the costs and discrepancies, the solution to this problem is to give managers some equity stake in the firm. Doing so the managerial incentives would be in line with the shareholders’ interests. Himmelberg, Hubbard and Palia (1999) support this by showing that when managerial ownership is high, when managers have power on executives’ compensation, the firm value decreases.

A recent paper of Alexander Pepper and Julie Gore (2012) provides a new conceptual framework which places the agent performance at the centre of the agency problem supporting that the incentives of both the shareholders and the owners of a company are most like to be aligned when the executives are motivated to work as effectively as they can. This new version of agency theory provides a better explanation for the relationship between the agent and shareholders' incentives, the firm performance and the executive compensation as it is based on a more realistic package of assumptions about the agent and shareholder behaviour.

#### The role of the board under the agency theory

As it is mentioned, the board of directors acts on behalf of the shareholders (Fama and Jensen, 1983) and it is the main internal control mechanism to find a balance between the interests of the shareholders and the managers. One of the core responsibilities of the board is to set the compensation of the CEOs and to monitor their performance (Lorsch and Maciver 1989). However, the evidence shows that the CEO compensation is excessive, and the financial regulators have expressed their concerns about high pay inequality within firms, something that led many researchers to start exploring what is the role of the board in the remuneration of the executives. That means that the CEO compensation varies across firms depending on the control responsibilities of the board which shows that it is the board responsibility to fix this issue and reduce the added agency costs.

#### ➤ Corporate Governance Codes-New Regulations

As described above, corporate governance is the mechanism the companies use to be directed and controlled. Traditional concerns have focused on the issues regarding the protection of the investors' and shareholders' rights as well as on financial statements, risk management and executive compensation. Corporate governance was poor before 1980, where the hostile takeover threats and the shareholder activism were low, and the executive compensation was not a hot topic. In 2000, New York Times starts mentioning 69 new stories that were related to corporate governance issues while this number increased to 426 stories in 2002. The first thing that changed and led the topic to become very popular was the takeover protection while the accounting fraud (Enron) became the most common reason of why it is important to generate some corporate governance codes. Looking at the internal corporate governance and more specifically at the board of directors, the legal model for the US does not require any norm for the board and focuses on the role of the independent directors for the best protection of the shareholders' interests.

As I am going to work on American public companies, one of the most significant regulations for this category in the United States is the Sarbanes-Oxley Act (SOX) since the Great Depression. The overall intend of SOX, also known as the "Public Company Accounting Reform and Investor Protection Act", is to improve the accuracy of the information which is provided to both board of directors and shareholders and protect the general public from accounting errors and financial scandals

like Enron, WorldCom, and Tyco. The main goal is to improve the auditing of the U.S. public companies and provide better audit insights, disclosure rules and criminal penalties while at the same time many of the provisions of the act apply to privately held companies. SOX attempts to achieve the above goals in three ways:

1. Reconstruct the auditing process. Auditing is not the same thing with consultancy and this should become clear.
2. Stiffen penalties when false information is provided (Enron).
3. Force companies to validate their internal financial control processes and sign that they are responsible.

Both criticism and praise are available for this Act. From the empirical investigation, Rice and Weber (2011) argue that SOX alone might not reach the initial goals as they found that only a minority of SOX reports improved the internal control. Another recent study of Arping and Sautner (2010), on the other hand, indicates that cross-listed firms that were not subject to SOX became more transparent following SOX, with transparency being measured by the dispersion and accuracy of the earnings forecast's analysis. However, the Financial Executives International (FEI) study and research support that SOX has improved the board composition and performance, the senior management engagement in financial controlling and the investor confidence in financial reports (Internal Auditors Study 2007). This code has been praised for building an ethical culture as it promotes the managerial transparency and employee responsibility regarding their acts while protecting the shareholders' incentives.

### **2.1.2 What is the board of directors?**

#### **➤ Board Composition**

The board of directors of a company are people asked to prove the company's strategy, approve business decisions (like takeovers, hires/fires of the executives, compensation for the high-level employees) and oversee the financial statements. They have specific legal duties within the organization, but they have their own businesses and meet a few times within a year. They are busy people who jointly put their expertise to work for the company they are asked for. The shareholders of the company vote on the directors during the annual meetings and they choose the board members to be the shareholders' representatives. In the United States, the board of directors has a clear fiduciary duty to protect the interests of the shareholders for the company's overall strategy, governance and performance. They delegate the responsibilities of the day-to-day job to the CEO as they are not the managers and they don't want to overtake the business. "The Board has the ultimate responsibility for the management, general affairs, direction and performance of Unilever. In all its dealings, the Board has regard to the interests of Unilever as a whole, including its shareholders, employees, customers and suppliers, together with Unilever's social and legal responsibilities in the communities in which it operates.", states the Unilever PLC company regarding the role and responsibilities of their board.

### ➤ Board Characteristics

The board of directors is characterized by the independence, number of directors and diversity. Regarding the independence, the directors may work inside the business or come from the external environment. The inside director is a director who is also an employee, chief executive or someone related to the company and has knowledge of the inner workings of the firm (ex. CEO, CFO, executive vice president, large shareholders). The outside director is not employed or engaged with the organization and does not represent the stakeholders. These people bring their knowledge and experience they have from the external activities from different industries to the organization. They are advantageous because they can be objective and there is no risk of conflict of interest. However, sometimes they may be unable to apply all the knowledge they have to the company because they don't know how this organization and industry is operating, as they don't work within the company on a daily basis. There is also a third category, the grey or other directors. In this section, the directors stay in the middle, they don't work for the company, but they have some links to mention (consultants, bankers).

In the US, the board of directors is consisted by all the directors, both executives and non-executives. This is called one-tier board and the CEO can also be the chairperson, something that is not optimal as he/she is hard to be monitored and fired, if necessary. A research done by Bhagat and Black (2002) on 928 companies during the period 1988 to 1993 found that companies with lower historical profitability are more likely to increase the number of the outsiders on the board and that this is not related to the firm performance, measured by the market-to-book ratio (Tobin's Q), return on assets and abnormal returns. In other words, the paper is against the conventional wisdom that the board dependence improves the firm performance. However, another interesting paper from Duchin, Matsusaka, and Ozbas (2010) sheds a light on the "information gap" and its importance on this matter. Based on the notion that the independence of the board affects positively the performance of the firm, they wanted to examine whether that relationship is influenced by how difficult it is for the independent directors to acquire expertise about the company. They worked on 2,897 American companies for a 5-year period, starting from 2000 and their main finding was that when the cost of acquiring information is low, there is an improvement in the performance when the outside directors are added to the board and when the cost of information is high, then the performance deteriorates. Moving on the recent years, Knyazeva, Knyazeva, and Masulis (2013) also examined the relation between outside directors and firm performance and found that there is a positive relationship between these two factors. Working on a representative sample of 900 small and mid-sized firms that are included in the S&P Index for the period of 1996 to 2006 and after controlling for the availability of the local talent, they reached out the result that the independent directors are positively related to firm value, measured by the market-to-book ratio, and the operating performance, based on ROA.

It seems that the research evidence regarding the potential benefits and drawbacks of the board independence effect in the operation of the company is mixed and can be summarized at the below table.

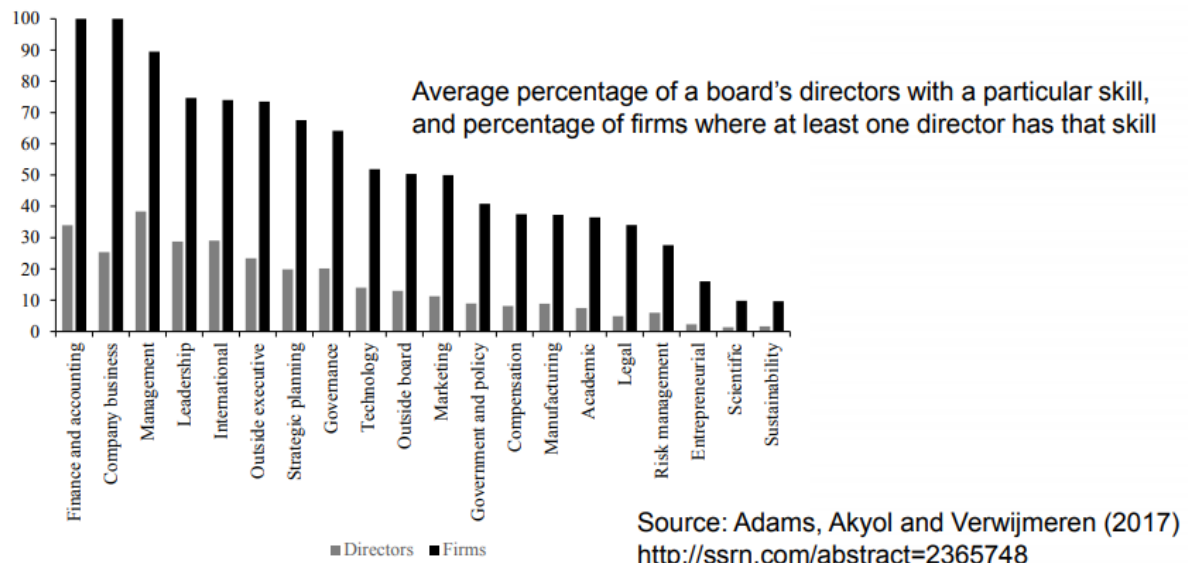
**Table 2. 1: Benefits and Drawbacks of Outside Directors on the Board**

Outside Directors on the Board			
Potential Benefits		Potential Drawbacks	
<b>Represent the interests of all shareholders</b>	Bhagat, and Black (2000)	<b>Cost of acquiring information might be high</b>	Duchin, Matsusaka, and Ozbas (2010)
<b>Provide third party advice and oversight</b>	Duchin, Matsusaka, and Ozbas (2010)	<b>Sometimes they are not too independent</b>	Coles, Daniel, and Naveen (2014)
<b>Can bring expertise in the board and reduce agency costs</b>	Boyd (1994)	<b>Some of them are not powerful enough</b>	Fogel, Ma, and Morck (2014)

Moving now to the size of the board, the empirical studies show that the board size is negatively related to the firm performance, showing that smaller boards perform better (six or seven people). Some possible reasons for that are the cost of the large board, the free riding, the higher payment and slower decision making as larger boards need more meetings to take decisions. However, in smaller boards monitoring is less likely and the exchange of different opinions is limited. Last, having different people within the board will provide different solutions, views and advices. Some potential difficulties here are the cost of diversity and the hard coordination among the members. Adams, Akyol, and Verwijmeren (2017) found that the firm performance is positively related to having skill sets that are related to each other on the board and between the inside and outside directors. As it is shown in the graph below, directors are not one-dimensional, and every firm has at least one person with financial accounting and company business background.



**Figure 2. 1:** Skill of the directors on average



However, as Dr. Verwijmeren, Professor of Corporate Finance at the Erasmus School of Economics states, the common ground boards perform better, because in terms of firm value the members communicate faster and make decisions easier than in diverse board of directors. Lobestone Global in the 6<sup>th</sup> Annual 2016 Private Company Board Compensation Survey found that the boards continually have strong impact on firm performance, with 87% of the companies reporting higher revenues and 82% reporting higher EBIT. It seems that the right directors can be an inseparable part of the goal's achievement and profitability improvement. His results confirm that the large boards can lead to inefficiencies, while smaller ones with limited diversity can drive an effective strategy.

#### ➤ Influence of the board on the CEO compensation

The board of directors, and more specifically the members of the compensation committee, is responsible for setting the CEO compensation package. It is found that there are several characteristics that influence the decision process of the compensation committee such as the board composition. To be more specific, the Dodd-Frank Wall Street Reform and Consumer Protection Act (2011) requires only outside directors to work on the compensation for more objective packages. In general, research has shown that the outside directors do not lead to lower the CEO compensation. Boyd (1994) found that, contrary to expectations, the number of insiders is negatively related to the compensation and that the CEO compensation is greater in firms where there is board independence. Finkelstein and Hambrick (1989) added that there is no relation between the outside director stock ownership and the CEO pay, which also leads to the result that the CEO compensation does not decrease in firms with board independence.

There are some cases though where the CEO is the board chairman at the same time. As mentioned above it is important for the compensation committee to consist of outside directors in order to avoid unexpected extra agency costs and eliminate the potential conflict of interest which is related to the decision regarding the executive compensation, performance and success. However, Larcker and Tayan (2016) state that the separation of the chairman and the CEO is not the right proxy for the firm performance or governance quality. Although the research results are mixed, it is reported that the number of the independent chairmen tripled from 9% to 28% (Spencer Stuart Board Index Report 2016), which shows that companies realized the consequences and took steps to change the situation.

#### ➤ Director Compensation

Apart from the executive compensation, the board of directors should determine the level and the form of the compensation for all the members. The board-of-directors compensation schemes vary across firms and are significantly associated with the effective monitoring. Although such characteristics build barriers to an effective corporate governance, the financial literature examined the existence of an optimal contract that would reduce the agency conflicts. However, more recent literature suggests the compensation to be a matter of negotiation between the board and the CEO (Hermalin and Weisbach, 1998).

