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The effect of within-firm Pay Inequality on Firm Performance

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Preface and Acknowledgements

In front of you lies the master thesis: The effect of within-firm Pay Inequality on Firm Performance. After the submission of this thesis, my time as a student at the Erasmus University Rotterdam has come to an end. The thesis is the final step in completing the master Financial Economics at the Erasmus School of Economics. Being a student at the Erasmus University for more than four years have learned me a lot about economics, especially finance. I have met nice people, was taught by enthusiastic researchers and learned a lot about myself.

The supervision of this master thesis has been done by Mr. Yuhao Zhu. I experienced the guiding as very nice and valuable. I got to do my own research, but when I needed some advice, Yuhao was always willing to help me with useful feedback. It helped me completing my master thesis the way I did. Thank you for that.

I would also like to thank my family and friends for always supporting me during my period as a student and giving me the opportunities to relax when I needed to. Especially during the exam weeks and the past few months in which I wrote this thesis, I got the support and right advice which helped me completing my study.

I hope you enjoy reading.

Joyce Belde

Bergen op Zoom,
November 7, 2018.

Abstract

Prior research finds contradicting results regarding the pay-performance relation. Not yet, a general conclusion can be drawn. Therefore, I study this relation in the Netherlands, Germany and the United States during 2008 till 2017 with another within-firm pay inequality measure: CEO-to-worker pay ratio. I use OLS and fixed effects regressions analysis. Before I study the pay-performance relation, I find that firm size and CEO characteristics do not influence the CEO-to-worker pay ratio. This ratio does not significantly affect firm performance, measured by Tobin's Q, return on assets and stock returns. When I look at differences in the pay-performance relation between countries, industries and years, only differences between some industries are significant. Hence, within-firm pay inequality does not affect firm performance in this sample and only significant differences between industries are found.

Keywords:
CEO-to-worker pay ratio, market performance, accounting performance, (fixed effects) regressions, public firms

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1 Introduction

The popular press has been giving attention to the payments received by Chief Executive Officers (CEOs) of listed firms. An article in the Dutch newspaper NRC asks whether the company can explain the high remuneration of their Chief Executive Officer (CEO). From 2017 onwards, Dutch listed companies are obligated to disclose their internal pay ratios. The FNV, a Dutch labor union, states that the standard ratio should be 20. However, many firms have a pay ratio above this standard. For example, Heineken has a pay ratio of 215 in 2017, Philips of 56, Randstad of 52 and ASML of 32. The CEO of Heineken explains the pay ratio with the idea that the company has offices and factories around the world. The employees who work at places outside the Netherlands get lower payments, and therefore the pay ratio of Heineken is this high (Tamminga, 2018).

A study conducted by the Vlerick Business School's Executive Remuneration Research Centre shows that CEOs in the United Kingdom have the highest total remuneration (fixed salary, bonuses and share-related remuneration are included) compared with European countries in 2012. The CEOs of the companies in this country receive 4,710,000 euro on average. Germany is second with an average payment of 3,100,000 euro. The Netherlands is third with 2,470,000 euro, closely followed by France with 2,290,000 euro and Belgium is fifth with a compensation of 1,980,000 euro on average (Vlerick Business School, 2013).

An article in the Guardian describes the results of another study by the Vlerick Business School. It states that in 2013 CEOs of German companies got paid 3,440,000 euro on average, slightly more than the CEOs of the U.K. FTSE100 firms who received on average 3,400,000 euro. For the first time, German CEOs earn more than their colleagues in the United Kingdom. This can be caused by more share-based payments in Germany, which increase the total amount paid to the CEOs. The highest paid CEO during 2013 in Germany was Martin Winterkorn from Volkswagen: he collected 15.7 million euro (Neate, 2015).

According to an article in Bloomberg the CEO-to-worker pay ratio is the highest in the United States: the pay ratio was 265 in 2016. In the Netherlands, the pay ratio was 171 and in Germany the pay ratio was 136 during this year. The CEOs of the S&P 500 companies receive 347 times more than their employees during 2016, compared with a ratio of 41 in 1983. This increase of more than 700 percent shows that the pay ratios rise extremely the last decades (Melin, 2018).

However, while most debates focus on the level of payments to executives and relative to (average) salaries of employees, the research by Jensen and Murphy (1990) indicates that the

focus should be more on the structure of executive pay. They take a closer look at the determinants of CEO compensation. It follows that public and private political forces impose regulations and because of these regulations, the pay-performance sensitivity decreases.

Based on these discussions, this study will take a closer look at relative CEO compensation. So, wage inequality within firms and the possible effects on performance of firms will be the topic of this thesis. The main goal is to find out how (un)equally the wages are divided between the CEO and employees within a firm and how this can affect the performance of that firm. Thus, the pay-performance relation will be investigated. To study this relationship, I will also look at the effect of firm size and CEO characteristics on the pay ratio and this pay ratio contains the compensation of a CEO relative to the average salary of employees of the same firm. On top of that, I delve into the differences between countries, industries and years relative to the pay-performance relationship.

1.1 Research question

Not only the popular press has been giving attention to the compensation of CEOs, scientific research has been done regarding CEO payments and the (possible) relation to firm performance as well. Bebchuk, Cremers and Peyer (2011) look at the CEO pay slice (CPS), which is the amount of compensation received by the CEO divided by the aggregate compensation of the top-five executives of a company, for firms in the United States from 1993 to 2004. They find that CPS is negatively associated with firm value, accounting profitability and stock returns. This negative correlation with firm performance is guided by acquisitions announced by the firm. Their results state that CPS is a useful tool to analyze firm performance and behavior.

Furthermore, Yarram (2014) studies the relation between CPS and value and performance of public firms. His main findings are in deviation from those of Bebchuk et al. (2011), because he does not find a significant influence from CPS on firm value. However, for Australian firms, CPS does have a significant positive impact on return on assets and stock returns for the period 2005 to 2011.

The subject of this thesis is about the inequality of pay within a firm between the CEO and non-CEO employees and the effect of this ratio on the performance of the firm. According to several studies, the salaries of employees and CEOs differ enormously in large companies (Oi & Idson, 1999 and Mueller, Ouimet & Simintzi, 2017). This large gap can be caused by numerous factors. However, it affects the effort of employees (Akerlof & Yellen,

1988, 1990) and in this way it can influence the performance of the firm. So, the research question of this thesis is:

Does within-firm pay inequality affect firm performance?

This question is related to the studies of Winter-Ebmer and Zweimüller (1999), Lazear (2000) and Berri and Jewell (2004) as well. These scientists research the relation between wages within firms and the performance of these firms. Those studies will be further discussed in Section 2 of this thesis. However, these studies have varying outcomes, that sometimes contradict each other. Therefore, it is even more interesting to research the pay-performance phenomenon.

1.2 Attributions to literature

This study attributes to the existing literature, because it looks at the pay-performance relation from a different point of view. The papers of Bebchuk et al. (2011) and Yarram (2014) look at the CEO payment relative to other executive payments, where this study focusses on the CEO payment relative to average employee salary. Winter-Ebmer and Zweimüller (1999) and Lallemand, Plasman and Rycx (2004) look at white- and blue-collar workers, and thus divide the employees within a firm in multiple levels. On top of that, Berri and Jewell (2004) do research to basketball players in the American Basketball League. These are all studies to wage inequalities within firms and the effect on firm performance, but with different measures for (relative) pay inequality.

I will look at the CEO-to-worker pay ratio. This measure contains the compensation of the CEO of a specific firm in one year divided by the average salary that an employee of the same firm in the same year receives. Only Faleye, Reis and Venkateswaran (2012) is one of few studies that uses a CEO-to-worker pay ratio. Other research has focussed on the effect of CEO compensation on firm performance (Izan, Sidhu & Taylor, 1998; Zhou, 2000; Merhebi, Pattenden, Swan & Zhou, 2006). Thus, the measure of within-firm pay inequality will be different from those in most existing literature and takes into account the relative CEO compensation to employee wages.

In addition, existing literature shows contradicting results about the relation between within-firm pay inequality and firm performance, as already mentioned in Section 1.1. This leaves a gap in the literature, because the discussion is still going on if there is a relation between pay and performance and if so, then the question is still not answered whether this

relation is significantly positive or negative. This ongoing debate is a reason for further investigation of the pay-performance phenomenon.

1.3 Results of thesis

This thesis examines the effect of within-firm pay inequality on firm performance. Within-firm pay inequality is measured with a CEO-to-worker pay ratio and firm performance is measured with both market and accounting performance measures. The Netherlands, Germany and the United States will be the research area for a period of ten years from 2008 until 2017. The largest listed firms of those countries are the subject of this study. First, it is studied whether firm size (Hypothesis 1) and CEO characteristics (Hypothesis 2) influence the CEO-to-worker pay ratio. These relations are tested with OLS and fixed effects regressions. The results imply that both firm size and CEO characteristics do not influence the pay ratio significantly.

Thereafter, the relation between within-firm pay inequality and firm performance is researched. OLS regressions and regressions with varying fixed effects are used to come to the results. Most important variables are the one-year-lagged total CEO-to-worker pay ratio, Tobin's Q and return on assets. It follows that this pay ratio does not seem to significantly affect the firm performance measures, Tobin's Q and return on assets. These results are confirmed by the robustness checks. Therefore, it cannot be concluded that the pay-performance relationship holds in this sample.

After the study to the overall pay-performance relation, I also take a look at potential differences between countries, industries and years. The regression analyses for Hypothesis 4 to 6 show some significant effects. Again, OLS and multiple fixed effects regressions are used to come to the results. The differences between countries and between years do not seem significant. There are no consistent significant results found in the regressions that are run for these two hypotheses. The only differences that are significant are the differences between industries. Effects of some industries are significant in all type of regressions and therefore it is concluded that the relation differs between industries.

Based on the results found by testing the hypotheses, the research question can be answered: within-firm pay inequality does not seem to affect firm performance. This conclusion is in contrast to the findings of Bebchuk et al. (2011) and Faleye et al. (2012). It is in contrast to the findings of Yarram (2014) regarding return on assets and stock returns (he finds a significant positive impact of CPS), but in line with the findings of Yarram (2014) regarding Tobin's Q (he finds no significant relation). With these findings, this study

contributes to the existing literature in adding an argument in the debate. In another research area and during another time period insignificant results are found. Where most studies find a significant positive or negative pay-performance relation, I find insignificant results. Therefore, this study can be a trigger for further research to test the pay-performance relation again in the same or other areas during the same or another research period with an improved methodology, to see if a consistent relation can be found.

1.4 Structure of thesis

The remainder of this study is organized as follows. Chapter 2 describes the literature review. Chapter 3 discusses the hypotheses based on the literature review. Chapter 4 describes the collected dataset and Chapter 5 explains the methodologies used. Chapter 6 shows the results and finally Chapter 7 presents the conclusions, limitations and suggestions for future research.

2 Literature Review

This chapter contains both theoretical and empirical studies. In Section 2.1 utility is related to relative wages and income of agents. In Section 2.2 tournament theory is discussed. Section 2.3 compares different types of compensation methods. Section 2.4 takes a look at the relation between internal wage inequalities and firm performance. Section 2.5 discusses the relation between wage inequality and firm size. Thereafter Section 2.6 looks at the influence of CEOs in payments to both CEOs and employees. Section 2.7 describes the relation between CEO pay and firm performance. Finally, Section 2.8 examines studies about the CEO pay slice.

2.1 Relative wages or income and utility

In the last decades, research has been done to the relation between relative wages and effort. Akerlof and Yellen (1988 and 1990) introduce the fair wage-effort hypothesis in their studies. This hypothesis follows from equity theory and social exchange theory. According to this hypothesis, effort is proportional to the wage that workers receive less than the subjectively determined fair wage. So, they present a theory whereby effort of employees depends on the fair wage relative to their actual wage. The workers proportionately withdraw effort as their actual wage falls short of their fair wage.

Clark and Oswald (1996) test the hypothesis that an agent his utility depends on his income relative to others. The authors use data of a British Household Panel Survey from 1991. With this dataset and the utility function they describe, their two main findings are that satisfaction levels are negatively related to the compared earnings levels and when income is

kept constant, satisfaction declines in education level. Thus, when workers are higher educated, satisfaction about their job decreases with a constant income.

Fehr and Schmidt (1999) take a closer look at agents who are either self-centered inequity averse (selfish) or inequity averse (fair types). Their main focus is the role of fairness in competitive environments. The authors find that when there are no possibilities to punish, selfish players influence fair players, and there will be unfair and noncooperative behavior.

When a fraction of the population cares for equitable outcomes, the puzzling evidence about punishing of free-riding behavior can be explained. This means that more stable cooperation is maintained when it is possible to punish free-riders, whether it is costly or not for the punishers, and when some agents are 'fair types'. The conclusion can be applied on working environments, when this environment is seen as competitive. Then, the effects of fairness (regarding wages) can be of influence on collaboration of employees and this affects firm performance.

Bolton and Ockenfels (2000) later test the Equity, Reciprocity and Competition (ERC) model in bargaining, market and dilemma games. They make assumptions about agents in their model and test the model in multiple games with factors for equity, reciprocity and observed competitive behavior. The results of this research indicate that only in ultimatum and dictator games, multiple facets of behavior can be derived and demonstrated. Equilibrium in ERC-models shows that people behave strategically. This model can also give an idea of how selfish people behave and whether they care about others. In this study people seem to be self-centered, however it differs from received theory. Whether agents are selfish can influence their productivity when their income is below (or above) the median income.

A more recent study of Card, Mas, Moretti and Saez (2012) investigates how job satisfaction and job search intentions of workers change when there is information on peers' salaries available. The authors use data of employees from the University of California in 2008 and salary information from 2007. They find that availability of information negatively affects the unit and occupation for workers paid below the median, but it has no effect on workers paid above the median. So, how satisfied an employee is with his job depends on the relative pay comparisons and this relationship is nonlinear.

2.2 Tournament theory

In 2005 two studies have been conducted regarding tournament theory, which can be used in many situations. Grund and Sliwka (2005) take a closer look at a situation in which participants are in a symmetric decision environment, namely the situation of a promotion

tournament. With their utility function, the effects of advantageous and disadvantageous inequity aversion can be separated. The authors find that inequity averse agents exert higher effort levels than agents who are purely self-interested for a given prize structure.

Nevertheless, in contrast to a standard tournament model with risk-neutral agents, first-best efforts (fixed wages that cover the costs of effort are paid to the agents, such that the participation constraints are met) are no longer implemented when prizes are endogenous and agents are inequity averse. Thus, tournaments with purely self-interested agents lead to higher efficiency than tournaments with inequity averse agents.

In the other study, Heyman (2005) tests several predictions that follow from tournament theory. He uses a matched employer-employee dataset of about 10,000 managers in 560 Swedish firms between approximately 1991 and 1995. With his regressions on workers' wage, the same results are found for white-collar workers and executives. For white-collar workers the effect of intra-firm wage dispersion on profits and average pay is positive and significant, using various measures of wage dispersion. For executives, there is a positive significant association between pay dispersion and profits as well. Those results are in line with tournament theory predictions.

2.3 Compensation methods

An important aspect of payments that has been studied is the compensation method, and it follows that the type of compensation can affect productivity of a firm. Lazear (2000) researches the compensation method at an American company. He tests the theory of personnel economics with a new dataset: pay performance and productivity measures of Safelite Glass Corporation in 1994 and 1995 which leads to 29,837 observations during 19 months. Using utility functions and regression analysis, he concludes that the compensation method affects firm performance. There is a 44 percent increase of the company productivity when the compensation method is changed from hourly wages to piece-rate regime.

Lemieux, MacLeod and Parent (2009) differentiate between performance-pay and non-performance-pay jobs. The goal of the authors is to study the connection between the growth of performance-pay and wage inequalities. Again, America is the research area. The Panel Study of Income Dynamics (PSID) is the sample they use for the years 1979 until 1998. As their method, the researchers use wage equations and regressions to take a look at the effect of performance-pay on (the logarithm of) average hourly wages. The main result shows that performance-pay is more closely tied to both observed and unobserved productive characteristics of employees compared to compensation in non-performance pay jobs. So,

when a firm uses performance-pay as compensation method, underlying changes in returns to skills get translated into more wage inequality.

2.4 Wage inequality and firm performance

Besides these studies, multiple researchers have taken a closer look at the relation between pay (in)equality and productivity and performance of firms. Some of them are already mentioned in Section 1.1 and 1.2. Winter-Ebmer and Zweimüller (1999) use a panel dataset of 130 Austrian firms with at least 20 employees during the period 1975 until 1991. They find a negative effect on performance of those firms for white-collar workers if wage inequality becomes too great. For blue-collar workers the result is different: if the wage inequality increases, performance of the firm (measured with standardizes wages) increases too. Only when the inequality becomes really high, blue-collar wages start to decline with increased dispersion.

Berri and Jewell (2004) test how wage inequality affects firm productivity with an experiment in the National Basketball Association (NBA). The dataset contains winning percentages and wages of teams who play their games in the NBA during 1996 till 2002. Using regression models, they analyze this relation. The authors state that other researchers have argued that greater wage dispersion leads to lower firm output. However, they do not find results in line with this statement, because their main finding is that wage inequality and firm productivity are not related at all in their sample.

On top of those two studies in Austria and America, other (European) countries have been part of research as well. Lallemand et al. (2004) take a closer look at the relation between intra-firm wage dispersion and firm performance. Their study contains data about private Belgian firms and their employees. The methodology is consistent with the one used by Winter-Ebmer and Zweimüller (1999). For those Belgian firms, there is a positive and significant relation between wage inequality and firm performance. The intensity of this relationship becomes larger for blue-collar workers and within companies with a high degree of monitoring.

Thereafter, Jirjahn and Kraft (2007) study which effects of wage dispersion on firm performance dominate and whether those effects depend on industrial relations regime or type of incentive scheme employed. This research has Germany as area of interest. The data contain a sample of manufacturing establishments from the fourth wage of the Hanover Panel in 1997 and regression analysis is used to test whether there is a relation between wage dispersion and firm performance. Their conclusion states that moderating factors influence the

relation between wage dispersion and productivity, but the relation is not uniform. Besides this, the effect of wage dispersion to enhance productivity seems stronger when piece rates are paid to employees and it is even stronger when group piece rates are paid.

One year later, Grund and Westergaard-Nielsen (2008) study the relation between dispersion of wage increases and firm performance. The researchers use employer-employee panel data of Danish firms with at least 20 employees during the period 1992 till 1997. In this study, analysis of regressions on firm performance is used as research method as well. Among those Danish firms, there is a negative relation between the dispersion of wage growth and performance of firms. This relation is mostly driven by white-collar workers compared with blue-collar workers and is robust to multiple factors. When the authors look at differences between industries or firm size, they do not find different results regarding the relation of dispersion in wage increases and firm performance.

Finally, Mahy, Rycx and Volral (2011) look at the relation between wage dispersion and firm productivity in different working environments. Again, Belgium is the area of research. The authors use two large-scale datasets with Belgian firms in 2003 that have at least 10 employees. Again, the same methodology as Winter-Ebmer and Zweimüller (1999) is used and the researchers find a hump-shaped relation between wage dispersion and firm performance. To a certain level of dispersion, it is more in line with the tournament incentive effects than with fairness and sabotage considerations. The relation is stronger with highly skilled workers and in more stable environments.

2.5 Wage inequality, CEO pay and firm size

Another (possible) association regarding pay inequality that has been studied is the relation between wage inequality and firm size. Oi and Idson (1999) look at the relation between firm size and wages they pay their workers. The authors base their results on multiple datasets and methods used in earlier research. Countries they compare are France, Germany, Italy, Japan and the United States. Their main result is that if firm size increases, the wages go up and other conditions for employees improve as well: daily hours of labor decrease, the employees are employed a greater number of days per year and employment varies less from month to month.

Thereafter, Zhou (2000) looks at the pay-performance relation in Canada and a part of his study focusses on CEO compensation and firm size. This paper will be described in more detail in Section 2.7, however the results regarding firm size show a positive relation between firm size and CEO pay, even for smaller and resources firms.

Additionally, Merhebi et al. (2006) re-examine the relation between CEO pay and firm performance in Australia. Again, a more detailed description of this study can be found in Section 2.7. Nevertheless, these researchers take a look at firm size elasticity of CEO pay. The results of their regression analysis show that there is a strong positive association between CEO pay and firm size.

Furthermore, Mueller et al. (2017) study the role of firm size in the debate about wage inequality. In the first part, they have a panel dataset for private and public firms in the United Kingdom from 2004 till 2013. With regressions of number of employees at the firm-level on pay ratios, the authors find that larger firms exhibit significantly more pay inequality within their firms. So, when firm size increases, the difference between wages of top- and bottom-level jobs increases too. In the second part, the researchers study fifteen developed countries with various sample periods from 1981 to 2010. Wage data from firms in this dataset show a positive link between total wage inequality at the country level and growth of firms in the economy of that country.

2.6 The influence of CEOs on within-firm payments

Wage inequalities within firms and the role of the CEO in this process has been studied by several scientists. Wade, O'Reilly and Pollock (2006) study the importance of considering fairness in the setting of CEO pay and payments to employees. The dataset contains observations from 122 publicly listed firms across 34 industries during a period of five years from 1981 until 1985. The researchers find that over- or underpayment of the CEO affects lower organizational levels as well. CEOs use their own power to increase their own salaries and those of their subordinates. Lower-level managers are more likely to leave the firm when they are underpaid relative to the CEO.

A few years later, Cronqvist, Heyman, Nilsson, Svaleryd and Vlachos (2009) investigate the effect of managerial entrenchment on wages of their employees. The sample period is from 1995 to 2002 and contains data from a matched employer-employee panel dataset in Sweden of 285 public firms. Results follow from regressions on the logarithm of wage with employee- and firm-level characteristics as independent variables. It turns out that the payments to workers are affected by managerial entrenchment. CEOs who have more control, pay higher salaries to their workers, but such behavior can be mitigated by financial incentives through cash flow rights ownership.

Again three years later, another research has been done in this area. Faleye et al. (2012) take a closer look at the determinants and effects of relative compensation of top executives

and employees at lower levels. The dataset contains data about 450 unique firms in S&P 1500 indexes from 1993 till 2006. Their method contains regressions on (relative) CEO compensations with multiple firm-level variables and CEO characteristics. The authors find that the pay differential between top executives and employees on a lower level in the firm is determined by their own relative bargaining power to negotiate with the relevant counterparty to get higher wages. Besides this finding, the authors conclude that when the relative pay (of CEO payment to average employee compensation) increases, firm value and firm performance increase too.

2.7 CEO compensation and firm performance

While I study the effect of wage inequalities within firms on firm performance, some researchers study the effect of CEO compensation on firm performance. The aforementioned paper of Jensen and Murphy (1990) also takes a closer look at the pay-performance relation for CEOs. They use a dataset with CEOs who are listed in the Executive Compensation Surveys published in Forbes during the period 1974 until 1986. The data is matched with corporate performance of firms in that fiscal year. Least squares regressions are used on CEO compensation and the results show that there is a positive relation between CEO and shareholder wealth. Nevertheless, it is small and has declined. On top of this, public and private political forces impose regulations which cause a reduction in the pay-performance sensitivity.

Izan et al. (1998) focus on the relation between CEO payments and firm performance too. They measure firm performance with accounting and share price indicators and have Australia as their research area. Data of 99 Australian firms during 1987 until 1992 will be used for this study and regressions yield the main results. Regressions on CEO remuneration and changes in CEO remuneration show little (if any) evidence that CEO compensation and firm performance are related. This result holds for all performance measures used and for both types of regressions.

Two other papers about CEO compensation are already mentioned in Section 2.5, however the main results of those papers have not been described yet. Zhou (2000) not only examines the relation between CEO compensation and corporate performance, but also the determinants of CEO compensation. The dataset contains the necessary CEO compensation and financial data of Canadian firms listed on the Toronto Stock Exchange index during 1993 till 1995. Again, regression analysis is the methodology to come to the main results. It follows that CEO compensation is positively related to firm performance, but the linkage is weak.

Zhou compares the Canadian results with firms in the U.S. and finds that the results in Canada are significantly weaker relative to American results.

Finally, Merhebi et al. (2006) study Australian CEOs and the pay-performance relationship. They use data from the top 500 public firms of Australia listed by Business Review Weekly from 1990 till 1999. Regressions on (changes in) CEO pay with shareholder wealth as main independent variable are used to study the pay-performance relation. The authors find a significant positive relation between CEO remuneration and performance, and they compare their results with other countries, namely the United Kingdom, the United States of America, and Canada. The conclusion is that Australian CEOs are paid similar to their colleagues in the other countries.

2.8 CEO pay slice

The final interesting aspect about wage inequalities within firms is about CEO compensation relative to compensation of other executives. Bebchuk, Cremers and Peyer (2011) investigate the relation between the CEO pay slice (CPS), which is the amount of compensation received by the CEO divided by the aggregate compensation of top-five executives from a company, and performance, value and behavior of public firms. They distinguish themselves from earlier research, because they use a new measure, namely CPS. During the period 1993 until 2004 American firms are investigated and both firm-level variables and CEO characteristics are used. For the results, the researchers adjust their variables with the industry median. The methodology starts with fixed effect regressions on CPS to see which variables impact this measure and thereafter fixed effects regressions on industry-adjusted Tobin's Q and return on assets will show how these firm performance measures are affected.

With the fixed effect regressions on CPS, it follows that the industry median CPS and number of vice presidents among the top-five executives are the most important in influencing CPS. Besides this, the authors find that CPS has multiple relations with value, performance and behavior of public firms. However, the most important finding is a negative relation between CPS and industry-adjusted Tobin's Q, which is a measure of firm value in this paper. The authors conclude that a higher CPS is linked with agency problems and the results show that CPS is a useful tool to analyse performance and behavior of firms.

In addition, Yarram (2014) studies the relation between CPS and value and performance of firms, but now Australia is the research area. The panel dataset he uses contains firms listed on the All Ordinaries Index (AOI) from 2005 until 2011. In this paper, there are (fixed

effects) regressions on CPS and regressions on firm value and performance like in the study of Bebchuk et al. (2011).

The regressions on CPS show that multiple variables have a positive significant impact on CPS. On the other hand, board size, CEO turnover and CEO shareholding have a significant negative influence on CPS. In contrast with the previous mentioned paper, this research of CPS on firm value and performance measures shows that CPS has no significant influence on firm value (which is measured by Tobin's Q) and that CPS has a significant positive impact on return on assets and on stock returns.

3 Hypotheses Development

The research question has already been stated in Section 1.1, but hypotheses need to be developed to be able to answer this question. These hypotheses are based on studies mentioned in the literature review. For the development, most important papers follow from Section 2.8. However, other studies are used as well to come to the hypotheses of this thesis. Section 3.1 describes the first two hypotheses, Section 3.2 shows the third hypothesis and finally Section 3.3 describes Hypothesis 4 to 6.

3.1 Hypotheses regarding within-firm pay inequality

First, I will have a look at the variables that may have an effect on within-firm pay inequality, which is measured as the CEO-to-worker pay ratio. It follows from earlier literature that there is a possibility that company size affects intra-firm pay inequality. The first hypothesis is therefore based on the papers of Oi and Idson (1999) and Mueller et al. (2017). Both studies conclude that if firm size increases, the within-firm pay inequality goes up.

Mueller et al. (2017) find that when firms are larger, pay inequality within those firms is larger too. On top of that, the study is important for this thesis because among others the three countries of interest are included in the research of Mueller et al. (2017). So, the first hypothesis is:

Hypothesis 1: The larger the firm size, the larger the within-firm pay inequality.