A recent article (2018) by the author Mims Maynard, partner in Morgan Lewis LLP in the department of Employee Benefits and Executive Compensation, brings the director compensation in the spotlight and discusses the steps the companies follow to avoid any issues regarding the compensation schemes.

1. Robust Process: Most companies hire a compensation consultant to set a benchmarking and reasonable compensation package relative to peer groups for directors, based on total compensation, meeting fees, cash and equity compensation. Here it is mentioned that it is important the decisions of the director compensation to be taken in separate meetings of those regarding the executive pay.
2. Follow Best Practices: Set the requirements under which the directors are eligible to hold shares until retirement from the board.
3. Proxy Disclosure: Define and provide the clear process for the director compensation in a proxy statement.

A recent Pay Governance review published in the Harvard Law School Forum in 2017 regarding the Director Compensation reveals that there is a major shift on how large publicly listed companies compensate their board. More specifically it shows that the median total direct compensation was \$265,487 in 2016, which represents a less than 1% increase in the compensation compared to 2015. Some of the changes that have led to these results are the elimination of the board meeting fees and retirement plans and the adoption of stock ownership guidelines. In general, the director compensation programs are quite similar from company to company with the primary difference in the level and not

the form of the compensation. The main goal of the U.S. companies is to attract and retain skilled and qualified directors in order to reduce misalignment with the shareholders' interests and to execute an effective corporate governance structure.

### **2.1.3 Pay dispersion across managers and impact on firm performance**

#### ➤ Theoretical models

##### Tournament theory

The tournament theory, as it is described in personnel economics by the economists Lazear and Rosen (1981), provides the situations where the wage dispersion is a matter of differences among the individuals and not of the absolute levels of output. This theory supports that the large pay dispersion motivates the qualified managers to take strong incentives, try harder and improve their performance. Since many years, management scholars and researchers have used this theory to describe a wide range of inter- and intra- organizational competitions, which provides extra incentives to participate in the "managerial tournament" and try hard to win the prize. In such tournaments, the players are rewarded based on their performance, and the winner receives the largest prize while the worst performer receives the smallest. The difference between the good and the bad present varies as the number of the participants increases. It is found that the participants with low ability are risk averse and they will choose riskier strategies to increase the possibility of winning the prize. Apart from the promotional incentives and pay differentials between the jobs, the tournament theory argues that short-term incentives are also necessary to motivate employees to compete for a position in the top management and may lead them to leave the competition if such incentives don't exist.

Previous studies have worked on this topic and the results are mixed. Main et al. (1993) found that large pay disparities among the top executives of 200 U.S. firms during the period 1980 to 1984, increases the firm performance. It is important to note that the tournament theory is associated with income inequality. When agents care only about their improvement, this does not cause any problem as their well-being is their incentive and they try to be improved. However, many experiments show that most of the individuals are not purely motivated by self-interest, but they care about the situation of their peers. Many psychologists observed that the utility of a person with a specific income is lower when this person knows that his/her peers receive more

##### Equity fairness theory

Contrary to the tournament theory, arguments regarding the equity fairness suggest that higher pay inequalities among the top management levels increase envy and adversely affect the employee performance and morale. Adams (1963), workplace and behavioral psychologist, first developed that theory claiming that the employees seek to maintain equity between what they bring to the company (inputs) and what they get from it (outputs). It is the feeling of fairness the employees need in order to be motivated and to contribute with their peers in the organization. It seems that if firms cannot control

the output perfectly, the only incentives the employees have are to increase the output to the maximum for their own benefit and for higher wages.

To sum up, the tournament theory is positively related to the wage dispersion and firm performance whereas the equity fairness theory is the opposite notion. Although the results from the previous studies are mixed, one is certain: both have caught the attention of the researchers in order to examine what affects the firm performance.

#### Satisfaction and comparison income

Clark and Oswald (1996) attempted to test whether the utility of the employees is affected by the income of the peer group, or otherwise the “comparison” wage or “reference level”. Working on a random sample of 5000 British workers who were asked how satisfied they feel with their jobs, they found that employees’ satisfaction is negatively correlated to their comparison earnings levels. Although this kind of data is rarely used by the economists, the social psychology works mainly on the self-reported levels of satisfaction showing that the investigation is empirically correct. They also claim that the satisfaction is significantly declining with the level of education. In general, the reported satisfaction seems to be a good proxy for the utility data. Carbonell (2004) also found the same results working on German companies and with self-reported data. The main conclusion of the paper is that the larger is the wage of an individual compared to the relatives, the happier the person is. In contrast, a more recent study by Boyce, Brown and Moore (2010) reveals that the reference income has no effect on the individual’s satisfaction. It is added that people weight more heavily upward comparisons than downward ones, meaning that the individuals won’t feel better when they receive more money than their reference group, but they might be affected when they find that they receive less.

#### ➤ Pay inequality and firm performance

Income inequality within firm is a topic that has attracted the attention of many regulators in the media and policy circles. In recent years, the researchers and many stock market investors are still working on this topic to determine whether it affects the performance of the employees and the company in general. Starting with the paper I used for my thesis, Mueller, Ouimet and Simintzi (2017), using a proprietary data set of both public and private UK firms, found that firms with higher pay disparities between the top and the bottom level jobs are larger and have better valuations and operating performance. They also report a positive and highly significant relationship between the firm growth and the income inequality, sharing their concerns about the reason why the wage inequality is in constant rise.

Working on 102 business units from the UK and the USA, Cowherd and Levine (1992) tried to investigate whether the wage inequalities between the management and hourly paid workers as within the management affect the product quality and the firm performance. The results from the standard

linear regressions showed that these variables are negatively associated. On the other hand, Hibbs and Locking (2000), using data from Swedish industries for the period 1964 to 1993 and plants from 1972 to 1993, found that the wage inequality increases the firm performance. However, they also report the negative relation of the between-industry wage inequality with the aggregate output and the growth of the productivity.

#### **2.1.4 Board members' attention to monitoring**

As mentioned above, the agency theory argues that the board of directors is responsible for monitoring, as by doing that they can observe and control whether the shareholders' incentives are in line with those of the owners and avoid the extra and unnecessary agency costs. Dah and Frye (2017), the paper I am based on for the investigation of the second part of my thesis, show that the average director compensation level is above the efficient compensation level and that this excess compensation leads to CEOs' entrenchment. They also point out that a slight increase in director excess compensation reduces the probability of the CEO turnover and the turnover-performance sensitivity. They conclude on the notion that the firms with low levels of fixed assets, high levels of capital expenditures and low CEO ownership require greater monitoring by directors, which is a determinant for the directors' pay increase.

### **2.2 Conceptual Framework**

On the previous part, I provide the overview of the results of different researches and working papers regarding the board of directors' composition and compensation, the pay disparities within firm and within the top management and how these are related to firm performance and monitoring incentives. At this section, I will try to organize all these ideas and to show their relationship on a visual representation so that it would be easy to remember and apply in the process of my research.

The section consists of three parts: The first part provides the relationship between the wage disparities within the board and the firm size, the second examines whether the main determinants of the board of directors' compensation are related to firm performance and valuations, and the third part describes the variables that affect the monitoring incentives.

Figure 2.2 shows that the pay inequalities within the board of directors are affected by the size of the firm. As it is discussed in the literature review part, Mueller, Ouimet, and Simintzi, (2017) show that firms with higher pay inequalities among the top and the bottom level employees are those who have a greater number of the people who are occupied there. My main goal here is to examine whether this result is the same based on the director pay disparities only. As a director compensation, I chose the total director compensation as reported in SEC filings, as it is used by one of my main papers (Dah and Frye, 2017). This number is the summary of the directors' cash fees (Director Cash

compensation), stock awards, option awards, non-equity incentive plan compensation, change in pension value and non-qualified deferred compensation earnings, and all other compensation for the years 2007 to 2017. The information regarding the board affiliation is collected by the ISS-Directors' Data Request (RiskMetrics) on WDRS and the size is the number of the employees in the firm. The firm size also contributes to the level of the director compensation and the firm performance, as mentioned in the literature review, so it is important to take it into account. Therefore, the independent variable on that search is the number of the employees in logs and the dependent is the three levels of the total director compensation, named as pay levels, the wage associated with independent directors over the wage associated with the others (OI), the wage associated with the employees (insiders) over the others (OE) and the wage associated with the employees (insiders) over the independent directors (IE).

**Figure 2. 2:** Pay levels within the board and firm size

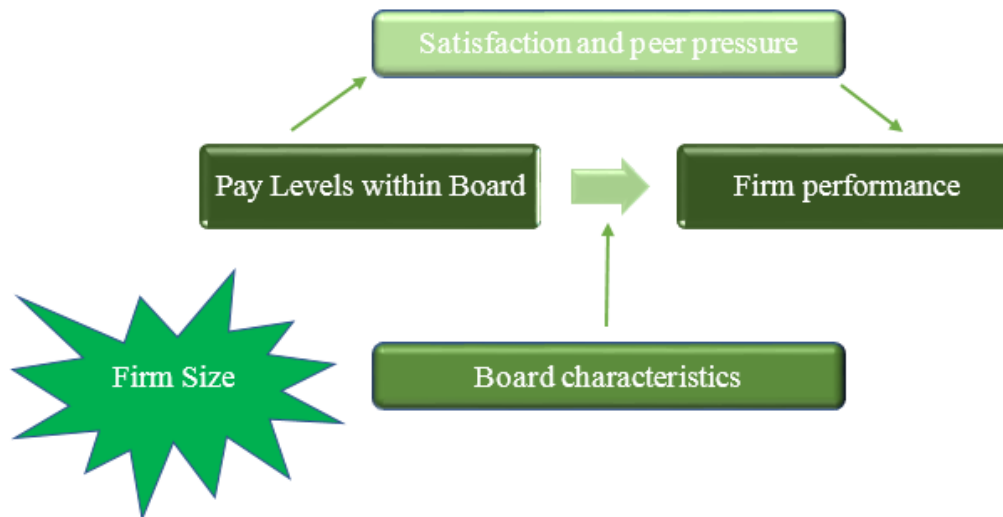


The second framework investigates the relationship between the pay level disparities and the firm performance and overall valuations. Based again on the paper “Within-Firm Pay inequality” (Mueller, Ouimet, and Simintzi, 2017) which shows that higher pay inequality among the upper and bottom level workers within the firm is associated with better operating performance and valuations, I will try to investigate whether these are still positively related with the pay levels within the board.

For firm performance I use as a measure both financial and accounting metrics. Following the method of the paper I mentioned above, I first use the return on assets (ROA) as a key performance metric, which is considered to be one of the best metrics for financial performance as it determines the possibility the company to generate an adequate return on these assets rather than simply showing robust return on sales. For robustness, I follow the method of the second paper I am based on (Dah, and Frye, 2017) and I use the Return on Sales (ROS) as metric for the firm performance. The pay disparities of the director levels are the same as the first framework. Given the previous results with the size, it is important to set the firm size as a control variable and to run the regressions both with and without the size controls to determine whether the size has any effect on firm performance. In addition, I am going to set the board characteristics as the moderator in this research and the feeling of equity and fairness compared to the peer salary as the mediator. The reason why I put these variables in that way is that the board characteristics (independence, insiders) influences the strength of the relationship between the pay levels and the firm performance while the feeling of satisfaction and the

comparable income explains why the differences between the members of the board lead them to increase or decrease their performance and consequently the performance of the firm. The dependent variable here is the firm performance (ROA, ROS) and the pay levels the independent one.

**Figure 2. 3:** Pay levels within board and firm performance

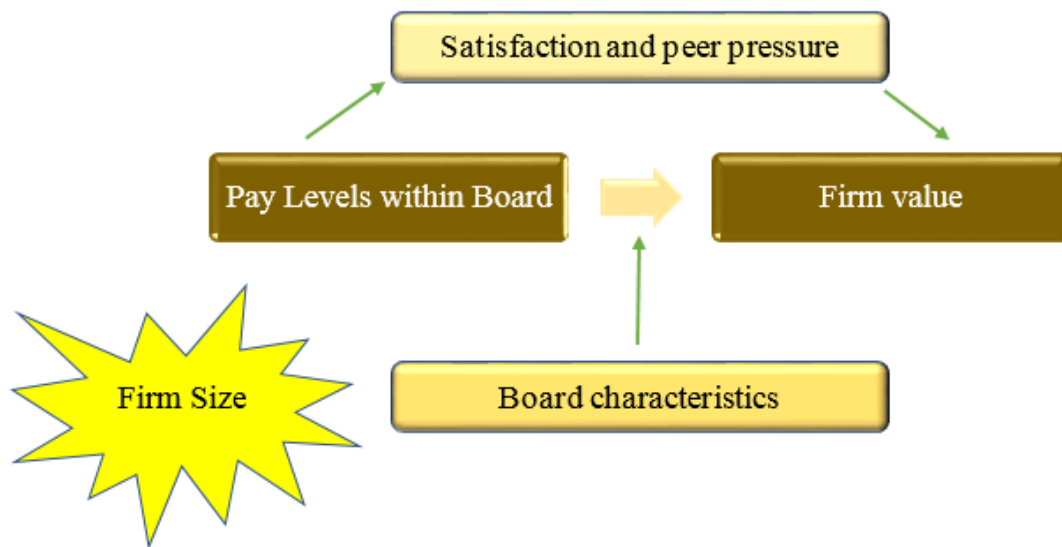


To measure the effect of the pay levels to firm value I am going to use the Tobin's Q metric. Tobin's Q is the ratio of the market value of assets over the book value of assets, where the market value is calculated as below:

Market value of assets= Book value of assets + Market value of common stock- sum of the book value of the common stock and balance sheet deferred taxes.