Another aspect that may be of influence on the within-firm pay inequality is characteristics of the CEO of a firm. The possibility that there is an association between these two features follows from the studies of Bebchuk et al. (2011) and Yarram (2014). Both show that certain CEO characteristics influence CPS. Bebchuk et al. (2011) look at CEO tenure and how long the CEO was working at the firm before becoming CEO. Unfortunately, none of those

variables have a significant effect. On the other hand, Yarram (2014) finds that CEO tenure, turnover and shareholding do have a significant effect on CPS. Moreover, Wade et al. (2006) find that CEOs use their power to increase their own salaries and salaries of employees. These significant results are the basis for the second hypothesis, which is about characteristics like if there was a change of CEO within a company, how many years of experience the CEO has and gender and age of the CEO. The hypothesis is as follows:

Hypothesis 2: Characteristics of a CEO (Change of CEO, CEO tenure, CEO age and CEO gender) influence the within-firm pay inequality.

3.2 Hypothesis regarding firm performance

After is has been made clear whether firm-level variables and CEO characteristics affect within-firm pay inequality, this variable will now be used as main independent variable. The next hypothesis follows directly from the research question of this study. The goal is to find out whether there is a relation between pay inequalities within firms and performance of those firms. So, the third hypothesis will focus on this (possible) relation. From the papers of Faleye et al. (2012), Bebchuk et al. (2011) and Yarram (2014) it follows that there are different results based on (fixed effects) regressions of a CEO payment ratio on firm value or performance.

Faleye et al. (2012) find a positive relation between relative pay and firm value and performance, but Bebchuk et al. (2011) find a significant negative relation between CPS and Tobin's Q. The study of Yarram (2014) finds no significant influence of CPS on Tobin's Q and a significant positive impact of CPS on return on assets and stock returns. Because of those contradicting results, it is worth studying this relation in another research area during a different timeframe. Based on these papers, Hypothesis 3 is as follows:

Hypothesis 3: Within-firm pay inequality affects firm performance.

3.3 Hypotheses regarding firm performance: differences

The third section of this chapter goes deeper into the differences between countries, years and industries. The reason for including of this section is that earlier research shows contradicting results between countries and different periods in time. On top of that, some studies look at differences between industries or adjust for differences between industries.

The fourth hypothesis will therefore focus on the differences between the countries of interest. The Netherlands, Germany and the United States have all been part of researches before. For example, Mueller et al. (2017) investigates fifteen developed countries, including

those three countries and Bebchuk et al. (2011) and Faleye et al. (2012) use data of listed American firms. As described before, those studies yield contradicting results.

On top of that, Jensen and Murphy (1990) conclude that public and private political forces impose regulations which causes a reduction of the pay-performance sensitivity. Since political forces differ between continents and even between countries, this could be a cause for different results between the Netherlands, Germany and the United States. Thus, the hypothesis is:

Hypothesis 4: The effect of within-firm wage inequality on firm performance differs between countries.

The next hypothesis is based on the papers of Bebchuk et al. (2011) and Yarram (2014) as well, because they adjust their variables of interest at the industry level. However, since I am not able to do that, I add a hypothesis that takes a closer look at the differences between industries. Grund and Westergaard-Nielsen (2008) look at the relation between wage growth inequalities and firm performance. When they study this relation in multiple industries, no differences are found. In this thesis, the type of industry will be defined by the four-digit Standard Industrial Classification (SIC) code. So, with this hypothesis it can be tested whether the relation is industry specific or whether the results are only significant in some of them. Therefore, the fifth hypothesis is:

Hypothesis 5: The effect of within-firm pay inequality on firm performance differs between industries.

The last hypothesis is based on the descriptive statistics of Yarram (2014). These statistics show that there is variation in variables during the sample period of the study. So, fluctuations in the sample period can be a reason for biased results. Besides this, papers on the pay-performance relationship have different research periods and results that are inconstant. The periods cover together a period from 1975 until 2011, and results vary from negative to positive and even no significant pay-performance relation is found in these studies (Winter-Ebmer & Zweimüller, 1999; Berri & Jewell, 2004; Lallemand et al., 2004; Heyman, 2005; Jirjahn & Kraft, 2007; Grund & Westergaard-Nielsen, 2008; Bebchuk et al., 2011; Faleye et al., 2012; Yarram, 2014). Taking this into consideration, and the fact that the recent financial crisis is part of the sample period, which can cause fluctuations in variables, the sixth and final hypothesis is specified as follows:

Hypothesis 6: The effect of within-firm pay inequality on firm performance differs between years.

4 Data

This chapter explains the created dataset that is used to test the hypotheses stated in Chapter 3. Section 4.1 describes the research period and area, Section 4.2 shows which information I collect and how, Section 4.3 shows how I calculate the main and control variables. Finally, Section 4.4 shows the descriptive statistics of the main variables.

4.1 Regions and periods

The dataset that will be used to test these hypotheses and to answer the research question contains listed German, Dutch and American companies during the period 2008 till 2017. Germany and the Netherlands have been part of the study of Mueller et al. (2017) and firms in the United States have been researched before multiple times, for example in Bebchuk et al. (2011), Card et al. (2012), and Faleye et al. (2012). However, this is the first study that only focuses on these three countries together at the same time.

The sample period is from 2008 until 2017, because this is the most recent period with complete information about the companies of interest. Going back further into the past is not possible for most of the companies, because their annual reports are not available anymore. Besides this, those years are nowadays less relevant for the results and performance of firms. Other studies that do research to the pay-performance relation use timeframes of at least seven years, so therefore I choose to have a period which is longer than seven years, but still possible to study, and thus the last ten years are chosen. This period should be long enough to be able to find reliable results that are still economically relevant.

From the three countries of interest, listed firms will be used. Those firms are all obligated to publish their (financial) reports every year, and therefore the necessary information for this study can be gathered. I choose the largest indices from those countries which have approximately similar number of companies with complete information for the research period. The indices that are used, are the Amsterdam Exchange Index (AEX), Deutsche Aktienindex (DAX), DOW Jones Composite Average Index and DOW Jones Industrial Average Index (DOW). The AEX includes the largest 25 public firms of the Netherlands, the DAX includes the largest 30 firms of Germany and the two DOW indices include 65 of the largest firms in the United States. Therefore, the total sample contains 120 firms.

4.2 Variables and data sources

In order to do research on the pay-performance relation and test all stated hypotheses, data on CEO compensation, CEO characteristics, average wages of employees, firm size and firm performance is needed. Besides these main variables, control variables are used in the regressions as well. Data used to calculate the relative compensation, market performance measures, accounting performance measures and control variables can be found in annual reports of the companies and in Compustat. In this thesis, three measures for firm performance will be used, namely return on assets, stock returns and Tobin's Q. These measures are used in studies of Bebchuk et al. (2011), Faleye et al. (2012) and Yarram (2014), and are elaborated in Section 4.3.

Remuneration data and characteristics of CEOs of American firms are gathered from the ExecuComp database of Compustat. For CEOs of Dutch and German companies, this data has to be collected manually from annual reports. Those reports can be found on the official websites of those firms. Compensation of employees and all other firm-level data for the companies in this sample can be gathered from the databases Compustat Global and Compustat North America. For some firms there are missing variables, for example capital expenditures (CAPEX), number of employees or staff expense. Other companies have incomplete data for a part of the research period or even the entire period. Therefore, 8 Dutch firms, 8 German firms and 46 American firms are excluded from the sample. This leaves data available of 58 firms for a period of 10 years.

The final dataset is a balanced panel dataset, because it contains balanced data from multiple firms in multiple years: all 58 firm have complete information during the 10 years. Data about 58 firms is spread over three countries: 17 Dutch, 22 German and 19 American companies. Information is available for a period of ten years, namely from 2008 until 2017. Thus, there are 580 observations in total in the sample.

4.3 Calculation of measures

4.3.1 CEO-to-worker pay ratio

The main variable of this study is the CEO-to-worker pay ratio. This ratio is the annual CEO compensation relative to the average salary of employees of one firm in the same year. Total compensation includes salary, bonus, other annual and restricted stock grants, LTIP pay-outs and all other values of options exercised. These amounts are gathered partly manually and partly with ExecuComp. The average salary of an employee is calculated as total staff

expense divided by the number of employees of firm *i* during year *t*. No distinction is made between employees. Finally, CEO compensation is divided by this average salary and the total pay ratio is:

$$CEO - to - worker\ pay\ ratio\ (total)_{it} = \frac{CEO\ total\ \boldsymbol{compensation}\ in\ year\ t}{total\ staff\ expense/nr.of\ employees\ of\ firm\ i\ in\ year\ t} \quad (1)$$

So, the pay ratio is calculated for every firm *i* in year *t*. As a robustness check for this measure, I calculate the pay ratio using CEO fixed salary instead of CEO total compensation. In this case, for both CEO and employees, annual salary is used. This produces a small adjustment to the total pay ratio as described above and yields the following salary pay ratio:

$$CEO - to - worker\ pay\ ratio\ (salary)_{it} = \frac{CEO\ fixed\ \boldsymbol{salary}\ in\ year\ t}{total\ staff\ expense/nr.of\ employees\ of\ firm\ i\ in\ year\ t} \quad (2)$$

For both ratios, one-year-lag ratios are calculated as well to use as independent variable for hypotheses 3 to 6. This means that when you are interested in the effect of relative compensation on firm performance in year *t*, the pay ratio of year *t–1* is used as measure. This method is explained in detail in Section 5.2 and elaborated in Equation 12. The use of one year lagged measures is based on the paper of Bebchuk et al. (2011), because they use one year lagged CPS in their regressions about the pay-performance relation.

4.3.2 Firm performance measures

In order to answer the research question, (firm) performance measures are needed besides the pay ratios. Two types of performance measures are used, namely accounting and market performance measures. Return on assets (RoA) is the accounting performance measure and Tobin's Q is the market performance measure. Besides these two, another market performance measure, annual stock return, is used as robustness check.

Return on assets is calculated in the same way as Bebchuk et al. (2011) compute this measure. It is operating income divided by book value of assets and measured in percentage points. Both required variables are gathered from Compustat for all companies. The equation is:

$$RoA = \frac{Operating\ income\ after\ depreciation}{Book\ value\ of\ total\ assets} * 100\% \quad (3)$$

Additionally, Tobin's Q is used and determined the same way as Bebchuk et al. (2011) do. It is defined as market value of total equity minus book value of equity plus book value of total assets, all divided by book value of total assets. Market value of equity is the number of shares outstanding times the closing price at the end of the fiscal year, both gathered from the

Compustat database. Book value of assets and equity are collected from Compustat as well. Tobin's Q is mostly a main variable, but sometimes one year lagged Tobin's Q is used as control variable in regressions on other performance measures. Equation 4 shows the calculation of Tobin's Q:

$$Tobin's\ Q = \frac{Market\ value\ of\ equity - book\ value\ of\ equity + book\ value\ of\ total\ assets}{Book\ value\ of\ total\ assets} \quad (4)$$

The final performance measure is stock returns and based on the paper of Yarram (2014). He uses the same three performance measures for firm performance as this study. I calculate stock returns as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Equation 5 describes this calculation.

$$R_t = \frac{(P_1 - P_0) + D}{P_0} \quad (5)$$

R_t is the stock return in year t. P_1 stands for the price at the end of the year, P_0 stands for the initial price and D stands for dividends per share.

4.3.3 Firm size measures

Hypothesis 1 focusses on the effect of firm size on the CEO-to-worker pay ratio. In earlier research, multiple variables are used as measures for firm size. However, for this research, I follow the calculation of Bebchuk et al. (2011), who measure this as the logarithm (log) of book value of total assets. As robustness check I use another measure, which is used by Faleye et al. (2012). They calculate it as logarithm of total net sales. In both studies, the logarithm of these variables is taken. These calculations yield the following two measures for firm size:

$$Firm\ size\ (total\ assets) = log(book\ value\ of\ total\ assets) \quad (6)$$

$$Firm\ size\ (total\ net\ sales) = log(total\ net\ sales) \quad (7)$$

4.3.4 Other variables

Besides the described main variables, controls are necessary to exclude potential biases. Bebchuk et al. (2011), Faleye et al. (2012) and Yarram (2014) use multiple variables as controls. I mostly focus on the research of Bebchuk et al. (2011) and try to use as many controls as they use. However, some data is not available for my dataset, because besides the United States, I have two European countries in the research area as well. I add multiple control and dummy variables to the regressions.

The first control variable is the ratio of capital expenditures (CAPEX) relative to book value of total assets, referred to as CAPEX/assets. The second is leverage and it is calculated as total long-term debt divided by book value of total assets. The third and the fourth variables are based on research and development (R&D) expenses. R&D ratio is total research and development expenses relative to total net sales. If R&D expenses are missing, it is supposed to be zero. A potential problem of this treatment is that if a firm does have research and development expenses, but it is not reported in their financial reports, it is supposed to be zero in my dataset. Therefore, it can happen that I miss R&D expenses for some firms in my data. Besides the R&D ratio, a dummy variable 'R&D missing' is added and set to one if those expenses are zero. The fifth variable is a book to market ratio and based on the calculation of Faleye et al. (2012). This ratio is the book value of total equity divided by the market value of total equity and referred to as B/M-ratio. How these values are calculated or gathered is already described in Section 4.3.2. The final control variable is the number of years of experience a CEO has at one firm (CEO tenure). This measure is calculated as the year of interest minus the year the CEO started as CEO at that company.

Besides those general control variables, dummy variables are used as well. Dummy variables are added for index and these are seen as country-level dummies. For each country a dummy is added. Industry dummies are also used in this thesis. For each industry a dummy is added and it equals one when a firm operates in that specific industry. Industries are divided in groups based on the four-digit standard industrial classification (SIC) code. Finally, yearly dummies are added for each year. So, a dummy for 2008 is equal to one if an observation falls in that year and zero is the observation took place in 2009 to 2017.