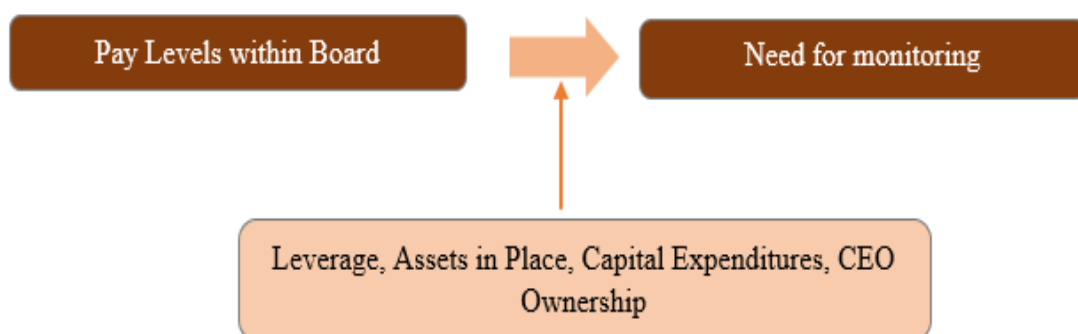
In my research, I use the formula of Chung and Pruitt (1994), which states that the Tobin's Q is equal to the sum of the Market Value of Equity, liquidating value of Preferred Stock and Debt divided by the book value of total Assets and I downloaded it from Compustat (WRDS/Fundamentals/ Balance Sheet Items). As in the Figure 2.3, Figure 2.4 shows that the dependent variable now is Tobin's Q with the same control, mediator and moderator variables.

**Figure 2. 4:** Pay levels within board and firm value



The third and last framework focuses on pay levels and monitoring incentives. To capture the need for monitoring, I am going to use the debt and total assets. Higher level of debt may indicate that the firm requires more monitoring whereas more total assets make it easier for the board to monitor which results in a lower compensation. Brick et al. (2006) found that the relationship might be positive or negative. In addition, I will use the firm complexity as a proxy for the need for monitoring, using the firm size as a metric for firm complexity. In general, when the size of the firm increases, the firm becomes more complex and it makes it difficult for the top management to control all its operations effectively. On that research I will use the pay levels as the dependent variables while the debt, the total assets and the firm size are the independent and the mediator ones.

**Figure 2. 5:** Pay levels within board and need for monitoring





## **2.3 Hypotheses**

In this section I provide all the hypotheses that are tested in this paper.

### Main Hypotheses

**Hypothesis 1:** Firms with higher pay inequality among the members of the board of directors are larger.

As mentioned in the literature review and the conceptual framework, there is previous research that states that the pay inequality within firms is positively associated with the firm size. Mueller, Ouimet and Simintzi (2017) support that the wage differentials between the top and the bottom level jobs are higher when the firms are larger. On this thesis, I will investigate whether the result is the same when we work with the wage differentials among the members of the board of directors.

**Hypothesis 2:** Firms with higher pay inequality among the members of the board of directors have better operating performance.

Based on the same paper, it is found that the firms that have greater pay dispersion between the top and the bottom level employees operate more effectively and have higher earnings surprises.

**Hypothesis 3:** Firms with higher pay inequality among the members of the board of directors have greater value.

After finding that higher pay inequalities firms have better operating performance, it is found that they have greater Tobin's Q as well, and consequently better valuations.

**Hypothesis 4:** Larger firms with higher leverage, higher debt and less total assets are more difficult to be monitored by the board.

Dah and Frye (2017) argue that the number of employees, which is consistent with larger firms, is negatively related with the complexity of the firm, and consequently with the need for monitoring. In addition, they found that firms with higher leverage and with low levels of fixed assets would suggest greater monitoring by the directors. At this paper, I will try to investigate whether the results are the same when we work with the pay disparities among the directors and whether the liquidity plays any important role in the monitoring of the firm.

Below you can see all the four hypotheses summarized:

**Table 2. 2:** Hypotheses

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**Hypothesis 1: Firms with higher pay inequality among the members of the board of directors are larger.**

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**Hypothesis 2: Firms with higher pay inequality among the members of the board of directors have better operating performance.**

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**Hypothesis 3: Firms with higher pay inequality among the members of the board of directors have greater value.**

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**Hypothesis 4: Firms with higher leverage, low levels of assets in place, high levels of capital costs and less CEO ownership are more difficult to be monitored by the board.**

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### **3 Data and Variable Construction**

#### **3.1 Sample Collection**

My main focus is to investigate whether the pay disparities among the members of the board of American publicly listed firms, and more specifically the firms that are listed in the S&P 500 index, the Standard and Poor's 500 American stock market index which is based on the market capitalizations of the 500 largest companies in the U.S (common stock on NYSE, NASDAQ, Cboe BZX Exchange), are related to the performance of the firm, and other characteristics, like the size and the valuation. The reason why I decided to work on the U.S. financial market is because it is more transparent, and the results are easily accessible.

Starting with my sample, I chose to focus on the period from 2007 to 2017 to avoid biases that might occur due to disclosure requirements that changed in 2006. Prior to 2006, companies had to disclose only the historical data of the director compensation, whereas from 2006 they were required to report the total director compensation. In addition, I wanted to check whether there are any changes 1 year before the 2008 crisis and what happens 9 years afterwards. In my opinion, the results are more robust when the research covers all the economic phases of the markets.

Regarding the director compensation data, I used the total compensation reported in SEC filings that can be found via ExecuComp. This number is the summary of the directors' cash fees (Cash compensation), stock awards, option awards, non-equity incentive plan compensation, change in pension value and nonqualified deferred compensation earnings, and all other compensation. The Institutional Shareholder Services (ISS) provides more information regarding the board of directors, their name, age, board affiliation, employment title, ethnicity, etc. The firm-specific data were collected by the Compustat database and CRSP database was used in order to obtain balance-sheet and income statement specific data. All these datasets assisted me in constructing a sample of observations per firm, per year, and working in a representative sample of cross-sectional time-series data. The main variables I used can be found in Table 3.2.

Based on the Standard Industrial Classification code (SIC), I exclude the companies that are related to finance, insurance and real estate (consumer finance, banks, asset management, financial exchanges, etc. CODE: 6000-7999 as well as those who are related to utilities (multi-utilities, power producers and energy traders, health care, etc. CODE: 4000-4999). This is a standard procedure that previous researchers follow in the corporate finance literature, as the firms on these categories operate differently and have significantly unsimilar goals (Brick et al. 2006).

Using STATA, I match all the databases, ExecuComp, ISS, Compustat and CRSP, based on the Ticker Symbol, an abbreviation which uniquely identify publicly traded companies, stocks, bonds, mutual funds, and the fiscal year. After this merging process, my dataset consists of 11193 firm-year observations for 243 S&P firms in 88 different industries (based on 4-digit SIC codes).

Below the table 3.1 describes the industry taxonomy of the companies according to the Standard Industrial Classification code (SIC). I present the code and the industry sector. (Source: Wikipedia, Compustat). As mentioned above, two categories with SIC codes 6000-6799 and 4000-4999 are excluded from the sample.

**Table 3. 1:** Industry classification (SIC)

<b>SIC codes</b>	<b>Industry sector</b>
<b>0100-0999</b>	Agriculture, Forestry and Fishing
<b>1000-1499</b>	Mining
<b>1500-1799</b>	Construction
<b>1800-1999</b>	not used
<b>2000-3999</b>	Manufacturing
<b>4000-4999</b>	Transportation, Communications, Electric, Gas and Sanitary service
<b>5000-5199</b>	Wholesale Trade
<b>5200-5999</b>	Retail Trade
<b>6000-6799</b>	Finance, Insurance and Real Estate
<b>7000-8999</b>	Services
<b>9100-9729</b>	Public Administration
<b>9900-9999</b>	Nonclassifiable

### 3.2 Variable construction

In this chapter I discuss all the variables that are used for the analysis. In Table 3.2, I present the variable construction for the regressions and a brief description for each one of them.

**Table 3. 2:** The variables

Variable	Description
<b>Board Characteristics</b>	
<b>DirComp</b>	Total director compensation as reported in SEC filings: summary of the director's cash compensation, stock awards, option awards, non-equity incentive plan compensation, change in pension value and non-qualified deferred compensation earnings and all other compensation. Source: ExecuComp
<b>Pay levels</b>	Pay ratios comparing the pay across the three categories of board members. Source: Mueller, Ouimet, and Simintzi (2017)
<b>Firm Characteristics</b>	
<b>ROA</b>	Return on Assets. Calculated as EBIT over the total assets. Source: Duffhues, and Kabir (2008)
<b>ROS</b>	Return on Sales. Calculated as EBIT divided by the total sales. Source: Duffhues, and Kabir (2008)
<b>SALES</b>	Represents the gross sales (the number of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers, for each operating segment. Source: Compustat
<b>Tobin's Q</b>	This ratio is a measure of firm assets in relation to a firm's market value. Calculated as below:  $\frac{\text{Total Assets} - \text{Book Value of Equity} + \text{Market Capitalization}}{\text{Total Assets}}$
<b>Firm size</b>	The natural logarithm of the number of employees of the company Source: Compustat
<b>Need for monitoring</b>	
<b>AT</b>	Total assets/liabilities of a company at a point in time. Source: Compustat
<b>LEV</b>	Investment strategy of using borrowed money to increase the potential return of an investment. Calculated as the total debt divided by the total assets. Source: Duffhues and Kabir (2008)

<b>DLC</b>	Total debt in current liabilities. Calculated as the summary short-term notes and the current portion of long-term debt. Source: Compustat
<b>DLTT</b>	Long-term debt in total. The item represents debt obligations due more than one year from the company's balance sheet date. This item includes purchase obligations and payments to officers, notes payable, long-term lease obligations, industrial revenue bonds, advances to finance construction, loans on insurance policies, indebtedness to affiliates, bonds, mortgages, and similar debt, all obligations that require interest payments, publishing companies' royalty contracts payable, timber contracts for forestry and paper, extractive industries' advances, production payments and advances for exploration and development. Source: Compustat
<b>SEQ</b>	Total stockholders' equity. This item represents the common and preferred shareholders' interest in the company. Source: Compustat
<b>CEO ownership</b>	Percentage of the total shares owned by the CEO i in year t. It is calculated as the Shares held by the CEOs over the Common Shares Outstanding.
<b>SHROWN</b>	Number of Shares owned by the CEO. Source: Compustat
<b>CSHO</b>	Common Shares Outstanding. The item represents the net number of all common shares outstanding at year-end, excluding treasury shares and scrip. Source: Compustat.
<b>PPE/AT</b>	Assets in place. Calculated as the Property, Plant and Equipment in Total Divided by the total Assets. Source: Compustat
<b>CAPX/AT</b>	Capital expenditures divided by the Total Assets. Source: Compustat

### **3.3 Descriptive Statistics**

At this chapter I provide a first insight on the sample for the further analysis. The below tables demonstrate the summary statistics of the board of directors' compensation for each hierarchy level, the firm characteristics and main variables summary statistics as well as some other important information that would add more value to my research. The second part of this chapter provides the correlations between the variables to specify my regressions.

### 3.3.1 Descriptive Statistics

Table 3.3 provides the categories of the members of the board which is essential for the pay-level construction for our regression analysis.

**Table 3. 3:** Categories within the board

Category	Name of the Job Title	Description
<b>I</b>	Independent/Outsiders	not employed or engaged with the organization and does not represent the stakeholders.
<b>O</b>	Others	don't work for the company, they have some links to mention (consultants, bankers).
<b>E</b>	Insiders	chief executive or someone related to the company and has knowledge of the inner workings of the firm

These three categories from Table 3.3 are divided in such way based on the engagement or affiliation the directors have with the firm. As we can see from Figure 3.1, the independent (I) directors, for example, are less engaged with the company as they do not work for it or for any shareholder and they just provide their experience and knowledge to a company, or sometimes to even more than one company. The inside directors (E), on the other hand, are employed by the company, work every day in it and represent the company and its shareholders, so they are strongly engaged with it. The other directors (O), are placed somewhere in the middle as they are neither employed by the company nor they are completely independent directors.