The last variables that are of interest to do this study are about CEOs. Characteristics of CEOs may influence the pay-ratio(s) and therefore Hypothesis 2 is stated. The included characteristics of CEOs to test this hypothesis are gender and age of the CEO. Furthermore, the earlier mentioned variable CEO tenure, which is the number of years of experience the CEO has at one specific firm, is used. Lastly, there is a dummy variable added that is equal to one if there is more than one CEO during one year at a specific firm and thus whether a CEO has left the company and has been replaced by another one. This variable is referred to as CEO Change.

4.4 Descriptive statistics

The final section of this chapter shows the descriptive statistics of the earlier mentioned variables. The lagged variables are not included, because the data is represent in the non-lagged variables (e.g. lagged Tobin's Q variables are represent in Tobin's Q). The descriptive statistics of the main variables are shown in Table 1.

Table 1: Descriptive statistics

Pay Ratio (total) is total CEO compensation divided by average employee salary. Pay Ratio (salary) is total CEO salary divided by average employee salary. RoA is the return on assets measured as operating income after depreciation divided by book value of total assets in percentages. Tobin's Q is the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Stock returns is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Firm size (assets) is the logarithm of book value of total assets in dollars. Firm size (sales) is the logarithm of total net sales in dollars. CAPEX/assets is the ratio of capital expenditures relative to book value of total assets. Leverage is total long term debt divided by book value of total assets. R&D ratio is research and development expenses divided by total net sales. R&D missing is a dummy and it is equal to one if R&D expenses are zero. B/M-ratio is the book to market ratio of book value of equity to total market value of equity. CEO tenure is the number of years of experience as CEO at one firm. Gender is a dummy variable, it is equal to one if the gender of the CEO is male and zero if it is female. CEO age is the age of the CEO during the year of interest. CEO change is a dummy and is equal to one if there is a change in CEO for a company during a year and zero if it has the same CEO during a specific year.

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
Pay Ratio (total)	580	123.1	186.0	5.349	1,907.5
Pay Ratio (salary)	580	19.340	16.596	0	139.1
RoA	580	0.083	0.058	-0.214	0.279
Tobin's Q	580	1.604	0.743	0.655	5.187
Stock returns	580	0.141	0.388	-0.881	3.042
Firm size, (log(total assets))	580	10.439	0.657	8.075	12.410
Firm size, (log(total net sales))	580	10.249	0.599	7.597	11.672
CAPEX/assets	580	0.049	0.036	0	0.238
Leverage	580	0.207	0.119	0	0.874
R&D ratio	580	0.00057	0.00336	0	0.02736
R&D missing	580	0.966	0.183	0	1
B/M-ratio	580	0.568	0.553	-4.079	3.002
CEO tenure	580	5.334	4.982	0	36
Gender	580	0.983	0.130	0	1
CEO age	580	56.041	5.600	40	73
CEO change	580	0.110	0.314	0	1

In total there are 580 observations that represent 58 different firms and 114 different CEOs within ten years. In this period, the largest pay ratio was 1,907.5 and the smallest 0. The maximum shows that there is a CEO in this sample who receives 1,907.5 times as much compared to the average annual employee salary of the same firm. Therefore, in 276 minutes the CEO earns an average year salary of one worker. On average, a CEO receive 123.1 times more total compensation than the average employee year salary and the CEO salary is 'just'

on average 19.340 times more. If the total and salary pay ratios are compared, it follows that total pay ratios are on average higher. This is logic, because the total pay ratios contain salaries and other compensations of CEOs, while the salary pay ratios only include salaries of CEOs. On top of that, the relatively large difference of more than 100 points between the two means reflects that a large part of the compensation received by the CEO consists of compensation other than salary (bonuses, stock grants, etc.).

Most statistics are in line with other literature. The maximum of Tobin's Q is 5.187 and this is a normal value compared to the values found by Bebchuk et al. (2011), Faleye et al. (2012) and Yarram (2014). This holds for the statistics of return on assets and stock returns as well. The minima of zero for CAPEX/assets, leverage and R&D ratio show that some firms do not have capital expenditures, long term debt or research and development expenses. The high mean of R&D missing (0.966) gives the insight that for most firms, research and development expenses are missing or zero.

The book to market ratio is on average 0.568 for companies in this sample. The maximum and minimum for this variable are deviating from the mean. So, some firms have a really high book value compared to market value and some have a really low book value compared to market value. A low market value can be caused by lower shares prices for a firm and a high market value can be caused by higher share prices.

Following the statistics of CEO tenure, CEOs have on average 5.334 years of experience. The CEO who has been the longest serving CEO in this sample has 36 years of experience. The average of gender dummy is close by one, which means that 98.3 percent of the CEOs are men. The average CEO of this sample is 56 years old. The youngest is 40 years old and the oldest CEO is 73 years old. The dummy variable CEO change has an average value of 0.110, which shows that only in 11 percent of the 580 observations a CEO has been replaced by another person.

5 Methodology

Chapter 4 explains the data for this study, so the methodology section will show what models or statistics are used to interpret the panel dataset and to test the hypotheses. In Excel the data sets for Europe and the United States are merged and this data is the input for statistical analysis in STATA (an application for statistical data-analysis). For all the regression models described in this chapter, I will look at the *t*–statistics of variables to see whether effects are statistically significant. These *t*–statistics are based on robust standard errors clustered at the firm-level. Whether the coefficient is positive or negative shows if there is a positive or

negative relation between the main variables. I use OLS and fixed effects regressions. The fixed effects are added in the regressions as FE. Fixed effects are a summation of a group of dummies times a group of coefficients. Dummy variables are included for each year, industry, country and/or firm.

The remainder of this chapter is organized as follows. Section 5.1 explains the methods used for Hypothesis 1 and 2, Section 5.2 shows the models for Hypothesis 3 and Section 5.3 elaborates the models to test Hypothesis 4 to 6. Lastly, Section 5.4 describes robustness checks that are done to verify whether results are robust with different variables.

5.1 Methodology for hypotheses about the pay ratio

The first two hypotheses have total CEO-to-worker pay ratio as main dependent variable. Hypothesis 1 takes a closer look at the relation between firm size and the pay ratio and Hypothesis 2 studies the effects of CEO characteristics on the pay ratio.

5.1.1 Hypothesis 1

Hypothesis 1 focusses on the effect of firm size on pay ratio. The main independent variable is firm size and it is measured as the logarithm of total assets. First, I take a look at the correlation between the two variables of interest. Thereafter, I run multiple regressions to see whether the potential relation between firm size and within-firm pay inequality is significant under different circumstances. I start with an Ordinary Least Squares (OLS) regression. This regression is used for every firm i during year t in the sample period and does not have control variables. Thereafter, I calculate this regression with fixed effects. Year, year and industry and year and firm fixed effects are then added to the regression. The regression model is elaborated in Equation 8.

$$Pay\ Ratio_{it} = a + b_1 * Firm\ size_{it} + FE + u_{it} \quad (8)$$

After this simple regression model, I will run two other models with control variables. The first model is based on the paper of Faleye et al. (2012). These authors run regressions on CEO pay with firm size and multiple control variables. I use as many of the same variables as they use. Equation 9 shows the regression model. It is calculated as OLS regression and with multiple fixed effects. Year fixed effects are used alone and in combination with firm or industry fixed effects.

$$Pay\ Ratio_{it} = a + b_1 * Firm\ size_{it} + c_1 * B/M\ ratio_{it} + c_2 * RoA_{it} + c_3 * Tobin's\ Q_{it} + c_4 * R\&D\ ratio_{it} + FE + u_{it} \quad (9)$$

The last model is based on the fixed effects regression model used by Bebchuk et al. (2011). They use a firm fixed effects regression on CPS and again, I use as many of the same variables as they use. I calculate this model as an OLS regression and with year, firm and/or industry fixed effects. Compared to the previous regression model in Equation 9, book-to-market ratio is excluded and CAPEX/assets, leverage and CEO tenure are added. The new model is elaborated in Equation 10.

$$Pay\ Ratio_{it} = a + b_1 * Firm\ size_{it} + c_1 * Tobin's\ Q_{it} + c_2 * RoA_{it} + c_3 * CAPEX/assets_{it} + c_4 * Leverage_{it} + c_5 * CEO\ years_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + FE + u_{it} \quad (10)$$

5.1.2 Hypothesis 2

The second hypothesis studies whether CEO characteristics have an effect on the pay ratio. This hypothesis is related to the studies of Bebchuk et al. (2011) and Yarram (2014), because they find that some characteristics have an effect. I will test the CEO characteristics that I have available in my dataset. The main variables that will be tested are gender, age, years of experience of a CEO (CEO tenure) and CEO Change. Gender and CEO change are dummy variables and age and CEO tenure are variables with number of years.

First, those variables will be tested in regressions separately and thereafter they are tested together. Thus, the main regression model with all CEO characteristic variables together for this hypothesis is described in Equation 11. I calculate this model as OLS regression and fixed effects regressions. The fixed effects regressions contain year fixed effects, year and firm and year and industry fixed effects.

$$Pay\ Ratio_{it} = a + b_1 * Gender_{it} + b_2 * CEO\ age_{it} + b_3 * CEO\ years_{it} + b_4 * CEO\ Change_{it} + FE + u_{it} \quad (11)$$

5.2 Methodology for hypothesis about firm performance

After the tests which variables affect the total CEO-to-worker pay ratio, another relation can be tested. Namely, whether this ratio influences firm performance. The third hypothesis studies this effect and this is the main part of this study to get an answer on the research question. The methods I use to test Hypothesis 3 are mostly inspired by Bebchuk et al. (2011).

These authors try to account for the fact that CPS is an endogenously determined variable. This means that this variable can be determined by factors that are also related to firm performance. To solve this problem, the researchers use one year lagged CPS, control for lagged Tobin's Q, adjust Tobin's Q at the industry level and add firm fixed effects. I do this the same way as them, except for the industry-adjustment. Instead of an industry-adjusted

Tobin's Q, I add dummy variables for industries in some fixed effects regressions like Yarram (2014) does.

I start with looking at the correlations between the main variables, namely Tobin's Q, return on assets and the one-year-lag total CEO-to-worker pay ratio. Thereafter, I run multiple regressions. The first regressions will have Tobin's Q as dependent variable and thereafter I run regressions on return on assets.

5.2.1 Tobin's Q and one year lagged total pay ratio

I run several regressions on Tobin's Q. In the first model, I only look at the relation between the two main variables. So, one year lagged total pay ratio and Tobin's Q are studied. See Equation 12. This OLS regression is calculated for every firm i during year t with the CEO-to-worker pay ratio of year *t–1*. Furthermore, the model is calculated as fixed effects regressions. Year fixed effects are used alone or in combination with industry or firm fixed effects.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + FE + u_{it} \quad (12)$$

The next regression models are based on the paper of Bebchuk et al. (2011). These authors run multiple regression models to test the effect of CPS on Tobin's Q. I will follow their method, and try to use as many control variables as they use. I use two models like them and calculate these as OLS regression models and fixed effects regressions. The fixed effects regressions contain year fixed effects, year and industry, and year and firm fixed effects, respectively. See Equations 13 and 14 for the models.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + c_1 * Firm\ Size_{it} + c_2 * RoA_{it} + c_3 * CAPEX/assets_{it} + c_4 * Leverage_{it} + c_5 * R\&D\ ratio_{it} + c_6 * R\&D\ missing_{it} + FE + u_{it} \quad (13)$$

$$Tobin's\ Q_{it} = a + b_1 * Pay\ ratio_{i,t-1} + c_1 * Tobin's\ Q_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * RoA_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + FE + u_{it} \quad (14)$$

In the models above, the dependent variable is Tobin's Q and the main independent variable is one-year-lag total pay ratio. To test for the relation between these two variables, multiple control variables are added. In Equation 13 firm size, return on assets, CAPEX/assets, leverage and two research and development variables are added. One year lagged Tobin's Q and years of experience of a CEO are added as extra control variables in Equation 14.

5.2.2 Return on assets and one year lagged total pay ratio

The previous section explains the method used for the relation between Tobin's Q, a market performance measure, and one year lagged total pay ratio. Another measure to test the relation between within-firm inequality and firm performance is the accounting performance measure. To test the same relation with this measure, return on assets is used in the previous models instead of Tobin's Q. Again, I start with a basis OLS regression model without controls. Thereafter, I calculate it as fixed effects regressions as well. In this case, fixed effects for year, year and firm or year and industry are added. See Equation 15 for the model.

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + FE + u_{it} \quad (15)$$

The first model (Equation 15) only studies the two main variables. Moreover I extend it with multiple control variables. The same variables are added as in Equations 13 and 14, however, instead of return on assets as control variable, Tobin's Q is added and the one year lagged Tobin's Q in Equation 14 is replaced by one year lagged return on assets. See Equations 16 and 17 for the regressions on return on assets. Once more, these OLS regressions are run as fixed effects regressions as well with year and industry or firm fixed effects.

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + c_1 * Firm\ Size_{it} + c_2 * Tobin's\ Q_{it} + c_3 * CAPEX/assets_{it} + c_4 * Leverage_{it} + c_5 * R\&D\ ratio_{it} + c_6 * R\&D\ missing_{it} + FE + u_{it} \quad (16)$$

$$RoA_{it} = a + b_1 * Pay\ ratio_{i,t-1} + c_1 * RoA_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * Tobin's\ Q_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + FE + u_{it} \quad (17)$$

5.3 Hypotheses 4 to 6

The methodologies for the first three hypotheses have now been discussed. For the last three hypotheses the methodology deviates from the previous techniques, because these study the differences between countries, industries or years. Where Hypothesis 3 tests the general relation between CEO-to-worker pay ratio and firm performance, Hypothesis 4, 5 and 6 test whether this relation differs between countries, industries or years.

5.3.1 Hypothesis 4

For the fourth hypothesis, again, regression models are calculated. However, these are different compared to the earlier described regressions. First, I start with OLS regression models on Tobin's Q without control variables, but with an interaction term for the one-year-

lag total pay ratio and country dummies. Thereafter, I run the same model with only year, year and firm and year and industry fixed effects. Equation 18 shows the regression model.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Country\ FE + Country\ FE + FE + u_{it} \quad (18)$$

Then, I add control variables to test whether the relation changes when firm-level variables and CEO tenure are added to the regression. This model can be found in Equation 19. These are the same controls as used in Equation 14, which is the most complete model I use to test Hypothesis 3. Again, the model is calculated as OLS regression and regression with fixed effects for year, firm and industry.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Country\ FE + c_1 * Tobin'sQ_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * RoA_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Country\ FE + FE + u_{it} \quad (19)$$

After the analysis of the market performance measure Tobin's Q, I analyze the accounting performance measure return on assets. The methodology for return on assets is the same as for Tobin's Q, except with another dependent variable, namely return on assets. First, an OLS regression with interaction terms is calculated. Thereafter, this model is calculated with year, firm and industry fixed effects. Then, a complete model with both interaction terms and control variables is used. Again, both OLS and fixed effects regressions are calculated for this model. See Equations 20 and 21.

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Country\ FE + Country\ FE + FE + u_{it} \quad (20)$$

$$RoA_{it} = a + b_1 * Pay\ ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Country\ FE + c_1 * RoA_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * Tobin's\ Q_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Country\ FE + FE + u_{it} \quad (21)$$

5.3.2 Hypothesis 5

Hypothesis 5 tests the differences between industries. A similar methodology is applied as described for Hypothesis 4. However, the interaction terms now consist of the one-year-lag total pay ratio and industry dummies (instead of country dummies). The regression on Tobin's Q without controls is described in Equation 22. This model is calculated as OLS regression and as regressions with year, country and firm fixed effects.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Industry\ FE + Industry\ FE + FE + u_{it} \quad (22)$$

The other model for this hypothesis contains the same control variables as the model with controls for Hypothesis 4. It is related to the most complete regression model on Tobin's Q of Bebchuk et al. (2011). Again, this model is calculated as OLS regression and year, country, and firm fixed effects regressions. See Equation 23 for the second type of model for this hypothesis.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Industry\ FE + c_1 * Tobin's\ Q_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * RoA_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Industry\ FE + FE + u_{it} \quad (23)$$

Besides those regressions on Tobin's Q, I run the same type of regressions on return on assets. The regressions of these models are shown in Equations 24 and 25. Again, the models are calculated as OLS regressions and fixed effects regressions with year, country and firm fixed effects.

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Industry\ FE + Industry\ FE + FE + u_{it} \quad (24)$$

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Industry\ FE + c_1 * RoA_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * Tobin's\ Q_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Industry\ FE + FE + u_{it} \quad (25)$$

5.3.3 Hypothesis 6

The last hypothesis of this study takes a closer look at the differences between years. Again, interaction terms between yearly dummy variables and the one-year-lag total CEO-to-worker pay ratio are included in the regressions. The same type of methodology as described for Hypothesis 4 and 5 is used for this hypothesis.

I start with a simple OLS regression model on Tobin's Q with just the one year lagged pay ratio and year dummies. This regression is also calculated with industry, country and firm fixed effects. The model is described in Equation 26.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Year\ FE + Year\ FE + FE + u_{it} \quad (26)$$

Thereafter, I use the most complete model of Bebchuk et al. (2011), which contains several control variables. This model is described in Equation 27. Once more, the model is calculated as an OLS regression and fixed effects regression with industry, firm and country fixed effects.

$$Tobin's\ Q_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Year\ FE + c_1 * Tobin's\ Q_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * RoA_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Year\ FE + FE + u_{it} \quad (27)$$

Likewise for the last hypothesis, results are calculated for both Tobin's Q and return on assets. The same models are used for return on assets as for Tobin's Q, only the dependent variable changes. First simple models are calculated and then control variables are added to this model. The regression models are calculated as OLS regressions and fixed effects regressions with fixed effects for industry, country and firm. See Equation 28 and 29 for the regression models.

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Year\ FE + Year\ FE + FE + u_{it} \quad (28)$$

$$RoA_{it} = a + b_1 * Pay\ Ratio_{i,t-1} + b_2 * Pay\ Ratio_{i,t-1} * Year\ FE + c_1 * RoA_{i,t-1} + c_2 * Firm\ Size_{it} + c_3 * Tobin's\ Q_{it} + c_4 * CAPEX/assets_{it} + c_5 * Leverage_{it} + c_6 * R\&D\ ratio_{it} + c_7 * R\&D\ missing_{it} + c_8 * CEO\ years_{it} + Year\ FE + FE + u_{it} \quad (29)$$

5.4 Robustness checks

Before conclusions can be derived from the main results, robustness checks have to be done. Robustness checks are used to test whether the results that are found with the main methodology are robust to other circumstances. For example, different models can be calculated or different variables can be used instead of the main variables. In this study, robustness checks will be done. I describe the checks per hypothesis. For all robustness checks, it holds that I run the same regression models as in the main part. However, I change either the dependent variable or the main independent variable. The robustness checks on stock returns are calculated twice with two different independent variables.

For the first hypothesis, the main variables are (total) CEO-to-worker pay ratio and firm size. I only use the total ratio for the CEO-to-worker pay ratio for the main results. As robustness check, I run the same models as with the total pay ratio, however now I look at the salary CEO-to-worker pay ratio. I run the same three models following the same methodology as the main results, only with a different dependent variable. So, the models are calculated as OLS regressions and fixed effects regressions with and without control variables.

Furthermore, I have another variable as robustness check for firm size. The main results are based on the variable that Bebchuk et al. (2011) use, namely the logarithm of total assets. As robustness check I use a firm size variable based on Faleye et al. (2012). They calculate

firm size as the logarithm of total net sales. In this case, I run the same three models as in the main results part, but now I only change the main independent variable, namely firm size.

The second hypothesis takes a closer look at the effect of CEO characteristics on the CEO-to-worker pay ratio. In the main results part, I use total CEO-to-worker pay ratio and again, as robustness check for this hypothesis, I change the dependent variable to the salary CEO-to-worker pay ratio. Therefore, this check will follow the same methodology as the main results part, but with another dependent variable, namely salary CEO-to-worker pay ratio.

The third hypothesis tests the effects of within-firm pay inequality on firm performance. As robustness check to the main methodology, I use the same methodology with different dependent variable or main independent variable. The dependent variables are Tobin's Q and return on assets. As robustness check, I use stock returns. The same regressions are calculated (OLS, fixed effects, with and without control variables), but then Tobin's Q is replaced by stock returns, the other market performance measure.

Moreover, for the one-year-lag total CEO-to-worker pay ratio I have a robustness check. Instead of the total ratio, the ratio with only salaries of CEOs is used as main independent variable to see whether the effect of the pay ratio changes on firm performance measures.

Hypothesis 4 to 6 have similar methodologies. All these hypotheses first have regressions without control variables and thereafter regressions with control variables. The regressions include interaction terms for pay ratio and countries, industries or years and are calculated as OLS regressions and fixed effects regressions. As robustness check to those results, I run these regressions again with another one year lagged pay ratio variable. Where I use the total CEO-to-worker pay ratio in the main results, I use the one-year-lag salary CEO-to-worker pay ratio as robustness check. The different pay ratio may affect the differences between countries, industries or years.

Furthermore, I calculate the same models with another firm performance measure, namely stock returns. This variable is used as robustness check to Tobin's Q and return on assets. This firm performance measure is used by Yarram (2014). When I use another measure for the pay ratio, firm performance measures are the same as in the main results part and when I use another firm performance measure, the total CEO-to-worker pay ratio remains the main dependent variable.

6 Results

After the extensive discussion of the data and methodology, this chapter will show the results of the methods used. For all results, I will use the five percent significance level as reference point to conclude whether effects are significant or not. Section 6.1 shows the main results of Hypothesis 1. Section 6.2 and 6.3 describe the main results of Hypothesis 2 and 3, respectively. Section 6.4 explains the results of Hypotheses 4 to 6. Finally, Section 6.5 shows the robustness checks done to test whether the main results hold.

6.1 Results of Hypothesis 1

The first hypothesis of this thesis tests whether firm size affects the CEO-to-worker pay ratio. It is based on the studies of Oi and Idson (1999) and Mueller et al. (2017), because both studies find a significant positive relation. Therefore, I expect the effect to be positive. This relation will be researched using multiple regression models. The hypothesis is stated in Section 3.1 as follows:

Hypothesis 1: The larger the firm size, the larger the within-firm pay inequality.

However, before the regressions are analyzed, I first look at the correlation between the main variables: firm size and total CEO-to-worker pay ratio. The correlation between the two is significant at the five percent significance level with a coefficient of 0.2738. This means that there is a small positive correlation between the variables.

The results for Hypothesis 1 are shown in Tables 2 and 3. I report twelve pay ratio regressions using three types of models with and without control variables and using ordinary least squares (OLS) or fixed effects models. The first model tests this relation without any control variables and is shown in Table 2. Column 1 shows the OLS regression model. It has a positive significant effect, because when total assets (the measure for firm size) increase with one percent, the pay ratio increases with 0.775 units. This model is also calculated with year, year and industry and year and firm fixed effects, shown in Columns 2 to 4. The results with year and year and industry fixed effects are positive and significant as well. The effect of an increase by one percent of total assets on the total pay ratio in these models is 0.767 and 0.589, respectively. However, the coefficient of -4.344 in the model of Column 4 is insignificant, and thus firm size does not seem to influence the pay ratio with year and firm fixed effects.

Table 2: Pay ratio (total) regressions without controls, firm size

This table presents regressions on the total CEO-to-worker pay ratio without control variables. Column 1 is an OLS regression, Column 2 is a year fixed effects (FE) regression, Column 3 is a year and industry FE regression and Column 4 is a year and firm FE regression. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. For further variable descriptions, see Table 1. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (total)			
	(1)	(2)	(3)	(4)
Firm size (assets)	77.50***	76.68***	58.92***	-4.344
	(19.40)	(19.30)	(20.93)	(53.59)
Constant	-685.9***	-683.2***	-475.6**	52.32
	(194.8)	(199.5)	(218.2)	(492.8)
Observations	580	580	580	580
R-squared	0.075	0.079	0.735	0.750
Year FE	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES

The models containing control variables are shown in Table 3. The first model, shown in Columns 1 to 4, follows the model of Faleye et al. (2012). In this model some control variables are added. It is first calculated as an OLS regression. This model shows again a positive significant result: an increase of the pay ratio with 1.128 units when total assets increase by one percent. All control variables in this model are insignificant. When the model is calculated with year, year and industry and year and firm fixed effects (Columns 2 to 4) it follows that the effect changes.

With only year fixed effects, the results of the model remain the same as the OLS regression. Control variables are insignificant and the effect of firm size on the total pay ratio is positive and significant, namely 1.173 units when total assets increase with one percent. When industry fixed effects are added, the effect of firm size on the total pay ratio decreases to just 0.580 units. In this case, R&D ratio becomes significant too. If the model is calculated with year and firm fixed effects, the results changes completely. The effect of firm size becomes negative and insignificant. Thus, firm size does not seem to affect the total pay ratio in Column 4 and only R&D ratio is a significant (control) variable.

The other type of model is shown in Columns 5 to 8. These are regression models based on the model used by Bebchuk et al. (2011). Column 5 is an OLS regression, Column 6 is a year fixed effects regression, Column 7 is a year and industry fixed effect regression and Column 8 is a year and firm fixed effects regression. It follows from the coefficients in the table that, again, the OLS regression function, the year fixed effects and year and industry

fixed effects models show a positive significant coefficient (at the five percent level) of firm size on the total pay ratio, namely 112.5, 116.9 and 63.13 respectively. This means that when total assets increase with one percent, the pay ratio goes up by 1.125, 1.169 and 0.631 units respectively. However, the model with year and firm fixed effects has a negative insignificant coefficient for firm size. In this regression, only the control variable CEO tenure has a significant positive effect.

Table 3: Pay ratio (total) regressions with controls, firm size

This table presents regressions on the total CEO-to-worker pay ratio with control variables. Column 1 to 4 show regressions with controls based on Faleye et al. (2012). Models in Columns 5 to 8 are based on the models from Bebchuk et al. (2011). Column 1 and 5 are OLS regressions, Column 2 and 6 are year fixed effects (FE) regressions, Column 3 and 7 are year and industry FE regressions and Column 4 to 8 are year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. For further variable descriptions, see Table 1. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (total)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm size (assets)	112.8***	117.3***	57.97***	-13.77	112.5***	116.9***	63.13**	-2.755
	(35.13)	(38.46)	(21.32)	(44.74)	(30.73)	(33.05)	(23.93)	(51.17)
Tobin's Q	67.46	74.25	-2.267	2.542	66.82*	74.38	2.241	-1.345
	(47.09)	(53.33)	(11.44)	(11.89)	(38.70)	(44.75)	(11.94)	(12.15)
RoA	404.1	371.9	149.6	179.1	468.5	428.4	158.7	172.1
	(413.9)	(408.6)	(131.0)	(149.5)	(367.0)	(356.2)	(120.3)	(182.3)
R&D ratio	-416.1	-308.8	-9,599**	-10,638**	1,852	2,094	-2,895	-4,988
	(579.4)	(618.4)	(3,644)	(4,809)	(1,335)	(1,570)	(3,795)	(4,624)
B/M-ratio	-1.217	-2.371	-10.59	11.61				
	(17.91)	(17.77)	(10.44)	(19.29)				
CAPEX/assets					-223.3	-219.0	33.57	108.1
					(418.9)	(425.5)	(253.6)	(204.1)
Leverage					370.0	370.3	-8.550	-77.45
					(261.7)	(256.7)	(83.40)	(62.89)
R&D missing					23.76	26.50	19.03	-220.4
					(27.89)	(29.96)	(42.16)	(135.1)
CEO tenure					6.679**	6.727**	3.986**	4.335**
					(2.649)	(2.762)	(1.707)	(1.843)
Constant	-1,196***	-1,226**	-467.4*	112.7	-1,323***	-1,356***	-578.7**	192.3
	(438.3)	(474.9)	(234.7)	(428.8)	(403.2)	(437.2)	(257.5)	(587.3)
Observations	580	580	580	580	580	580	580	580
R-squared	0.192	0.199	0.736	0.751	0.272	0.278	0.742	0.759
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Because the regression functions in Tables 2 and 3 have varying outcomes, an overall conclusion cannot be derived for these models. The correlation between the total pay ratio and firm size shows a small significant positive effect. In most models, the effect of firm size is

positive and significant, however, when year and firm fixed effects regressions are run, the effect becomes negative and insignificant for all three type of models (one without controls and two with control variables). Therefore, it cannot be concluded that larger firm size leads to larger within-firm pay inequality. It cannot even be determined that there is a (significant) relation between these two, because there are positive significant effects reported and negative insignificant effects. So, the first hypothesis is rejected based on the results found. This conclusion is not in line with expectation. Oi and Idson (1999) and Mueller et al. (2017) find a significant positive relation between firm size and within-firm pay inequality in their studies. Hence, the conclusion that larger firm size, which is measured by the logarithm of total assets, does not lead to higher within-firm pay inequality, which is measured by the total CEO-to-worker pay ratio, is surprising.