**Figure 3. 1:** Setting board members regarding the engagement with the firm

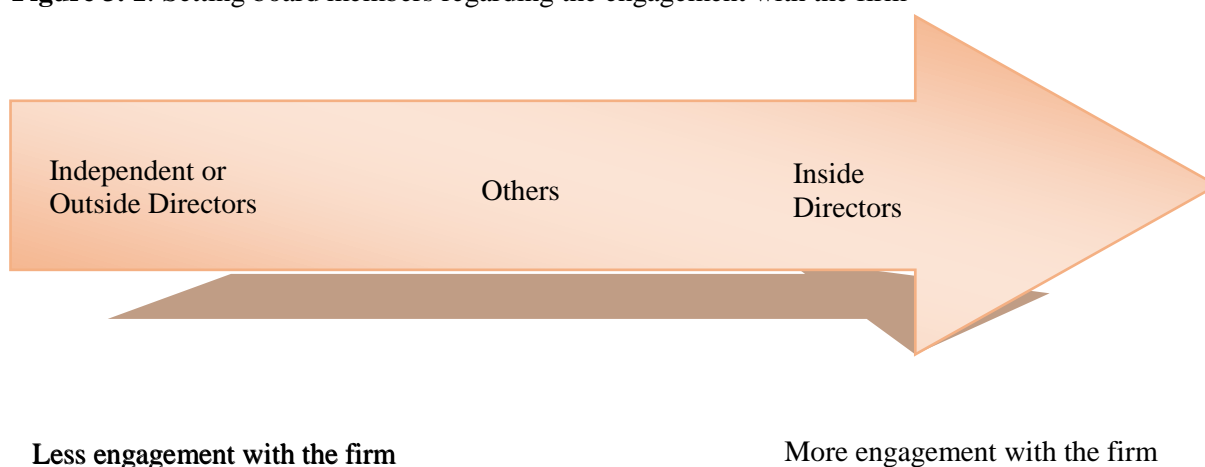


Table 3.4 illustrates the distribution of the wages separately for each category of the board members on all firm-year observations. The total compensation of the directors is collected, as mentioned, from ExecuComp as reported in SEC filings for the period 2007 to 2017 and is winsorized at the 10% and 99 % level.

The reason why I chose these percentage levels is because in the literature, studies of high-quality data generally provide percentages of gross errors much higher than 1% in each tail in order to not miss large outliers (Hample, 1986). I would like to increase the robustness of my results and I use the 10% and 99% winsorized mean. As can be seen in Figure 3.2, the independent directors are in the majority and they exist in every company, something that is related to the Dodd-Frank Wall Street Reform and Consumer Protection Act (2011) which requires all the companies to keep mostly outside directors on the board and especially in the compensation committee. It seems that the “others” directors category receives more money than the other two, whereas the independent directors’ compensation is higher than the insiders’ in average.

For instance, the average wage in the “independent” (I) category is \$194,071.1, the average wage in the insiders (E) category is \$183730.6 and the average wage in the “others” category is \$206132.7. Moving from the insiders to the independent directors, we see a slight increase of 6% on average. In particular, if an inside director decides to become an outsider, there would be a 5.6% increase on his/her wage that is higher than if the same inside director decides to work as an independent director for the company. It can be assumed that the directors who have no or less affiliation with the firm receive a better compensation package than those who are employed by the firm.

**Table 3. 4:** Distribution of wages per category

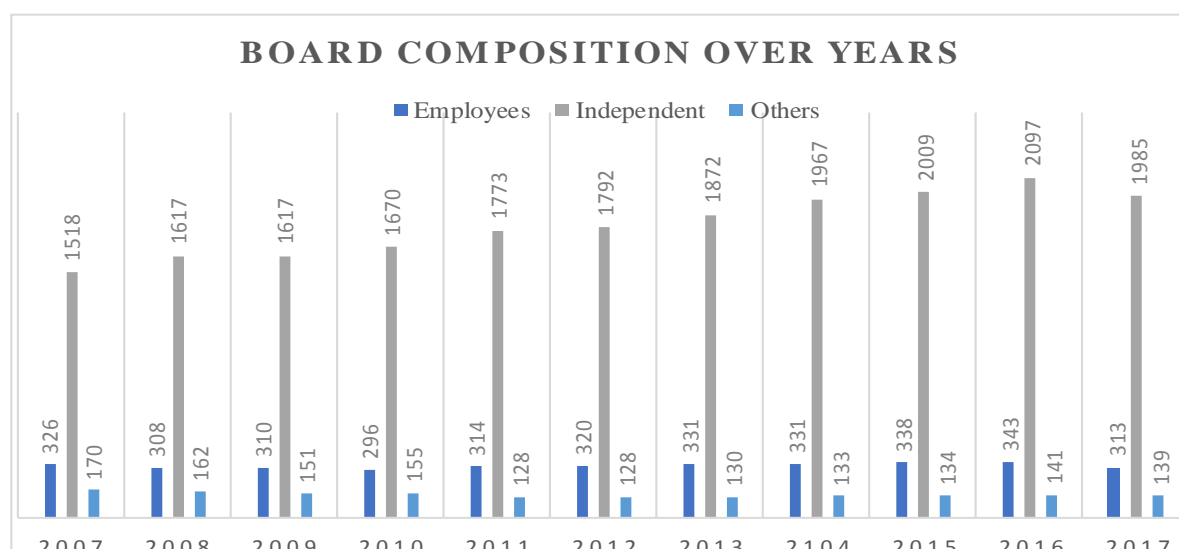
This table shows the distribution of wages for each category level across the firm-year observation data. Wages are in dollars (\$) and are winsorized at 10 and 99<sup>th</sup> percentile. The sample period is from 2007 to 2017. The categories are described in Table 3.2.

<b>Categories</b>	<b>Obs.</b>	<b>Avg.Wage</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>Std. Dev</b>
<b>I</b>	<b>19917</b>	<b>194071.1</b>	<b>340</b>	<b>216089</b>	<b>283807</b>	<b>163190.7</b>
<b>O</b>	<b>1571</b>	<b>206132.7</b>	<b>1,011.77</b>	<b>211135</b>	<b>284922</b>	<b>197473.6</b>
<b>E</b>	<b>6840</b>	<b>183730.6</b>	<b>300</b>	<b>200047.5</b>	<b>273083.5</b>	<b>164989</b>



**Figure 3. 2:** Board composition over the years

The below graph shows the distribution of the Insiders, Independent (Outsiders) and Others within the board for all the firm-year observations.



Moving now to the within-firm pay inequality, I compute for all  $(3 \times 2)/2 = 3$  category-level pairs the corresponding ratio of compensation within a given firm and year (“pay ratio”). To be more specific, I is the category that is less related to the company operations (independent), O (others) as more related to I and E the most related (insiders). For example, the “pay ratio IO” means that I divide the wage associated with O (others) by the wage associated with I (independent).

Table 3.5 shows the pay levels distribution among the three categories-level pairs. I would expect to find that the average pay ratio increases as the level pairs are more distant (IE), however it seems that this is the lowest pay ratio in average. For example, pay ratio IE is lower than OE, which is lower than the IO. In addition, I provide also the percentage of firm-year observations for which the pay ratio is above 1. This amount shows that the employee pay is closely related to the peer salary when it is close or equal to one (or 100%). It seems that 0.56% of the ratios of the firm-year observations are less than 1.

**Table 3. 5:** Distribution of wages per pay ratio

This table shows the distribution of wages for each pay level across all firm-year observations. Wages are in dollars (\$) and winsorized at 10 and 99<sup>th</sup> percentile. Category-pair levels are described in Table 3.2. The sample period is from 2007 to 2017.

<b>Pay Level</b>	<b>Obs.</b>	<b>Avg.Pay ratio</b>	<b>25%</b>	<b>50%</b>	<b>75%</b>	<b>Std. Dev</b>	<b>Ratio&gt;1</b>
<b>IO</b>	<b>242</b>	<b>1.254</b>	<b>0.769</b>	<b>0.978</b>	<b>1.218</b>	<b>1.511</b>	<b>112</b>
<b>IE</b>	<b>243</b>	<b>0.971</b>	<b>0.809</b>	<b>0.955</b>	<b>1.063</b>	<b>0.277</b>	<b>97</b>
<b>OE</b>	<b>243</b>	<b>1.286</b>	<b>0.712</b>	<b>0.959</b>	<b>1.241</b>	<b>1.315</b>	<b>111</b>

Table 3.6 and the figure below demonstrate the summary statistics of the director compensation of all the public listed firms on the S&P 500 of my sample for all the years prior and after the crisis of 2008. From the first table and the graph below, I observe that the director compensation was \$188911 million on average with a respective median of \$189739 million in 2008. After that year, there was a slight decrease of 15.6% on average and 8.25% in median terms for the next year. The next years, I observe that the total director compensation (as reported in SEC filings) increases continuously and steadily within the last 2 years. It is also interesting to note that the director compensation is greater than the median since 2013, something that it is in line with the previous literature regarding the excessive compensation of the directors (Dah, and Frye, 2017).

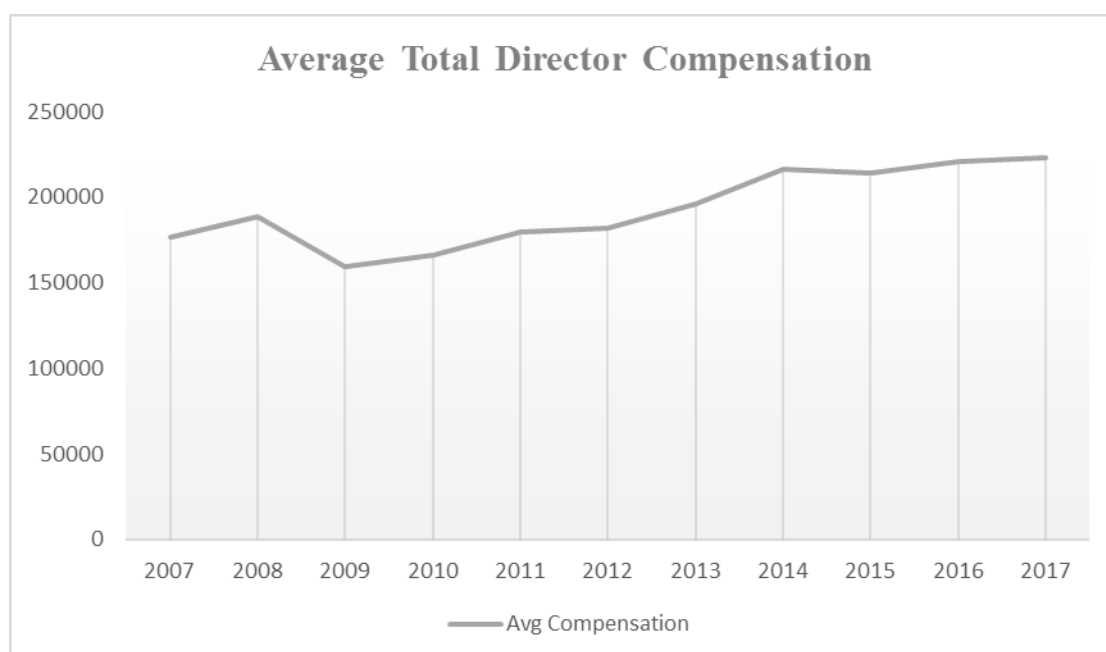
**Table 3. 6:** Director Compensation

This table shows the summary statistics of the director compensation of all the firm-year observations. The wages are in dollars (\$) and winsorized at 10% and 99%percentile. The values are expressed in thousands of dollars.

Fiscal Year	Observations	Mean	Median	Std. deviation
2007	2014	177014.3	171743.5	156271
2008	2087	188911	189739	157266.6
2009	2078	159589.7	174086	140560.1
2010	2121	165912.3	189998	153085.1
2011	2215	179458.3	202024	157745.4
2012	2240	182084.8	212715.5	156486.3
2013	2333	196178.9	223391	163780
2014	2431	216654	244175	177322.9
2015	2481	214474.3	249967	174493
2016	2581	221113.8	257854	168987.5
2017	2437	222980.6	255162	181474.8
Total	25018	194669.5	215097.5	165056

**Figure 3. 3:** Average Total Director Compensation

The graph below illustrates the summary statistics of the average total compensation of the members of the board for the period 2007 to 2017.



The last table of this chapter, table 3.7, illustrates the summary statistics for the main variables that are used in the regression analysis in order to investigate my main research question and the hypotheses. Panel A accounts for the three proxies I am going to use for the firm performance (ROA, ROS) and the firm value (Tobin's Q) and Panel B is about the accounting measures, which are going to be used for the size effect (firm size), the need for monitoring (Leverage, Assets in Place, Capital Expenditures and CEO ownership) as well as control variables (firm size). The total number of observations is not the same as in table 3.6, something that it shows I lost some observations during the merge of the director compensation and the firm characteristics. The average publicly listed company in the U.S has positive return on assets and sales of 12.3% and 16.3% respectively whereas the average Tobin's Q ratio is 2.087 In terms of the number of the employees, the average firm size of the firms in my sample is 4.67 thousand people with \$2.16 billion sales. From the same table, I observe that the average large firm of my sample has total assets of \$2.3 billion with debt ratio of 0.24, assets in place 0.68 and capital expenditures of 0.045. Last, the share ownership of the CEO is 25% on average.

**Table 3. 7:** Main variables summary statistics

This table presents summary statistics for firm performance and accounting measures for all the firm-year observations. Sales, total Assets (AT) are in million dollars.

Characteristics	Obs.	Mean	Median	Std
<b>Performance measures</b>				
ROA	25018	0.123	0.112	0.064
ROS	25018	0.162	0.148	0.093
Sales	25018	2157763	31575.5	6076112
Tobin's Q	25018	2.087	1.921	1.367
Firm size (natural logarithm)	25018	4.673	3.858	2.748
<b>Accounting Measures</b>				
AT	25018	2339766	40148.5	5260383
Leverage	25018	0.246	0.256	0.162
PPE/AT	22909	0.681	0.330	0.304
CAPX/AT	12445	0.045	0.032	0.037
CEO ownership	25018	0.257	0.140	0.289

### 3.3.2 Correlations

On this chapter I provide the possible correlations between the dependent and independent variables that I am going to use in the regressions.

As can be seen in table 3.8, firm size (FS) is positively and statistically significant for all the three categories, except the IE pay ratio, something that is in line with the theory that the firm size affects the compensation levels (Gabaix and Landier, 2008; Gabaix et al., 2014), whereas ROA and ROS provide an insignificant correlation with the compensation levels IO and IE and OE (see table 3.3 for the abbreviations). We see also that the correlation between the performance measures (ROA, ROS) and the pay inequality at the firm level (ALL) is not significant and the same results holds for the Tobin's Q. Regarding the need for monitoring, we see a positive and significant relationship between the Pay inequality within the board (ALL) and the CEO ownership. Based on the multicollinearity theory, when two explanatory variables are very highly correlated (0.7 or higher) it is better to drop one of the two variables from the regression model (Farrar and Glauber, 1967). From those variables that will be in the same regression model there are no signs of multicollinearity, which is a positive sign and enables me to continue with my analysis, having the first impression of the relationship among the variables.

**Table 3. 8:** Cross Correlation table for the within board inequality analysis

Pearson correlation coefficient for the pay ratios (IO, IE, OE), Within-firm pay inequality (ALL), Return on Assets (ROA), Return on Sales (ROS), Tobin's Q, Sales, Firm Size (FS) based on the number of employees, Total Assets (AT), Assets in Place (PPE/AT), capital expenditures (CAPX/AT), Leverage (LEV) and CEO Ownership (CEO\_OW). Significance level: 5%

	IO	IE	OE	ALL	ROA	ROS	Q	SALES	FS	AT	PPE/AT	CAPX/AT	LEV	CEO_OW
IO	1													
IE	0.2790*	1												
OE	-0.1075*	0.4288*	1											
ALL	0.0579*	0.0590*	-0.0411	1										
ROA	0.0045	0.0070	-0.0104	-0.0404	1									
ROS	0.0072	0.0040	-0.0140	0.0036	0.6201*	1								
Q	0.0089	0.0085	0.0163	-0.0022	0.2757*	-0.1216*	1							
SALES	0.0533*	0.0431	-0.0538*	-0.0475	0.0186	0.0332	0.0062	1						
FS	0.0238*	0.0493	0.0961*	-0.0503*	-0.0139	-0.0192	-0.0586*	-0.0999*	1					
AT	0.0068	-0.0105	-0.0803*	-0.0369	0.0205	0.0189	-0.0062	0.6011*	-0.0482	1				
PPE/AT	0.0001	-0.0038	-0.0190	0.0420	-0.0732*	0.0096	-0.1328*	-0.1328*	-0.0024	-0.0699*	1			
CAPX/AT	0.0296	0.0097	0.0646*	0.0041	0.0331	-0.0849*	-0.0456	-0.0540*	0.0730*	-0.0101	0.5380*	1		
LEV	0.0238	0.0493	0.0961*	-0.0022	-0.0139	-0.0192	-0.3092*	-0.3092*	-0.0833*	-0.0482	0.0311	-0.0325	1	
CEO_OW	-0.0165	0.0185	0.0155	0.0485*	0.0027	-0.0300*	0.0226*	-0.0226	-0.059**	-0.0018	-0.0514	-0.0219	0.1016	1

## 4 Methodology

For this research I use multivariate panel data regressions since my dataset consists of time-series data with a panel structure, as it contains information of different variables for different years. For that reason, my panel is characterized as unbalanced. The analysis of the time-series panel data is carried out with the fixed effects model, as it is important to control for omitted variables that may affect my results and hurt the outcome. For example, in my research I expect the firm size to influence the relationship between the pay inequality within the board and the firm performance (Mueller, Ouimet, and Simintzi, 2017). In addition, I use time-fixed effects as my variables change over the time and I am interested in investigating the effect of the time and the time-invariant effects of the independent variables on the dependent ones.

I start with the basic econometrical setup for my analysis. In the regression I use year fixed effects and I cluster the standard errors at the firm level, so that each observation provides us with wages for all the pay ratios within the board for the same year and firm. In general, the regressions take the following form:

$$Y_{i,t} = \alpha + \beta x_{i,t} + \lambda_t + u_{i,t} \quad (1)$$

Where:

$Y$  = independent variable

$x$  = dependent variable

$\alpha$  = the intercept term

$\beta$  = slope coefficient

$u_i$  = error term

$t=1, \dots, T$  years

$i=1, \dots, N$  firms

$\lambda$  = year fixed effects

It is important to mention here the three general problems that occur when we analyze the pay-performance analysis:

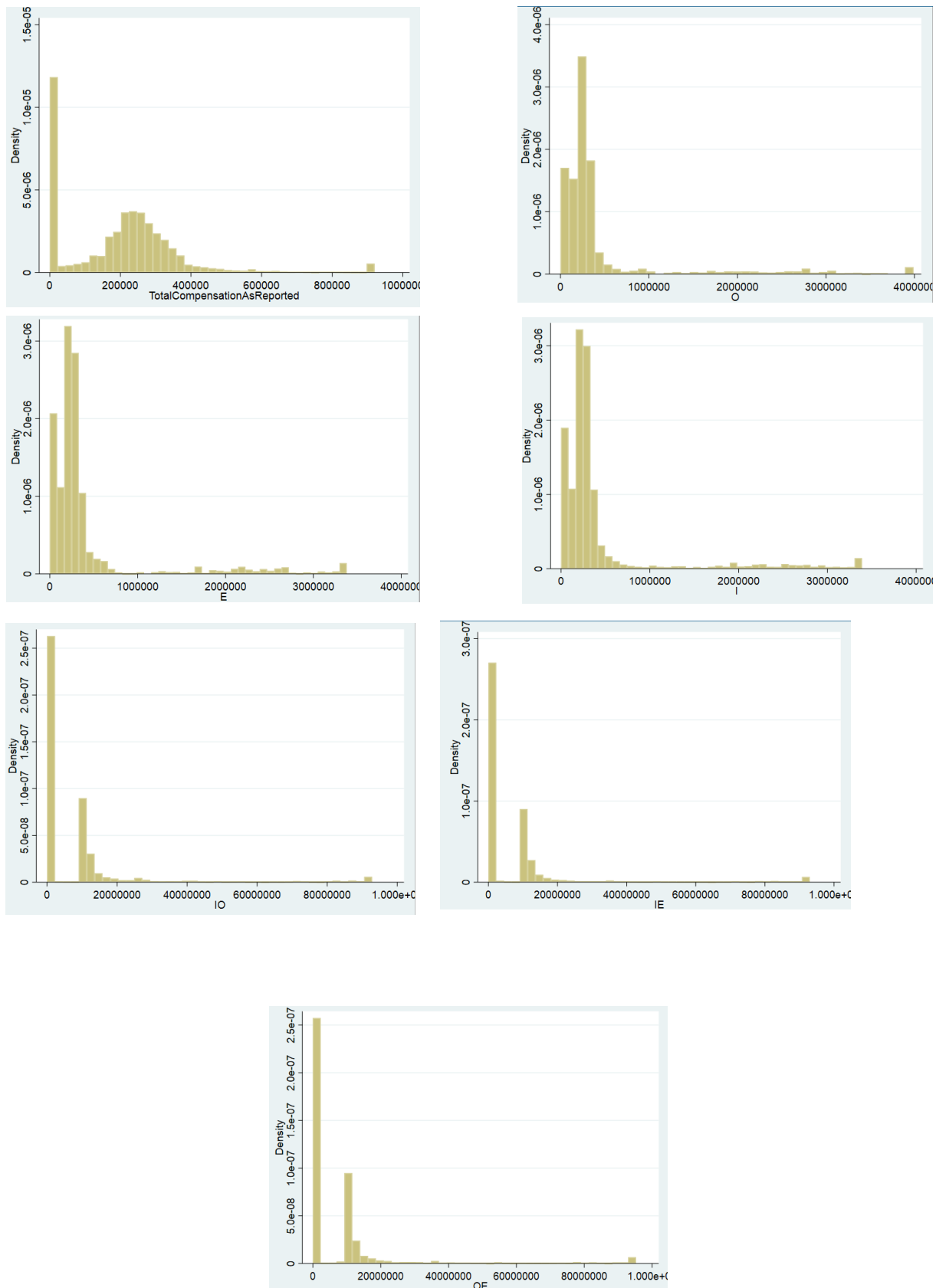
### ➤ Skewedness of the compensation variables test

The first issue that I have to take into account is whether the director compensation variables have a skewed distribution. Figure 4.1 below provides the histogram of the pay ratios winsorized at 10 and 99<sup>th</sup> percentile. As I mention above, I use these levels to catch all the outliers and to provide a more robust result (Hampele, 1986).



As we can see, all the compensation variables (total director compensation, compensation of others, independent and insiders, pay ratios) are positively skewed (right skewedness-many observations are above the median), which violates the outcome for the fixed effects regressions. For that reason, I will use the natural logarithm of the pay levels to solve this problem. We also see that there is a big outlier around zero, which means that there are some companies which don't provide us with their directors' compensation. To avoid problems from this outlier, I exclude these firms from my sample as well.

Figure 4. 1: The skewedness of the compensation variables



➤ Endogeneity problem-Autocorrelation of the error terms

The second issue is related to the endogeneity problem between the independent and dependent variables. To be more specific, firms with higher pay inequalities have better performance (Mueller, Ouimet and Simintzi, 2017), but it might be possible that firms that perform better might increase the pay inequalities among their employees. Therefore, I separate this bidirectional causation by using lagged independent variables which reduces the endogeneity problem as there is no previous literature which supports that there is any relationship between the current compensation and the firm performance of the previous year.

At this stage, I have to test for autocorrelation in the error term  $v_i$  within the fixed effects panel data model, which affects the standard errors and the significance of the coefficients. To do so, I follow the Breusch Godfrey autocorrelation test with the below hypotheses:

$H_0$ : There is no serial correlation in panel data

$H_1$ : There is serial correlation in panel data

If the second hypothesis is correct, then I have to cluster the regression models to correct the standard deviations and solve the autocorrelation problem. (Drukker, 2003) I chose this test as it is applied in time series panel data, it is less sensitive to the assumption that the residuals are normally distributed (as Durbin-Watson) and it allows us to test for serial correlation through a number of lags, besides just one lag, the outcome of this analysis is shown in chapter 5 (empirical results).

➤ Multicollinearity test

Multicollinearity (also known as collinearity) is a test to identify whether there are high intercorrelations among the many different variables in the analysis. As I have already mentioned in the data and variable construction table 3.8 of the previous section, we find no extreme correlations among the variables that will be used in the same regression model. The only high correlations are those among the variables that are not directly related to each other: ROS-ROA (0.6201), and Total Assets-Sales (0.6011)

## **4.1 Regression construction**

### **4.1.1 Pay inequality and Firm size**

To investigate the relationship between the pay inequalities within the board of directors and the firm size, I perform a stringent test following the methodology of Mueller, Ouimet, and Simintzi (2017)

In order to not replicate the article, I use a different dataset (variables, years, country) to shed a light on my first hypothesis by running  $(3 \times 2)/2 = 3$  individual regressions - one for each pay ratio. This enables me to investigate whether there is any relationship between the pay inequality and the firm size. My regression is constructed to test the first hypothesis below:

- Hypothesis 1: Firms with high pay inequalities within the board are larger

$$\ln(\text{Pay ratio})_{it} = \beta_0 + \beta_1 \ln \text{Size} + \lambda_t + v_{it} \quad (2)$$

Here, the dependent variable is the pay ratio (in logs) associated in each category within the board, the Others over the Independent (IO), the Insiders over the Independent (IE) and the Insiders over the Others (OE). The natural logarithm of all the employees in the firm is used as a proxy for the firm size. All the three regressions include year fixed effects. Regarding the coefficients,  $\beta_0$  is the constant intercept,  $\beta_1$  is the elasticity of the director compensation to the firm size,  $\lambda_t$  is the dummy for the year fixed effects and  $v_{it}$  is the standard error which is clustered at the firm level.