6.2 Results of Hypothesis 2

After studying the effects of firm size on total CEO-to-worker pay ratio, Hypothesis 2 researches other aspects that can influence the pay ratio. These aspects are based on the CEO of a firm. The hypothesis is described in Section 3.1 and added here as reminder:

Hypothesis 2: Characteristics of a CEO (Change of CEO, CEO tenure, CEO age and CEO gender) influence the within-firm pay inequality.

Again, multiple regression models will show if there are characteristics that influence the total CEO-to-worker pay ratio in this sample. But before this analysis, I take a look at the correlation coefficients of the variables of interest. These correlations can be found in Table 4. Of the four characteristics that are tested, only two show significant positive correlations with the pay ratio. CEO age has a correlation coefficient of 0.2270 and CEO tenure of 0.0961. The other two characteristics do not have a significant correlation. The coefficient of gender is positive and insignificant (0.0414) and of CEO change negative and insignificant (-0.0201). Thus, it seems from the correlations that only CEO age and tenure influence the pay ratio in a significant way. The correlations between the characteristics are all smaller than 0.5 when looking at absolute values of the coefficients. Therefore, the correlations are not considered to show a multi-collinearity problem.

Table 4: Correlations of Pay ratio (total) and CEO characteristics

This table reports Pearson correlations of the main variables for Hypothesis 2. Column 1 shows the correlations of the variables on total CEO-to-worker pay ratio. Column 2 describes the correlations on gender, Column 3 on CEO age, Column 4 on CEO tenure and Column 5 on CEO change. See Table 1 for all variable descriptions. The *p*–values of the coefficients are reported between parentheses. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable Variable	Pay Ratio (total)	Gender	CEO age	CEO tenure	CEO change
Pay Ratio (total)	1.0000				
Gender (dummy)	0.0414	1.0000			
	(0.3191)				
CEO age	0.2270***	0.0602	1.0000		
	(0.0000)	(0.1479)			
CEO tenure	0.0961**	-0.1108***	0.4958***	1.0000	
	(0.0207)	(0.0075)	(0.0000)		
CEO change	-0.0201	0.0466	-0.1128***	-0.2348***	1.0000
	(0.6298)	(0.2620)	(0.0066)	(0.0000)	

The regression models are reported in Table 5. This table shows OLS regressions for the characteristics separately. These regressions can be found in Columns 1 to 4. It follows that gender and CEO age have positive significant effects. If the CEO is a man (dummy is equal to one), the pay ratio goes up by 59.17 compared to when a CEO is a woman. The second column illustrates the effect of age of a CEO on the pay ratio of the same firm. The coefficient is positive and significant. This indicates that when a CEO becomes one year older, the pay ratio, and thus his total year compensation relative to the average employee year salary, goes up by 7.539.

The other two characteristics, CEO tenure and CEO change, report insignificant results. The coefficient of CEO tenure is 3.587 and the coefficient of CEO change is -11.90. Besides, the R-squared of the models in Columns 1 to 4 are really small. This means that in the models, only a small part of the variance in the dependent variable is explained by the independent variable.

Columns 5 to 8 of Table 5 show regression models in which the characteristics are tested simultaneously. In the OLS and year FE regression models, only CEO age is positive and significant. In the OLS regression model, the total pay ratio increases with 7.770 when the CEO becomes one year older. In the year FE regression, this effect is 7.614. Moreover, gender shows positive coefficients, but those are only significant at the ten percent significance level. CEO tenure and CEO age do not seem to influence the pay ratio in these models, because the coefficients are insignificant at all three significance levels.

Surprisingly, gender becomes negative and significant in Column 7: When the gender of a CEO is male, the total pay ratio decreases by 74.30. In Column 8, the year and industry FE

regression shows a significant positive effect for gender. Under these circumstances a male CEO has a pay ratio that is 95.78 higher compared to CEOs that are women.

In the year and firm FE model (Column 7), CEO age has a positive effect of 5.903, which is only significant at the ten percent significance level. In all other regressions, this effect is significantly positive. CEO tenure, which is the years of experience a CEO has at one specific firm, and CEO change have insignificant effects in all models and the coefficients vary from negative to positive. So, whether a firm changes their CEO during a fiscal year, does not affect the total CEO-to-worker pay ratio significantly.

Based on the described results, the second hypothesis should be rejected. Of the four variables of interest, none has a significant effect in all models. Two characteristics are always significant at the ten percent significant level, namely gender and CEO age, but for gender the effect varies from -74.30 to 95.78 and this does not show any consistency. CEO age has a coefficient that is similar in every model. It only varies from 5.903 to 7.770, however the robustness check does not show any significant results for this characteristic (See Section 6.5.2). The other two variables are insignificant in every model. So, whether the CEO of a company leaves and gets replaced by another CEO does not affect the total CEO-to-worker pay ratio, which is a measure for within-firm pay inequality and the experience of a CEO does not seem to influence the pay ratio as well.

Thus, the conclusion is that none of the CEO characteristics seem to influence the within-firm pay inequality significantly, which is measured by the CEO-to-worker (total) pay ratio. So, Hypothesis 2 is rejected. This is in line with the results of Bebchuk et al. (2011), who do not find significant results for the CEO characteristics I use in this research. However, the conclusion contradicts to the results found by Yarram (2014). He finds that CEO tenure significantly influences CPS. In my analysis, CEO tenure is insignificant in all regressions.

Table 5: Pay ratio (total) regressions, CEO characteristics

This table presents regressions on the total pay ratio. Columns 1 to 5 show OLS regressions with CEO characteristics, separately and together. Column 6 is a firm FE regression, Column 7 a year and firm FE regression and Column 8 reports a year and industry FE regression model. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. For further variable descriptions, see Table 1. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker Pay Ratio (total)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender (dummy)	59.17***				36.34*	36.91*	-74.30***	95.78***
	(21.59)				(18.31)	(18.45)	(11.44)	(3.504)
CEO age		7.539***			7.770***	7.614***	5.903*	6.044***
		(1.786)			(2.203)	(2.243)	(3.226)	(2.181)
CEO tenure			3.587		-0.627	-0.609	0.00713	-0.423
			(3.105)		(3.434)	(3.458)	(2.607)	(1.946)
CEO change				-11.90	0.703	-0.0573	0.824	1.596
				(15.75)	(11.33)	(11.77)	(11.18)	(11.68)
Constant	64.93	-299.4***	103.9***	124.4***	-344.8***	-342.1***	-257.5	-261.1**
	(0)	(90.48)	(28.25)	(21.18)	(101.8)	(103.5)	(160.7)	(111.6)
Observations	580	580	580	580	580	580	580	580
R-squared	0.002	0.052	0.009	0.000	0.053	0.056	0.763	0.747
Year FE	NO	NO	NO	NO	NO	YES	YES	YES
Industry FE	NO	NO	NO	NO	NO	NO	NO	YES
Firm FE	NO	NO	NO	NO	NO	NO	YES	NO

6.3 Results of Hypothesis 3

The main hypothesis to answer the research question is the third one. The hypotheses before study the effects on the total CEO-to-worker pay ratio, but this hypothesis looks at the effect of this pay ratio on firm performance. It is stated in Section 3.2 and repeated here:

Hypothesis 3: Within-firm pay inequality affects firm performance.

For this hypothesis two type of firm performance measures are used. First, I look at the effects of the one year lagged pay ratio on a market performance measure, namely Tobin's Q, and then I look at the effect on return on assets which is an accounting performance measure. The regressions in this part will have less observations than the first two hypotheses, because of the use of one year lagged variables. Therefore, the observations of 2008 are excluded.

Before the regression analysis, I look at the correlations between the one year lagged total CEO-to-worker pay ratio and the two performance measures. The correlation between the one-year-lag total pay ratio and Tobin's Q is 0.1819. This coefficient is significant even at the one percent significance level. It shows a small positive correlation. The correlation coefficient of one-year-lag total pay ratio and return on assets is 0.2344. Again, this result is

significant even at the one percent significance level. Thus, from the correlations it follows that a higher pay ratio has a small positive effect on the firm performance measures.

6.3.1 Results with market performance measure

The regressions of the one-year-lag total CEO-to-worker pay ratio on Tobin's Q are reported in Table 6. The first four columns show regressions of the one year lagged total pay ratio on Tobin's Q without control variables. Column 1 to 3 show small positive coefficients and Column 4 has a small negative coefficient of -0.0000448, however all these effects are insignificant at the three significance levels. So, whether this regression is run as OLS or with fixed effects does not change the significance of the effect, only the sign changes from positive to negative when year and firm fixed effects are used.

The relation can be studied with control variables as well. Therefore, two type of models with controls are calculated for this study. Columns 5 to 8 show the first type of model based on the models described by Bebchuk et al. (2011). These models contain six control variables, namely firm size (assets), return on assets, CAPEX relative to assets ratio, leverage, R&D ratio and R&D missing. Again, the sign of the one year lagged total pay ratio effect on Tobin's Q is positive for the OLS, year FE and year and industry FE regressions and negative for the year and firm FE regression. In Columns 5 and 6 the positive effect of the one-year-lagged total pay ratio is significant. So, when the regression with controls is run as OLS regression, it follows that the one year lagged total pay ratio affects Tobin's Q with 0.000687 if the pay ratio increases with one. For the year fixed effects regression, this effect is 0.000706.

In these models, only R&D ratio is a significant control variable in all regression types. However, the sign of this effect varies from -16.08 to 89.55 and is not consistent. Firm size, return on assets, leverage and R&D missing have some significant effects, but not consistent in all types of regressions (OLS and FE regressions).

The third type of model used for this hypothesis, besides the models without controls and with six control variables, is also based on Bebchuk et al. (2011). However, now two more controls are added: one year lagged Tobin's Q and CEO tenure. This is the model reported in Columns 9 to 12. Column 9 shows an OLS regression, Column 10 a year fixed effect regression, Column 11 a year and industry fixed effects regression and Column 12 a year and firm fixed effects regression. In all models, the effect of the one year lagged total pay ratio on Tobin's Q is positive. So, an increase of the one year lagged total CEO-to-worker pay ratio with one increases Tobin's Q during this year. This effect varies from 0.0000552 to 0.000285.

Unfortunately, the effects of this variable are only significant in the OLS and year fixed effects regressions. One year lagged Tobin's Q and R&D ratio are the only two variables that are significant controls in all regressions for this type of model. Besides these significant results, firm size and R&D missing are only significant in the OLS and year fixed effects regressions. All other variables report insignificant results.

If the three types of models are compared, it can be seen that for all OLS regressions and year fixed effects regressions the effect of one year lagged pay ratio is similar in the model without controls and the first model with controls (Column 5), however the models in Columns 9 and 10 show smaller results, namely 0.000276 and 0.000285. These are the only two significant coefficients of the one year lagged total pay ratio on Tobin's Q.

When the regressions with year and firm and year and industry fixed effects are compared it follows that the effect of one year lagged total pay ratio is always insignificant and varies for the year and industry fixed effects regressions from 0.0000269 to 0.0000966 and for the year and firm fixed effects regressions from -0.0000448 to 0.0000552.

6.3.2 Results with accounting performance measure

After the description of the results on the market performance measure Tobin's Q, I now continue with the analysis of the regressions on the accounting performance measure return on assets (RoA). The same type of models and regressions are calculated for this measure. The results are reported in Table 7.

From this table, it follows that the effect of the one year lagged total pay ratio on return on assets is positive in all models. However, the effect is only significant at the ten percent significance level in Columns 1 (0.0000751) and 2 (0.0000743), the OLS and year fixed effects regressions without control variables, at the five percent level in Column 9 (0.0000120) and even at the one percent level in Column 10 (0.0000125). The effect of Column 1 shows that an increase of the one year lagged total pay ratio with one unit increases the return on assets in this year with 0.0000751 percent.

Furthermore, the control variables have varying coefficients. The only variables that are significant in all regressions are the CAPEX to assets ratio and one-year-lag return on assets. Those variables have in all models (in which they are included) a positive significant effect on return on assets. This is expected, because those variables are closely related to the dependent variable: return on assets is also a measure in which you divide by total assets. Tobin's Q shows positive significant results in the OLS and year fixed effects regressions. Besides these

controls, leverage, R&D ratio, R&D missing and CEO tenure show some significant effects, but not consistent.