#### 4.1.2 Pay inequality, Firm performance and valuations

My second hypothesis investigates the relationship between the pay inequalities within the three categories of the board and the overall performance of the firm. Having the paper of Mueller, Ouimet and Simintzi (2017) as a reference, I create the below regression, which will help me to answer the second hypothesis:

- Hypothesis 2: Firms with higher pay inequalities among the three different categories of the board members perform better.

$$\text{Performance}_{it} = \beta_0 + \beta_1 \text{PayInequality}_{(t-1)} + \beta_2 \ln \text{size} + \lambda_t + v_{it} \quad (3)$$

Here, the dependent variable is the performance of the firm within a given year and the independent variable is the pay inequality. Pay inequality at the firm level is lagged by one year and the size of the firm ( $\ln\_employees$ ) is used as a control variable. Again, as before,  $\beta_0$  is the constant intercept,  $\beta_1$  is the elasticity of the performance to the pay inequality,  $\beta_2$  is the elasticity of the performance to the control variable (firm size),  $\lambda_t$  is the dummy for the year fixed effects and  $v_{it}$  is the standard error which is clustered at the firm level and year level.

To investigate my third hypothesis, I use the same regression model as the above with the only difference that the independent variable now is the firm value, where Tobin's Q is used as a proxy for the firm valuations.

- Hypothesis 3: Firms with higher pay inequalities among the three different categories of the board members have higher valuations

$$\text{FirmValue}_i = \beta_0 + \beta_1 \text{PayInequality}_{(t-1)} + \beta_2 \text{lnsize} + \lambda_t + v_{i,t} \quad (4)$$

At this regression,  $\beta_0$  is the constant intercept,  $\beta_1$  is the elasticity of the firm value to the pay inequality,  $\beta_2$  is the elasticity of the firm value to the control variable (firm size),  $\lambda_t$  is the dummy for the year fixed effects and  $v_{i,t}$  is the standard error which is clustered at the firm level and year level

#### 4.1.3 Pay inequality and need for monitoring

In this regression, I follow the methodology of Dah and Frye (2017) to investigate whether the pay disparities among the members of the board and more specifically among the three categories IO, IE, OE have any impact in the firm's need for monitoring. Leverage, assets in place, capital expenditures and CEO ownership are significant determinants of the director compensation and consequently of the pay inequalities. We can see that from the correlation matrix of the previous chapter, and especially the strong and positive relation of the CEO ownership to the pay inequality at the firm level. Due to that, my fourth and last hypothesis is:

- Hypothesis 4: Firms with higher leverage, low levels of assets in place, high levels of capital costs and less CEO ownership are more difficult to be monitored by the board

$$\ln(\text{Pay ratio})_i = \beta_0 + \beta_1 \text{Leverage}_{(t-1)} + \beta_2 \text{PPE/AT}_{(t-1)} + \beta_3 \text{CAPX/AT}_{t-1} + \beta_4 \text{CEOOwnership} + \lambda_t + v_{i,t} \quad (5)$$

At this regression, I use the pay inequality (in logs) as the dependent variable, and the leverage, the assets in place (PPE/AT), the capital expenditures (CAPX/AT) and CEO ownership as the independent variables. All the independent variables, except the CEO ownership, are lagged by one year.

## 5 Empirical Results

In this section I present the empirical results of my analysis in order to test my main research question and the hypotheses. This chapter is divided into five parts as they were described in the conceptual framework of the previous section.

The first chapter of this section provides the results of the relationship between the pay disparities among the three categories in the board of directors and the firm size, the second chapter describes the impact of these pay inequalities to the firm performance, and the third part describes the impact of these pay inequalities on the firm's valuations in the third part.

The fourth and last chapter provides the relationship between the pay inequalities within the board of directors with the need of the firm for monitoring. Before moving to the analysis part, first I provide a time-series graph from STATA with the evolution of the pay inequalities (of all the three pay ratios) within the board on average through years and second the autocorrelation test for the standard errors.

**Figure 5. 1:** Evolution of pay inequality within the board for the period 2007 to 2017.

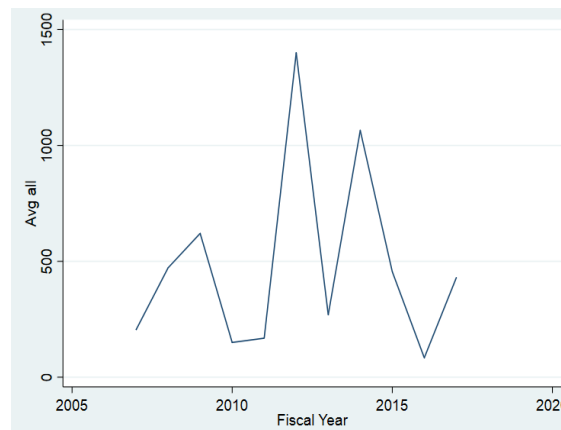


Figure 5.1 shows how the pay inequalities from all the pay ratios within the board have changed over the period of 2007 to 2017. As we can see, until the mid of 2009, the crisis period, the pay disparities continuously increased, whereas after the crisis period there was a rapid decline until 2010. After that year, the pay gaps follow some peaks and troughs until 2015. It seems that the differences among the wages of the directors started to increase again since the mid of 2015, something that explains the excess director compensation issue that is discussed in the literature (Dah and Frye, 2017).

As explained in the previous section, the first thing I must do is to check whether the three regressions of pay inequality include any autocorrelation because of the lagged independent variables I use. Using this general regression, I will test for the autocorrelation based on the Breusch-Godfrey LM test (see also Appendix B).

General regression Pay-performance elasticity:  $\ln(\text{Payratios})_{i,t} = \alpha + \beta_1 \text{ROA}_{t-1} + \beta_2 \text{ROS}_{t-1} + \beta_3 \text{FS}_{t-1} + \beta_4 \text{TQ}_{t-1} + \beta_5 \text{Lev}_{t-1} + \beta_6 \text{PPE/AT}_{t-1} + \beta_7 \text{CAPX/AT}_{t-1} + \beta_8 \text{CEO\_OWN}_{t-1} + \beta_{10} \ln \text{SALES} + \beta_{11} \text{R\&D/AT}_{t-1} + \beta_{12} \text{ADV/AT}_{t-1} + \lambda + u_{i,t}$

### Variable definitions:

- Pay ratios =  $\frac{\text{Others}}{\text{Independent}} (\text{IO}), \frac{\text{Employees}}{\text{Independent}} (\text{IE}), \frac{\text{Employees}}{\text{Others}} (\text{OE})$ , ratios with compensation in logs
- ROA = yearly return on assets
- ROS = yearly return on sales
- FS = Firm Size (number of employees in logs)
- TQ = Tobin's Q ratio
- Lev = Leverage
- AT = total assets
- PPE = property, plant and equipment
- CAPX = Capital Expenditures
- CEO\_OWN = CEO equity ownership
- SALES = Sales of firm in logs
- R&D = research and development expenditure
- ADV = advertisement expenditure
- $\lambda$  = year-fixed effects dummies
- $u$  = standard error

As we have a multivariate linear regression, the adjusted R-squared is the measure that will better explain our regression results, as it calculates the R-squared only from those variables whose addition in the regression is significant.

Table 5.1 provides the results of the Breusch Godfrey autocorrelation test with one degree of freedom (one lag). Since I am only analyzing the autocorrelations of the residuals at lag 1, the chi2 is a high-test statistic for all the three regressions (value of 188.408, 153.034, 1120.870 respectively) and the p value is very small (0.0000), so we reject the null hypothesis of no serial correlation in all cases. As accurate standard errors are very important to exist in a regression analysis, we should make some adjustments for clustering at the firm level, this allows for arbitrary correlation within the firms which corrects for autocorrelation, - due to the fact that different types of directors can be found on different

firms and my main goal is to investigate the pay inequality among the board members within the firm. As we can see in table 5.1, the first column presents the dependent variables (IO, IE, OE in logs) and the independent variables are the same for each regression as it is shown above. The chi2-statistics are the test statistics for the Breusch-Godfrey LM autocorrelation test whose significance can be determined by the p-values.  $H_0$ : no serial correlation,  $H_1$ : serial correlation. See APPENDIX B for STATA codes I used for the Breusch-Godfrey LM autocorrelation test.

**Table 5. 1:** Breusch-Godfrey LM test for autocorrelation

General regression Pay-performance elasticity:  $\ln(\text{Payratios})_{i,t} = \alpha + \beta_1 \text{ROA}_{t-1} + \beta_2 \text{ROS}_{t-1} + \beta_3 \ln \text{employees}_{t-1} + \beta_4 \text{TQ}_{t-1} + \beta_5 \text{FS}_{t-1} + \beta_6 \text{LEV}_{t-1} + \beta_7 \text{PPE/AT}_{t-1} + \beta_8 \text{CAPX/AT}_{t-1} + \beta_9 \text{CEO\_OWN}_{t-1} + \beta_{11} \ln \text{SALES} + \beta_{12} \text{R\&D/AT}_{t-1} + \beta_{13} \text{ADV/AT}_{t-1} + \lambda + u_{i,t}$

Dependent	chi2	p-value	$H_0$	$H_1$
ln(IO)	188.408	0.0000	Reject	Accept
ln(IE)	153.034	0.0000	Reject	Accept
ln(OE)	1120.870	0.0000	Reject	Accept

### 5.1 More Pay inequality at Larger firms

**Hypothesis 1:** Firms with higher pay inequality among the members of the board of directors are larger.

To explore the relationship between the pay inequality within the board of directors and the firm size, I run three separate regressions for the three different categories of directors. In this part I show the contemporaneous relationship, as I use the regressions for the same firm, for the same fiscal year. Here, I use the number of employees (in logs) as a proxy for firm size.

From table 5.2 we can see that while moving from the left to the right, the distance between the three categories of board members is vague. The coefficient of the firm size ( $\ln\_employees$ ) is significant for only the IE pay ratio and it is negative, whereas the other two pay levels are positive and insignificant. The negative sign shows the negative relationship between the firm size and the pay inequality. The very low adjusted R-squared of the two pay ratios IO and OE also shows that their relationship with the firm size is insignificant.

For example, a one percent increase in firm size decreases the pay associated with insiders by 0.0896% relative to the pay of independent directors and this result is statistically significant at 1%



level. In contrast, the insiders' pay increases by 0.0450% relative to the wage of the other directors and the wage of the other increases by 0.000104% relative to the independent directors with a one percent increase in firm size, but these results are insignificant. When directors with lower board affiliation (Independent-Others) and/or similar engagement to the firm (Others-Insiders) are compared to one another, an increase in the firm size has no effect to the pay inequality. However, when directors who work for the company and have more relationship with its operation (Insiders) are compared with directors who don't have any relationship with the company (Independent), an increase in the firm size widens the pay inequality between them.

Overall, the result is that larger firms indeed reveal more pay inequality within the board when it comes to the directors' compensation, similar to the result of Mueller, Ouimet and Simintzi (2017) regarding the pay inequality among the different level of employees within the firm. However, not all pay ratios are affected by the firm size, but only those who have large distance regarding the affiliation and engagement with the firm (I) relative to the inside directors who participate on the daily operations of the firm (E). Consequently, an insider's pay decreases relative to the independent wage, whereas the former does not change relative to the others' wage, or the other directors don't see any difference in their wage relative to the independent ones, when the firm size increases. Regarding the constant terms, we observe that they are significant for all the three pay ratios. The omission of more size related variables in the regression may bring the high number of the coefficients.

**Table 5. 2:** Pay inequality-firm size (based on number of employees) (cluster by Ticker code)

The table presents regressions in which the dependent variable is the pay ratios (in logs) associated with a given pay ratio. The independent variable is the firm size (log\_employees) which is the number of the employees in logs. All regressions include year-fixed effects and the standard errors are clustered at the firm level (Ticker Symbol). The sample period is from 2007 to 2017. \*, \*\*, and \*\*\* denote significance at 10%, 5% and 1% level respectively.

	(1)	(2)	(3)
	IO	IE	OE
Number of employees	0.001 (0.004)	-0.089*** (-0.61)	0.045 (0.26)
_cons	6.607*** (9.94)	6.877*** (9.32)	6.882*** (7.01)
N	2606	2582	2583
R-squared	0.027	0.017	0.007
Adjusted R-squared	-0.004	0.010	0.001

Taking the sales of the firm (in logs) as a proxy for the firm size, we can see that my results are not affected by the number of the sales. On Table 5.3, we can see that the coefficient of the firm size is negatively and statistically significant at 10% level for the IE pay ratio, whereas all the other coefficients of firm size are positive and statistically significant. The coefficients in this regression are similar in sign and magnitude as in Table 5.2, leading us to the same result as above.

**Table 5. 3:** Pay inequality-firm size (based on number of sales) (cluster by Ticker code)

The table presents regressions in which the dependent variable is the pay inequality (in logs) associated with a given pay ratio. The independent variable is the firm size (log\_sales) which is the amount of yearly sales of the firm in logs. All regressions include year-fixed effects and the standard errors are clustered at the firm level (Ticker Symbol). The sample period is from 2007 to 2017. \*, \*\*, and \*\*\* denote significance at 10%, 5% and 1% level respectively.

	(1)	(2)	(3)
	IO	IE	OE
Number			
of sales	0.00628 (0.06)	-0.184* (-1.78)	0.173 (1.20)
_cons	6.607*** (5.09)	6.877*** (6.59)	6.882*** (2.81)
N	2606	2582	2583
R-squared	0.3352	0.0041	0.0149
Adjusted	-0.0037	0.0037	0.0031
R-squared			

**Outcome: Larger firms exhibit larger pay inequalities for some of the pay levels within the board of the directors of the same firm**

## **5.2 Operating performance and Firm Value**

**Hypothesis 2:** Firms with higher pay inequality among the members of the board of directors have better operating performance.

To investigate this hypothesis, we need to work on the pay inequality at the firm level based on the three pay ratios at the same time and not separately as in the previous hypothesis. To get a measure of pay inequality at the firm level, I compute the percentile of each firm-year observation within the pay ratio and I lag the result by one year. This is described at the methodology section, in the descriptive statistics chapter (page 31), which is used to solve the endogeneity problem between the dependent and independent variables.

Panel A of table 5.4 describes the relationship between the pay inequality within the firm among the board members and the firm performance based on the Return on Assets measure (ROA). Column 1 shows that this relationship is positive but insignificant. In column 2, I use the firm size (log\_employees) as the control variable for this regression. As we can see, the result is slightly smaller and again statistically insignificant. The result is that the pay inequalities within the board do not affect the performance of the firm.

and

**Hypothesis 3:** Firms with higher pay inequality among the members of the board of directors have greater value.

Panel B provides the relationship between the pay inequalities within the firm among the board members and the firm value (Tobin's Q). The results mirror the Panel A with the only difference that column 1 presents the negative relationship between these two variables, which is again insignificant. Using the firm size as a control variable, the coefficient of the pay inequality becomes positive, but still the results are statistically insignificant. Overall, it seems that there is no relationship between the pay inequalities within the board at the firm level and the firm valuations. Panel B is similar to the previous results, a negative but not significant relationship between the pay inequalities and the firm value. The change of the control variable makes this relationship weaker and still insignificant.

**Table 5. 4:** Operating performance and firm value-based on ROA (cluster by Ticker code)

The table presents regressions for analyzing the relationship between the pay inequality and firm performance and pay inequality and firm valuations. In Panel A the dependent variable is the Return on Assets (ROA) and the independent variable is the pay inequality at the firm level, lagged by one year. In column (2), firm size (log\_employees) is the number of employees (in logs) and it is my control variable. Panel B is similar to Panel A with the only difference that the dependent variable is the Tobin's Q. All regressions include year-fixed effects and the standard errors are clustered at the firm level (Ticker Symbol). The sample period is from 2007 to 2017. \*, \*\*, and \*\*\* denote significance at 10%, 5% and 1% level respectively.

**Panel (A): Return on Assets**

	(1) ROA	(2) firm size
PayInequality <sub>t-1</sub>	0.0057 (0.08)	0.0037 (1.47)
firm size		0.00174 (0.77)
_cons	0.118* (7.29)	5.082*** (16.77)
N	2605	2605
R-squared	0.0084	0.3065
Adjusted R-squared	0.0028	

**Panel (B): Tobin's Q**

	(1) TobinsQ	(2) firm size
PayInequality <sub>t-1</sub>	-0.00065 (-0.55)	0.0014 (1.13)
firm size		0.014 (0.40)
_cons	2.01*** (6.45)	2.486*** (10.64)
N	2605	2605
R-squared	0.172	0.0066
Adjusted R-Squared	0.086	

For robustness, I decided to check what happens when we use the Return on Sales as a proxy for the firm performance and the number of sales (in logs) as a control variable. We see that our results are not driven by my choice to use the number of employees as a proxy for firm size. Panel A shows that again the relationship between the pay inequality within the board and the firm performance is positive and statistically insignificant and with the presence of the control variable (log\_sales), this relationship becomes negative but remains statistically insignificant. In sum, there is no relationship between the pay disparities among the members of the board within the firm, the overall performance of the firm and the valuations.

**Table 5. 5:** Operating performance and firm value-based on ROS (cluster by Ticker code)

The table presents regressions for analyzing the relationship between the pay inequality and firm performance and pay inequality and firm valuations. In Panel A the dependent variable is the Return on Sales (ROS) and the independent variable is the pay inequality at the firm level, lagged by one year. In column (2), firm size (log\_sales) is the number of firm sales (in logs) and it is my control variable. Panel B is similar to Panel A with the only difference that the dependent variable is the Tobin's Q. All regressions include year-fixed effects and the standard errors are clustered at the firm level (Ticker Symbol). The sample period is from 2007 to 2017. \*, \*\*, and \*\*\* denote significance at 10%, 5% and 1% level respectively.

**Panel A: Return on Sales**

	(1) ROS	(2) firm size
PayInequality <sub>t-1</sub>	0.000456 (1.0)	-0.000222 (-0.75)
firm size		-3.3025 (-0.43)
_cons	-52.8 (-0.45)	12.12*** (39.56)
N	2605	2605
R-squared	0.0059	0.1641
Adjusted R-squared	-0.00066	

**Panel B: Tobin's Q**

	(1)	(2)
	TobinsQ	firmsize
PayInequality <sub>t-1</sub>	-0.00523	-0.00046
	(-0.48)	(-0.56)
firm size		3.7075
		(0.95)
_cons	1.65***	1.23***
	(3.70)	(39.56)
N	2605	2605
R-squared	0.0285	0.541
Adjusted R-squared	0.006	

**Outcome: Firms with higher pay inequality neither perform better or worse than the others nor have better or worse valuations.**

### 5.3 *Need for monitoring*

**Hypothesis 4:** Firms with higher leverage, low levels of assets in place, high levels of capital costs and less CEO ownership are more difficult to be monitored by the board

In general, firms that require more monitoring, demand more time and effort from the directors to control this firm, so their compensation should be higher. It is found that the director compensation is directly related to this need, but what happens with the differences between the pay of directors? In this section, I want to investigate whether the pay inequality within the board is related to this need, using as proxies for importance of monitoring the leverage, the assets in place, the capital expenditures and the CEO ownership, the same proxies that affect the total director compensation (Dah and Frye, 2017). For example, a firm with high assets in place is a company with many tangible assets, meaning that the company is easier to be monitored so the need for monitoring is low and so as the director compensation. In my opinion, as the director compensation is low as the assets in place increase in amount, the pay gaps among the members of the board should decrease as well equally. Based on the previous literature, I expect to find a positive relationship between the leverage, the capital expenditures, advertising costs and the need of the firm for monitoring (Brick et.al, 2006), and negative with the assets in place and the CEO ownership. As mentioned in the data chapter, assets in place is the ratio of Property, Plant and Equipment in total divided by the total assets whereas the CEO

ownership is the percentage of equity that is held by the CEO. All these variables are lagged by one period except the CEO ownership. The results can be found on table 5.6. We observe that our results are not very significant. Only the CEO ownership seems to affect the pay inequality within the board. Firms in which the CEOs hold a high amount of the firm's equity, may mean that the CEO is closely related to the shareholders' and managers' interests, which means that the company requires less monitoring, so the pay inequality decreases. We see no significant relationship with the leverage or the assets in place or the capital expenditures.

**Table 5. 6:** Need for monitoring (cluster by Ticker code)

The table presents regressions for analyzing the relationship between the pay inequality and the need of the firm for monitoring. The dependent variable is the pay inequality at a firm level (in logs) and the independent variables are the leverage, assets in place (PPE/AT), the capital expenditures (CAPX/AT) and the CEO ownership (CEO\_Own), all lagged by one year. All regressions include year-fixed effects and the standard errors are clustered at the firm level (Ticker Symbol). The sample period is from 2007 to 2017. \*, \*\*, and \*\*\* denote significance at 10%, 5% and 1% level respectively.

	(1)
	PayInequality
Leverage <sub>t-1</sub>	0.0346 (0.015)
PPE <sub>t-1</sub> /AT <sub>t-1</sub>	0.0067 (0.0566)
CAPX <sub>t-1</sub> /AT <sub>t-1</sub>	-0.0004 (0.087)
CEO_Own	-0.0314*** (0.012)
_cons	16.78*** (202.99)
N	2605
R-squared	0.1306
Adjusted R-squared	-0.0146

**Outcome: Only firms with high CEO stock ownership affect the pay inequality within the board at the firm level.**



## 6 Conclusion

### 6.1 Concluding Remarks

Reaching the end of this thesis, I would like to summarize and to give a small synopsis of what I found from this analysis. After being exposed to the topic of the board of directors through the lectures and the seminars at the University, my main goal was to focus on this “elite” type of people and to investigate whether they face pay gaps, a phenomenon which is very well researched by the numerous papers mainly regarding the CEO compensation and the compensation of the top and bottom level employees. Based on the methodology of the previous literature, I had to examine whether the results for the pay inequality among different levels of workers are like the pay inequality within the board. I decided to divide the board into three categories, the independent (I), or in other words outside directors, who are not engaged with the company’s operations and daily issues, the inside directors (E), who are employed by the company and are strongly engaged with it and the other (O), or grey directors, who stay in the middle of the two previous categories as they might have been employed by the shareholder but they don’t necessary participate in the daily operation of the firm. Using a contemporaneous data set for 243 publicly available companies in the North America, listed in the S&P 500 index for the period 2007 to 2017, I am able now to give an answer to my main research question as stated in the introduction.

***‘Is the pay inequality within the board of directors detrimental for the firm’s operating performance and need for monitoring?’***

In my opinion, although the results are not very surprising, this research will add value to the existing literature because I combine topics that have been investigated in different papers and I focus on the pay inequality within the board, something different from the excess compensation of the directors, the pay inequality within the top management or the pay inequality between the top and bottom level employees. Before I move to my analysis, I perform a Breusch-Godfrey LM test for autocorrelation, I correct my standard errors at firm level and I implement year fixed effects for all the regressions.

Starting with my analysis, the first hypothesis investigates the impact of the firm size on the pay inequality within the board. I found that larger firms increase the wage dispersion especially between those directors who have long distance regarding the engagement. The compensation of the insiders relative to the Independent directors is the first ratio that is affected the most, then the Inside relative to the Other directors, and last the ratio of the Others relative to the Independent directors whose distance is low and somewhat the same. The results are the same when I use the sales (in logs) of the firm as a proxy for firm size, instead of the number of employees (in logs).

The second and third hypotheses investigate the relationship of the pay inequality with the firm performance and valuation. After controlling for firm size, both with the number of employees and the number of sales, and after using both Return on Assets and Return of Sales as a robustness check for the firm performance, I found that the pay disparities among the three categories of the board of directors is not related neither with the performance nor with the valuation of the firm.

The fourth and last hypothesis focuses on the need for monitoring of the firm and whether this is related to the pay inequalities within the board. Using the leverage, the assets in place, the capital expenditures and the CEO ownership, which are determinants of the director compensation, I study whether these variables can work as determinants for the pay gaps among the directors. I find that, using these variables as independent variables, only the CEO ownership affects the pay inequality. To be more specific, I found that this variable decreases the pay inequality among the members of the board, as when the CEOs hold more of the firm's equity it is easier for the firm to be monitored by the board, so the directors don't invest much time and effort to complete this task and they don't have to compete to achieve more money.

To sum up, some of the findings are consistent with the previous literature and some other findings provide slightly different results. For example, we found that the firm size is related to the pay inequalities within the boards which is in line with the finding of Mueller, Ouimet and Simintzi research (2017). However, the main conclusion that gives an answer to my main empirical question is that the pay inequalities within the Independent, Insiders and Other directors are not detrimental for the operating performance and valuations, contrary to the result of Mueller, Ouimet and Simintzi (2017) as well as the proxies for the need for monitoring (leverage, assets in place, capital expenditure) do not significantly affect the wage differentials among the board members, while the CEO ownership is considered to have a detrimental effect on the pay inequalities within the board. This outcome is opposite to the findings of Dah and Frye (2017) who support that all of these variables, except leverage, significantly affect the director compensation.

## **6.2 *Limitation and further research***

This study has several limitations I would like to point out which need to be taken into consideration for further research. First, given the available dataset from Compustat regarding the Director Compensation, my sample does not have many observations that might change the results, although it is required that all the employees disclose their compensation especially in the U.S.. Their name was mentioned but not their salary. These directors are not included in the final sample. Second, since I had to merge different databases and different files, I lost many observations which would be valuable for my research and would provide stronger and more robust results. Third, I had in mind to use the

number of members in the board as a proxy for board size instead of the number of employees within the whole firm as a proxy for the firm size, to examine whether I would have different results, but the database doesn't provide me with this information. Fourth, although I used logarithms for the dependent variables to fix non-normality concerns and lags for the independent ones to fix the endogeneity between the dependent and independent variables, I am not sure whether the problem has been solved. Maybe the results would be different if I performed an Instrumental Variable or a dynamic GMM estimation.