6.3.3 Conclusion

Based on the results of the one year lagged total CEO-to-worker pay ratio on the accounting and market performance measures, return on assets and Tobin's Q respectively, a conclusion can be drawn regarding Hypothesis 3. Unfortunately, with this dataset no consistent significant results are found for the relation between the one year lagged total CEO-to-worker pay ratio and both Tobin's Q and return on assets.

There are significant results for both performance measures, however in most models the effect is small and insignificant. For Tobin's Q the effect of the one year lagged pay ratio varies from negative to positive (-0.0000448 to 0.000764), but only the OLS and year fixed effect regression models with controls show a significant coefficient. The models without controls and all models with year and industry and year and firm fixed effects have insignificant results for the one-year-lag total pay ratio.

The regressions on return on assets all show positive coefficients for one year lagged total CEO-to-worker pay ratio, varying from 0.00000239 to 0.0000751. However, they are significant in only two models: The OLS and year fixed effect regressions in Columns 9 and 10 of Table 7. In these models, return on assets increases with 0.0000120 and 0.0000125 percent respectively if the one year lagged total pay ratio increases with one.

Besides the few significant effects for the one year lagged total CEO-to-worker pay ratio, the control variables show not many significant results as well. Some controls are significant in every model, namely one year lagged Tobin's Q and R&D ratio in the regressions on Tobin's Q and CAPEX/assets in the regressions on return on assets. These controls are closely related to the dependent variables. The other controls show varying results.

Thus, it can be concluded that there is no (consistent) significant effect of one year lagged CEO-to-worker pay ratio on the performance measures used in this study. Really small changes occur for this relation when control variables are added to regression models. Besides, no large transformations arise when different types of models are used. All type of regressions (OLS and multiple FE regressions) show insignificant effects for the one year lagged total CEO-to-worker pay ratio. Sometimes, there is a significant effect, but none of those is consistent. Besides this, most control variables are insignificant too. Only some of them have significant positive or negative effects, but these are then highly related to the dependent variable (e.g. return on assets and CAPEX/assets).

The analysis leads to the conclusion that Hypothesis 3 should be rejected. Within-firm pay inequality, which is measured by the one year lagged total CEO-to-worker pay ratio, does not seem to affect firm performance, which is measured by both Tobin's Q and return on assets. The results regarding Tobin's Q are in line with the findings of Yarram (2014). However, the non-existing relation between firm performance measures and the one year lagged total pay ratio in my study is surprising. Bebchuk et al. (2011) find a significant negative pay-performance relation and Faleye et al. (2012) conclude that there is a positive significant pay-performance relation in their study. That no significant result is found is thus not expected.

Table 6: Regressions of one year lagged (total) pay ratio on Tobin's Q

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (total)$_{t-1}$	0.000764	0.000752	6.38e-05	-4.48e-05	0.000687***	0.000706***	2.69e-05	-4.45e-05	0.000276***	0.000285***	9.66e-05	5.52e-05
	(0.000594)	(0.000632)	(0.000140)	(9.75e-05)	(0.000192)	(0.000200)	(0.000135)	(0.000135)	(6.77e-05)	(7.35e-05)	(9.25e-05)	(0.000129)
Tobin's Q$_{t-1}$									0.865***	0.862***	0.573***	0.513***
									(0.0323)	(0.0310)	(0.0496)	(0.0601)
Firm size (assets)					-0.413***	-0.433***	0.147	0.352	-0.130***	-0.132***	-0.0289	-0.252
					(0.0981)	(0.102)	(0.131)	(0.620)	(0.0213)	(0.0262)	(0.0567)	(0.302)
RoA					7.319***	7.180***	3.667*	1.715	0.576	0.656	0.776	-0.243
					(1.636)	(1.675)	(1.926)	(2.256)	(0.732)	(0.760)	(1.866)	(2.193)
CAPEX/assets					-1.915	-2.003	0.205	1.039	-0.511	-0.578	-0.302	0.349
					(1.928)	(1.991)	(1.197)	(1.188)	(0.428)	(0.450)	(1.039)	(1.182)
Leverage					-0.465	-0.463	1.032**	0.578	-0.147	-0.155	0.317	0.134
					(0.513)	(0.486)	(0.452)	(0.798)	(0.198)	(0.191)	(0.394)	(0.673)
R&D missing					-0.141	-0.155	0.172	2.724**	-0.150***	-0.157***	0.156	0.908
					(0.115)	(0.109)	(0.182)	(1.244)	(0.0381)	(0.0333)	(0.118)	(0.635)
R&D ratio					-14.82***	-16.08***	87.36***	89.55***	-7.174***	-7.697***	50.23***	39.96**
					(2.926)	(2.609)	(16.71)	(28.65)	(1.623)	(1.553)	(8.681)	(15.16)
CEO tenure									-0.00166	-0.00158	0.000358	0.000309
									(0.00222)	(0.00209)	(0.00241)	(0.00240)
Constant	1.547***	1.377***	1.394***	1.430***	5.581***	5.787***	-0.834	-4.824	1.764***	1.865***	0.691	2.199
	(0.104)	(0.105)	(0.0428)	(0.0411)	(1.092)	(1.073)	(1.296)	(6.749)	(0.269)	(0.310)	(0.585)	(3.255)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.033	0.074	0.792	0.840	0.526	0.564	0.822	0.847	0.830	0.841	0.867	0.877
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Table 7: Regressions of one year lagged (total) pay ratio on Return on Assets (RoA)

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. See ***Table 1***Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (total) $_{t-1}$	7.51e-05*	7.43e-05*	1.70e-05	2.04e-05	2.68e-05	2.44e-05	6.25e-06	2.39e-06	1.20e-05**	1.25e-05***	4.87e-06	3.45e-06
	(4.20e-05)	(4.30e-05)	(1.63e-05)	(2.10e-05)	(1.63e-05)	(1.53e-05)	(1.32e-05)	(1.77e-05)	(5.15e-06)	(4.33e-06)	(9.91e-06)	(1.45e-05)
RoA $_{t-1}$									0.657***	0.671***	0.370***	0.234**
									(0.0515)	(0.0464)	(0.0651)	(0.0911)
Firm size (assets)					0.00847	0.00931	-0.00110	-0.00464	0.00103	0.000909	-0.00304	-0.0116
					(0.0119)	(0.0124)	(0.0124)	(0.0246)	(0.00346)	(0.00347)	(0.00846)	(0.0231)
Tobin's Q					0.0485***	0.0498***	0.0272	0.0115	0.0165***	0.0160***	0.0189*	0.0103
					(0.00540)	(0.00554)	(0.0167)	(0.0157)	(0.00412)	(0.00384)	(0.0112)	(0.0128)
CAPEX/assets					0.330**	0.332**	0.566***	0.615***	0.105**	0.109**	0.350***	0.474***
					(0.128)	(0.132)	(0.124)	(0.173)	(0.0465)	(0.0494)	(0.110)	(0.156)
Leverage					0.00969	0.0137	-0.0551*	-0.0872**	0.000350	0.00114	-0.0419*	-0.0685**
					(0.0341)	(0.0340)	(0.0327)	(0.0349)	(0.0127)	(0.0122)	(0.0219)	(0.0281)
R&D missing					-0.00638	-0.00574	-0.0388***	-0.0810	-0.00934	-0.00926	-0.0503***	-0.129*
					(0.0158)	(0.0157)	(0.0116)	(0.0681)	(0.00752)	(0.00703)	(0.0136)	(0.0712)
R&D ratio					-0.203	-0.136	-4.939***	-4.042**	-0.496*	-0.476*	-6.227***	-5.680***
					(0.376)	(0.366)	(1.541)	(1.977)	(0.260)	(0.240)	(1.551)	(2.091)
CEO tenure									-0.000498*	-0.000544*	-0.000324	-0.000389
									(0.000288)	(0.000276)	(0.000321)	(0.000352)
Constant	0.0754***	0.0515***	0.0510***	0.0660***	-0.0982	-0.125	0.0618	0.167	-0.00210	-0.0176	0.0855	0.270
	(0.00749)	(0.00784)	(0.00606)	(0.00554)	(0.119)	(0.122)	(0.127)	(0.282)	(0.0323)	(0.0311)	(0.0863)	(0.264)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.055	0.078	0.710	0.782	0.459	0.480	0.773	0.823	0.726	0.751	0.812	0.836
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

6.4 Results of Hypothesis 4 to 6

The last three hypotheses of this thesis test the same relationship as Hypothesis 3, however these hypotheses focus on differences between regions or periods in the dataset. Hypothesis 4 focusses on the differences between countries and these results are described in Section 6.4.1. Hypothesis 5 takes a closer look at the differences between industries and this outcome is explained in Section 6.4.2. The last hypothesis analyzes the differences between years and these results are shown in Section 6.4.3.

6.4.1 Results of Hypothesis 4

This hypothesis studies the differences between countries. Again, the main relation to test is the effect of one year lagged total CEO-to-worker pay ratio on the accounting and market performance measures, but with dummies and interaction terms for each country. The hypothesis is stated in Section 3.3 and repeated below:

Hypothesis 4: The effect of within-firm wage inequality on firm performance differs between countries.

In this thesis an index represents a country. So, AEX stands for the Netherlands, DAX for Germany and DOW for the United States. The results of the regression models on Tobin's Q and return on assets can be found in Tables 8 and 9, respectively.

The regressions on Tobin's Q are shown in Table 8. The first four columns show the relation between the one year lagged total CEO-to-worker pay ratio and Tobin's Q, adjusted for each country. No control variables are added in these models. Column 1, 2 and 4 show negative insignificant coefficients for the pay ratio. This means that in the Netherlands, the effect of the one-year-lag total pay ratio on Tobin's Q is negative, but insignificant. Column 3 reports a positive significant effect at the ten percent significance level. In this model, the one-year-lag total pay ratio in the Netherlands affects Tobin's Q. When the pay ratio goes up by one, Tobin's Q increases with 0.00169.

The interaction terms of Germany and the United States and the one-year-lag total pay ratios are significant at the ten percent significance level in Column 3. Both terms are negative, and therefore, the effect of one-year-lag total pay ratio in Germany and the United States is lower compared to the Netherlands. The effect is -0.00074 for firms listed on the DAX, and the effect of pay ratio on Tobin's Q is -0.00003 for firms listed on the DOW indices.

The models in Column 5 to 8 contain control variables. However, with these controls, the results regarding the differences between countries become less significant. Only one-year-lag Tobin's Q and R&D ratio are significant controls in all models. Besides, only the interaction term between Germany and the total pay ratio in the year and industry fixed effects regression shows a significant negative coefficient.

Table 8: Regressions on Tobin's Q, country differences

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Dummy variables on the country level and interaction terms between countries and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	-0.000719	-0.00124	0.00169*	-6.48e-05	0.000272	0.000147	0.000727	-5.27e-05
	(0.00150)	(0.00153)	(0.000891)	(0.000678)	(0.000340)	(0.000346)	(0.000483)	(0.000620)
I = DAX (GER)	0.0419	0.0266	0.0339	-0.859***	0.0722	0.0677	0.0174	0.0571
	(0.287)	(0.292)	(0.202)	(0.167)	(0.0514)	(0.0543)	(0.105)	(0.716)
I = DOW (U.S.)	0.0904	0.0549	0.646**	1.093***	0.0736	0.0622	0.249*	0.976***
	(0.274)	(0.276)	(0.277)	(0.0180)	(0.0513)	(0.0534)	(0.145)	(0.309)
DAX * Pay ratio (total)$_{t-1}$	-0.00208	-0.00178	-0.00243**	0.000662	-0.000560	-0.000481	-0.00118**	0.000226
	(0.00204)	(0.00210)	(0.00103)	(0.000895)	(0.000408)	(0.000431)	(0.000472)	(0.000623)
DOW * Pay ratio (total) $_{t-1}$	0.00140	0.00193	-0.00172*	-5.09e-06	-1.08e-05	0.000128	-0.000672	0.000108
	(0.00162)	(0.00168)	(0.000903)	(0.000698)	(0.000321)	(0.000326)	(0.000481)	(0.000639)
Tobin's Q $_{t-1}$					0.858***	0.852***	0.548***	0.513***
					(0.0343)	(0.0334)	(0.0498)	(0.0614)
Firm size (assets)					-0.140***	-0.141***	0.00161	-0.253
					(0.0263)	(0.0312)	(0.0854)	(0.304)
RoA					0.505	0.614	0.344	-0.250
					(0.744)	(0.778)	(2.033)	(2.214)
CAPEX/assets					-0.779*	-0.850*	-0.0942	0.345
					(0.437)	(0.467)	(1.181)	(1.191)
Leverage					-0.147	-0.155	0.0963	0.132
					(0.198)	(0.190)	(0.509)	(0.676)
R&D missing					-0.146***	-0.154***	0.120	0.870
					(0.0502)	(0.0464)	(0.138)	(0.610)
R&D ratio					-6.115**	-6.715***	58.10***	38.65**
					(2.569)	(2.460)	(11.67)	(16.79)
CEO tenure					-0.00214	-0.00195	-0.000130	0.000293
					(0.00239)	(0.00231)	(0.00228)	(0.00255)
Constant	1.654***	1.507***	1.167***	1.431***	1.869***	1.965***	0.443	2.257
	(0.174)	(0.176)	(0.124)	(0.0369)	(0.299)	(0.339)	(0.726)	(3.173)
Observations	522	522	522	522	522	522	522	522
R-squared	0.096	0.142	0.815	0.840	0.831	0.843	0.870	0.877
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

The regressions on return on assets are reported in Table 9. The first half of the table shows a model without control variables, calculated as OLS regressions or fixed effects regressions. The second half shows a model including control variables (Columns 5 to 8). In Column 1 to 4, all interaction terms are insignificant. Only the interaction term between Germany and the total pay ratio is significantly negative at the ten percent significance level. However, this effect cannot be interpreted, because the coefficient of the one year lagged total pay ratio is insignificant in these models.