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## APPENDIX A

Ticker		
No.	Symbol	CompanyName
1.	AAP	ADVANCE AUTO PARTS INC
2.	ABC	AMERISOURCEBERGEN CORP
3.	ABT	ABBOTT LABORATORIES
4.	ADBE	ADOBE SYSTEMS INC
5.	ADI	ANALOG DEVICES
6.	ADM	ARCHER-DANIELS-MIDLAND CO
7.	ADP	AUTOMATIC DATA PROCESSING
8.	ADS	ALLIANCE DATA SYSTEMS CORP
9.	ADSK	AUTODESK INC
10.	AGN	ALLERGAN PLC
11.	AKAM	AKAMAI TECHNOLOGIES INC
12.	ALB	ALBEMARLE CORP
13.	ALGN	ALIGN TECHNOLOGY INC
14.	ALK	ALASKA AIR GROUP INC
15.	ALXN	ALEXION PHARMACEUTICALS INC
16.	AMAT	APPLIED MATERIALS INC
17.	AMD	ADVANCED MICRO DEVICES
18.	ANSS	ANSYS INC
19.	AOS	SMITH (AO) CORP
20.	APA	APACHE CORP
21.	APC	ANADARKO PETROLEUM CORP
22.	APD	AIR PRODUCTS AND CHEMICALS INC
23.	APH	AMPHENOL CORP
24.	ARNC	ARCONIC INC
25.	ATVI	ACTIVISION BLISSARD INC
26.	AVGO	BROADCOM INC
27.	AVY	AVERY DENNISON CORP
28.	AZO	AUTOZONE INC
29.	BA	BOEING CO
30.	BBY	BEST BUY CO INC
31.	BDX	BECTON DICKINSON & CO
32.	BIIB	BIOGEN INC
33.	BKNG	BOOKING HOLDINGS INC

34. BLL	BALL CORP
35. BMY	BRISTOL-MYERS SQUIBB CO
36. BR	BROADRIDGE FINANCIAL SOLUTNS
37. BSX	BOSTON SCIENTIFIC CORP
38. CAH	CARDINAL HEALTH INC
39. CBS	CBS CORP
40. CCL	CARNIVAL CORP/PLC (USA)
41. CDNS	CADENCE DESIGN SYSTEMS INC
42. CF	CF INDUSTRIES HOLDINGS INC
43. CHD	CHURCH & DWIGHT INC
44. CHRW	C H ROBINSON WORLDWIDE INC
45. CL	COLGATE-PALMOLIVE CO
46. CMCSA	COMCAST CORPORATION
47. COL	ROCKWELL COLLINS INC
48. COO	COOPER COMPANIES INC
49. COP	CONOCOPHILLIPS
50. COST	COSTCO WHOLESALE CORP
51. COTY	COTY INC
52. CPB	CAMPBELL SOUP CO
53. CPRT	COPART INC
54. CRM	SALESFORCE.COM INC
55. CSCO	CISCO SYSTEMS INC
56. CSX	CSX CORP
57. CTAS	CINTAS CORP
58. CTL	CENTURYLINK INC
59. CTSH	COGNIZANT TECH SOLUTIONS
60. CVS	CVS HEALTH CORP
61. CXO	CONCHO RESOURCES INC
62. DG	DOLLAR GENERAL CORP
63. DHR	DANAHER CORP
64. DIS	DISNEY (WALT) CO
65. DISCA	DISCOVERY INC
66. DLTR	DOLLAR TREE INC
67. DOV	DOVER CORP
68. DVN	DEVON ENERGY CORP
69. DXC	DXC TECHNOLOGY COMPANY
70. EA	ELECTRONIC ARTS INC

71.	EBAY	EBAY INC
72.	ECL	ECOLAB INC
73.	EL	LAUDER (ESTEE) COS INC -CL A
74.	EMR	EMERSON ELECTRIC CO
75.	EOG	EOG RESOURCES INC
76.	ESRX	EXPRESS SCRIPTS HOLDING CO
77.	EXPD	EXPEDITORS INTL WASH INC
78.	EXPE	EXPEDIA GROUP INC
79.	F	FORD MOTOR CO
80.	FCX	FREEPORT-MCMORAN INC
81.	FDX	FEDEX CORP
82.	FIS	FIDELITY NATIONAL INFO SVCS
83.	FISV	FISERV INC
84.	FLIR	FLIR SYSTEMS INC
85.	FLR	FLUOR CORP
86.	FOXA	TWENTY-FIRST CENTURY FOX INC
87.	FTI	TECHNIPFMC PLC
88.	GD	GENERAL DYNAMICS CORP
89.	GE	GENERAL ELECTRIC CO
90.	GILD	GILEAD SCIENCES INC
91.	GIS	GENERAL MILLS INC
92.	GLW	CORNING INC
93.	GM	GENERAL MOTORS CO
94.	GOOGL	ALPHABET INC
95.	GPC	GENUINE PARTS CO
96.	GPN	GLOBAL PAYMENTS INC
97.	GPS	GAP INC
98.	GT	GOODYEAR TIRE & RUBBER CO
99.	HAL	HALLIBURTON CO
100.	HAS	HASBRO INC
101.	HBI	HANESBRANDS INC
102.	HCA	HCA HEALTHCARE INC
103.	HD	HOME DEPOT INC
104.	HFC	HOLLYFRONTIER CORP
105.	HLT	HILTON WORLDWIDE HOLDINGS
106.	HOG	HARLEY-DAVIDSON INC
107.	HOLX	HOLOGIC INC

108.	HP	HELMERICH & PAYNE
109.	HPE	HEWLETT PACKARD ENTERPRISE
110.	HPQ	HP INC
111.	HRB	BLOCK H & R INC
112.	HRL	HORMEL FOODS CORP
113.	HSIC	SCHEIN (HENRY) INC
114.	HSY	HERSHEY CO
115.	IBM	INTL BUSINESS MACHINES CORP
116.	ILMN	ILLUMINA INC
117.	INCY	INCYTE CORP
118.	INTC	INTEL CORP
119.	INTU	INTUIT INC
120.	IPG	INTERPUBLIC GROUP OF COS
121.	IQV	IQVIA HOLDINGS INC
122.	IR	INGERSOLL-RAND PLC
123.	ISRG	INTUITIVE SURGICAL INC
124.	ITW	ILLINOIS TOOL WORKS
125.	JBHT	HUNT (JB) TRANSPRT SVCS INC
126.	JCI	JOHNSON CONTROLS INTL PLC
127.	JEC	JACOBS ENGINEERING GROUP INC
128.	JKHY	HENRY (JACK) & ASSOCIATES
129.	JNPR	JUNIPER NETWORKS INC
130.	K	KELLOGG CO
131.	KEYS	KEYSIGHT TECHNOLOGIES INC
132.	KHC	KRAFT HEINZ CO
133.	KMX	CARMAX INC
134.	KO	COCA-COLA CO
135.	KORS	MICHAEL KORS HOLDINGS LTD
136.	KSS	KOHL'S CORP
137.	KSU	KANSAS CITY SOUTHERN
138.	LB	L BRANDS INC
139.	LEG	LEGGETT & PLATT INC
140.	LH	LABORATORY CP OF AMER HLDGS
141.	LKQ	LKQ CORP
142.	LLY	LILLY (ELI) & CO
143.	LMT	LOCKHEED MARTIN CORP
144.	LRCX	LAM RESEARCH CORP

145.	LUV	SOUTHWEST AIRLINES
146.	LYB	LYONDELLBASELL INDUSTRIES NV
147.	MAR	MARRIOTT INTL INC
148.	MAS	MASCO CORP
149.	MAT	MATTEL INC
150.	MDT	MEDTRONIC PLC
151.	MGM	MGM RESORTS INTERNATIONAL
152.	MHK	MOHAWK INDUSTRIES INC
153.	MKC	MCCORMICK & CO INC
154.	MLM	MARTIN MARIETTA MATERIALS
155.	MNST	MONSTER BEVERAGE CORP
156.	MO	ALTRIA GROUP INC
157.	MOS	MOSAIC CO
158.	MRK	MERCK & CO
159.	MRO	MARATHON OIL CORP
160.	MSFT	MICROSOFT CORP
161.	MSI	MOTOROLA SOLUTIONS INC
162.	MU	MICRON TECHNOLOGY INC
163.	MYL	MYLAN NV
164.	NBL	NOBLE ENERGY INC
165.	NCLH	NORWEGIAN CRUISE LINE HLDGS
166.	NFLX	NETFLIX INC
167.	NFX	NEWFIELD EXPLORATION CO
168.	NKE	NIKE INC
169.	NKTR	NEKTAR THERAPEUTICS
170.	NLSN	NIELSEN HOLDINGS PLC
171.	NOC	NORTHROP GRUMMAN CORP
172.	NOV	NATIONAL OILWELL VARCO INC
173.	NSC	NORFOLK SOUTHERN CORP
174.	NTAP	NETAPP INC
175.	ORLY	O'REILLY AUTOMOTIVE INC
176.	OXY	OCCIDENTAL PETROLEUM CORP
177.	PAYX	PAYCHEX INC
178.	PCAR	PACCAR INC
179.	PEP	PEPSICO INC
180.	PFE	PFIZER INC
181.	PG	PROCTER & GAMBLE CO

182.	PHM	PULTEGROUP INC
183.	PKG	PACKAGING CORP OF AMERICA
184.	PM	PHILIP MORRIS INTERNATIONAL
185.	PNR	PENTAIR PLC
186.	PRGO	PERRIGO CO PLC
187.	PSX	PHILLIPS 66
188.	PVH	PVH CORP
189.	PWR	QUANTA SERVICES INC
190.	PXD	PIONEER NATURAL RESOURCES CO
191.	PYPL	PAYPAL HOLDINGS INC
192.	QCOM	QUALCOMM INC
193.	QRVO	QORVO INC
194.	RCL	ROYAL CARIBBEAN CRUISES LTD
195.	REGN	REGENERON PHARMACEUTICALS
196.	RL	RALPH LAUREN CORP
197.	RMD	RESMED INC
198.	ROL	ROLLINS INC
199.	ROST	ROSS STORES INC
200.	RTN	RAYTHEON CO
201.	SEE	SEALED AIR CORP
202.	SJM	SMUCKER (JM) CO
203.	SNA	SNAP-ON INC
204.	STX	SEAGATE TECHNOLOGY PLC
205.	STZ	CONSTELLATION BRANDS
206.	SWK	STANLEY BLACK & DECKER INC
207.	SWKS	SKYWORKS SOLUTIONS INC
208.	SYK	STRYKER CORP
209.	SYMC	SYMANTEC CORP
210.	SYU	SYSICO CORP
211.	TAP	MOLSON COORS BREWING CO
212.	TDG	TRANSDIGM GROUP INC
213.	TEL	TE CONNECTIVITY LTD
214.	TGT	TARGET CORP
215.	TIF	TIFFANY & CO
216.	TMO	THERMO FISHER SCIENTIFIC INC
217.	TSCO	TRACTOR SUPPLY CO
218.	TSS	TOTAL SYSTEM SERVICES INC

219.	TXT	TEXTRON INC
220.	UAA	UNDER ARMOUR INC
221.	UAL	UNITED CONTINENTAL HLDGS INC
222.	UHS	UNIVERSAL HEALTH SVCS INC
223.	UPS	UNITED PARCEL SERVICE INC
224.	URI	UNITED RENTALS INC
225.	UTX	UNITED TECHNOLOGIES CORP
226.	VAR	VARIAN MEDICAL SYSTEMS INC
227.	VIAB	VIACOM INC
228.	VMC	VULCAN MATERIALS CO
229.	VRSN	VERISIGN INC
230.	VRTX	VERTEX PHARMACEUTICALS INC
231.	WAT	WATERS CORP
232.	WBA	WALGREENS BOOTS ALLIANCE INC
233.	WDC	WESTERN DIGITAL CORP
234.	WMT	WALMART INC
235.	WRK	WESTROCK CO
236.	WY	WEYERHAEUSER CO
237.	WYNN	WYNN RESORTS LTD
238.	XEC	CIMAREX ENERGY CO
239.	XLNX	XILINX INC
240.	XRAY	DENTSPLY SIRONA INC
241.	XYL	XYLEM INC
242.	YUM	YUM BRANDS INC
243.	ZTS	ZOETIS INC

## APPENDIX B

- **Breusch-Godfrey LM test for autocorrelation-pay-performance elasticity**

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. regress lnIO lnsize ceoown_w lev_w employees_w ros_w ROA_w lnsales advert_w randd_w LIQUIDITY_w capxat_w ppeat_w Q_w

. regress lnIE lnsize ceoown_w lev_w employees_w ros_w ROA_w lnsales advert_w randd_w LIQUIDITY_w capxat_w ppeat_w Q_w

. regress lnOE lnsize ceoown_w lev_w employees_w ros_w ROA_w lnsales advert_w randd_w LIQUIDITY_w capxat_w ppeat_w Q_w
```