In the second part of the table, OLS regression and year fixed effects regressions show significant coefficients for the one year lagged total pay ratio and the interaction term of the United States and the pay ratio. The interaction term between Germany and the total pay ratio is significant at the ten percent significance level in Columns 5 and 6. Thus, in the Netherlands, the effect of an increase of the one-year-lag total CEO-to-worker pay ratio with one increases return on assets with 0.000104 in the OLS regression (Column 5). For Germany, the same increase has an effect on return on assets of 0.000003. In the United States, the coefficient is equal to 0.0000065. In Column 6, the effects for the Netherlands, Germany and the United States are 0.000112, 0.0000145 and 0.000007 respectively. Thus, from these models it follows that the effect of the pay ratio on return on assets is the largest in the Netherlands.

However, in the models with year and firm and year and industry fixed effects, the effects of pay ratio and interaction terms are insignificant at all significance levels. In these models, many control variables show varying results from positive to negative and insignificant to significant. So, from this dataset, it cannot be concluded that the effect of within-firm wage inequality, measured by the one-year-lagged (total) CEO-to-worker pay ratio, on firm performance, measured by Tobin's Q and return on assets, differs between countries. There are too few significant results found in the regression models. Thus, Hypothesis 4 is rejected.

This is not in line with expectation, because Bebchuk et al. (2011) and Yarram (2014) find contradicting results for their studies in the United States and Australia, respectively. Thus, their results differ between countries. I conclude that there are no (significant) differences between countries and this finding is surprising.

Table 9: Regressions on Return on Assets (RoA), country differences

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. Dummy variables on the country level and interaction terms between countries and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	0.000268	0.000259	7.42e-05	-4.43e-05	0.000104**	0.000112**	-1.54e-05	-6.10e-05
	(0.000175)	(0.000181)	(8.19e-05)	(7.27e-05)	(4.73e-05)	(4.72e-05)	(6.73e-05)	(7.59e-05)
I = DAX (GER)	0.0282	0.0282	0.00689	-0.0764***	0.00936*	0.00894*	-0.00242	-0.0156
	(0.0237)	(0.0241)	(0.0195)	(0.0209)	(0.00554)	(0.00530)	(0.0127)	(0.0626)
I = DOW (U.S.)	0.0437*	0.0432*	0.0686***	0.0773***	0.0172***	0.0174***	0.0389**	0.0672***
	(0.0236)	(0.0239)	(0.0252)	(0.00263)	(0.00549)	(0.00523)	(0.0171)	(0.0214)
DAX * Pay ratio (total)$_{t-1}$	-0.000388*	-0.000385*	-0.000117	0.000144	-0.000101*	-9.74e-05*	-1.67e-05	8.97e-05
	(0.000198)	(0.000203)	(9.47e-05)	(0.000112)	(5.49e-05)	(5.49e-05)	(6.89e-05)	(8.76e-05)
DOW * Pay ratio (total)$_{t-1}$	-0.000220	-0.000212	-6.25e-05	6.40e-05	-9.75e-05**	-0.000105**	1.69e-05	6.58e-05
	(0.000182)	(0.000188)	(8.41e-05)	(7.86e-05)	(4.80e-05)	(4.75e-05)	(6.75e-05)	(7.77e-05)
RoA$_{t-1}$					0.641***	0.654***	0.311***	0.232**
					(0.0483)	(0.0436)	(0.0794)	(0.0921)
Firm size (assets)					-0.00215	-0.00242	0.00249	-0.0117
					(0.00334)	(0.00330)	(0.00929)	(0.0229)
Tobin's Q					0.0155***	0.0152***	0.0148	0.0103
					(0.00403)	(0.00378)	(0.0119)	(0.0130)
CAPEX/assets					0.0660	0.0714	0.391***	0.474***
					(0.0432)	(0.0456)	(0.115)	(0.156)
Leverage					0.000356	0.00156	-0.0702***	-0.0689**
					(0.0121)	(0.0113)	(0.0193)	(0.0280)
R&D missing					-0.00950	-0.00925	-0.0497***	-0.152*
					(0.00744)	(0.00703)	(0.0171)	(0.0790)
R&D ratio					-0.398	-0.376	-5.917***	-6.480**
					(0.265)	(0.246)	(1.876)	(2.466)
CEO tenure					-0.000642*	-0.000691**	-0.000352	-0.000373
					(0.000329)	(0.000320)	(0.000329)	(0.000353)
Constant	0.0550***	0.0314*	0.0429***	0.0674***	0.0264	0.0113	0.0478	0.294
	(0.0190)	(0.0176)	(0.0127)	(0.00542)	(0.0309)	(0.0299)	(0.0860)	(0.263)
Observations	522	522	522	522	522	522	522	522
R-squared	0.129	0.153	0.742	0.783	0.732	0.757	0.823	0.837
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

6.4.2 Results of Hypothesis 5

Where Hypothesis 4 studies the differences between countries, Hypothesis 5 takes a look at the differences between industries. It is stated in Section 3.3 and copied here as reminder:

Hypothesis 5: The effect of within-firm pay inequality on firm performance differs between industries.

The hypothesis is tested with similar regressions as Hypothesis 4, however now interaction terms between industries and the one-year-lag total CEO-to-worker pay ratio are used. Because of the large size of the tables with regressions on Tobin's Q and return on assets, those are added in Appendix A.1 as Tables A.1 and A.2. The regressions in the first four columns of both tables report OLS and fixed effects regression models without control variables. It follows that in the OLS regression on Tobin's Q, 19 of the 41 industries show significant results (Column 1 of Table A.1). They vary from positive to negative. The fixed effects regressions show significant results for more than half of the industries. These results can be found in Columns 2 to 4 of Table A.1. The regressions with control variables are reported in Columns 5 to 8 of the same table. The OLS regression shows 26 industries with significant effects (Column 5 of Table A.1) and for the fixed effects regressions respectively 16, 14 and 13 industries have significant coefficients at least at the five percent level. At the ten percent significance level even more industries show significant coefficients. Six of the industries show significant results in all regressions on Tobin's Q. Besides the main variables, only one-year-lag Tobin's Q shows significant results in the regressions in which it is included. The other controls are not consistently significant.

The industries with SIC codes 2836, 3674, 4220 and 7363 show significant negative effects of the one-year-lag total pay ratio on Tobin's Q. These are several different industries. For example, the industry with SIC code 2836 is an industry that produces biological products and the SIC code 7363 represents a services-help supply services industry. Thus, it is surprising that in such varying industries the pay-performance relation is negative for both. The industries with SIC codes of 3714 and 6099 report a positive pay-performance relation. SIC code 3714 is a motor vehicle parts and accessories industry and 6099 is an industry in which functions are related to depository banking.

The same type of regressions are run on return on assets as well. The table with these results is added as Table A.2 to Appendix A.1. Once more, the same models are calculated with four type of regressions: OLS, year fixed effects, year and country fixed effects and year and firm fixed effects. Similar to the regressions on Tobin's Q, the interaction terms show many significant results. Four of the 41 industries show significant results in all models (Column 1 to 8). Thus, these industries differ significantly from each other. The coefficients of the multiple industries and pay ratio interaction terms vary from significantly positive to significantly negative.

The regressions on return on assets report significant results for four different industries. Three of those show positive effects, namely with SIC codes 2810, 4512 and 9997. These SIC

codes represent inorganic chemicals, air transportation (scheduled) and non-classifiable industries, respectively. The scheduled air transportation industry is large, because it contains many firms in this sample. The one industry that has negative effects is the services pre-packaged software industry with SIC code 7372.

Thus, for this hypothesis there are some consistent significant results found. Not all industries show significant effects in all models, however because some of them are significant in all models, Hypothesis 5 cannot be rejected. Different industries show positive effects. For example, industry with SIC code 6099, with functions related to depository banking, shows a positive pay-performance relation with performance measure Tobin's Q. The scheduled air transportation industry (SIC=4512) also shows a positive effect. Besides, the industry that makes industrial inorganic chemicals (SIC=2810) shows a positive pay-performance relation when performance is measured by return on assets. It may be that those industries are growing, and that therefore in such different industries the pay-performance relation is the same, namely positive.

Some industries that show a negative pay-performance relation are industries with biological products (SIC=2836), public warehousing and storage (SIC=4220) and with services pre-packaged software (SIC=7372). These industries are different, but all have a similar pay-performance relation, namely negative. It may be that these industries are declining or becoming less profitable and that therefore the effect of the one year lagged total CEO-to-worker pay ratio on firm performance measures is negative. The conclusion should be that there are indeed differences between industries. This outcome is in contrast to the result of Grund and Westergaard-Nielsen (2008), who do not find differences between industries.

6.4.3 Results of Hypothesis 6

The last hypothesis that will be tested, studies the differences between years. The hypothesis is justified in Section 3.3 and added here as reminder:

Hypothesis 6: The effect of within-firm pay inequality on firm performance differs between years.

Once more, the methodology with interaction terms is used to test Hypothesis 6. The interaction terms now contain yearly dummies and the one-year-lagged total CEO-to-worker pay ratio. Because of the size of the tables with results, they are added in Appendix A.2. The regressions are run on Tobin's Q and return on assets. Two types of models (with and without

controls) are run and they are calculated as OLS regressions, industry fixed effects, firm fixed effects and industry and country fixed effects.

The table with results on Tobin's Q is added in Appendix A.2 as Table A.3. The results on Tobin's Q show few significant results. In the models without control variables, none of the interaction terms between years and the one-year-lagged total pay ratio is significant at the five percent significance level. If control variables are added, the OLS regression shows some significant results for the years 2010, 2011, 2013, 2014 and 2017. The coefficients of these years are all positive. The coefficient of 2010 is 0.000496. This is the smallest significant coefficient. 2017 contains the largest significant coefficient, namely 0.000903. This means that the difference between 2009 and 2010 is smaller than between 2009 and 2017.

Besides the regressions on Tobin's Q, the same regressions are run on return on assets. Table A.4 in Appendix A.2 reports the results. However, none of the coefficients of the one-year-lagged total pay ratio show significant results at the five percent significance level.

The found results on Tobin's Q and return on assets show almost no significant results. The regressions on the market performance measure Tobin's Q do show some significant results, however not one year shows consistent significant coefficients in all regression models. Therefore, the conclusion for Hypothesis 6 should be that there are no significant differences between the years 2009 to 2017. The hypothesis is thus rejected. This is not in line with expectation. It was expected that, because the recent financial crisis is included in the research period, the pay-performance relation would differ between years and especially in the period of the crisis. Besides, several studies during different research periods find varying results for the pay-performance relation. However, no significant results are found in this study to conclude that the pay-performance relation differs between years.

6.5 Robustness checks

As a check for the main results found, regression models in this thesis are calculated once again with different variables. It cannot be taken for granted that the found main results are right. By testing the models again, with other dependent and/or independent variables, it can be concluded whether those results are robust to several checks.

6.5.1 Hypothesis 1

For Hypothesis 1, there are two variables used as robustness checks. Instead of the total CEO-to-worker pay ratio, the salary CEO-to-worker pay ratio is used and firm size (total assets) is

replaced by firm size (sales). The last variable is firm size measured by the logarithm of total net sales, like Faleye et al. (2012) do.

Tables B.1 and B.2 with these regressions can be found in Appendix B.1. The first robustness check takes a look at the other independent variable. When the total pay ratio is regressed with firm size (sales), the same results are found: positive and significant coefficients in all regressions except for the regressions with year and firm fixed effects. The coefficients are smaller compared to the coefficients in the main results. Some of the control variables become significant, however most of them are still insignificant. The regressions with year and firm fixed effects show again negative insignificant results, these coefficients are larger compared to the main regressions.

Besides a robustness check for the independent variable, another dependent variable is calculated. Instead of the total CEO-to-worker pay ratio, the salary CEO-to-worker pay ratio is used. These results are reported in Tables B.3 to B.6 in Appendix B.1. When regressions on the salary pay ratio are calculated with firm size (total assets), almost all coefficients are significant and positive. The year and firm fixed effects regression model without control variables has a coefficient that is only significant at the ten percent level. The coefficients vary from 6.522 to 8.967 (Table B.3).

When control variables are added in this model, the effect of firm size on the salary CEO-to-worker pay ratio becomes positive and significant in all models (Table B.4). the coefficients vary from 6.312 to 8.967. Still, most control variables are insignificant. Only the research and development variables (R&D ratio and R&D missing) are significant in some regressions, however these vary from significantly positive to negative.

If the regressions on the salary pay ratio are calculated with a firm size measure based on total net sales, then the results in the year and firm fixed effects regressions become once again insignificant (Tables B.5 and B.6). The coefficients in these models are positive, but insignificant at all significance levels. In other regressions, the coefficient of firm size (sales) is positive and significant. The coefficients vary from 5.893 to 10.27 in the models without and with controls.

Thus, when the main results of Hypothesis 1 are checked, it follows that all OLS, year fixed effects and year and industry fixed effects regressions show positive and significant results. However, the year and firm fixed effects regressions show varying results: from insignificant negative to insignificant positive and even significant positive. Thus, the conclusion about this hypothesis does not change because of the robustness checks. All tables for these regressions can be found in Appendix B.1.

6.5.2 Hypothesis 2

The second hypothesis tests the effect of four CEO characteristics on the pay ratio. The main results report the regression models on the total CEO-to-worker pay ratio. As robustness check to these results, the models are again calculated with another dependent variable, namely the salary CEO-to-worker pay ratio. Table B.7 with these regressions can be found in Appendix B.2. The main results do not show many significant effects and the robustness check regressions have even less results that are significant.

Gender is in most regressions significant and positive, however in the year and firm fixed effects regression, the coefficient is -0.181 and insignificant (Column 7). Thus, the positive significant results are not consistent in all models. The other characteristics, CEO age, tenure and change have insignificant results in all models, except for CEO change, which has a significant negative coefficient in Column 8 of Table B.7. This means that, with year and industry fixed effects, a replacement of a CEO by a new CEO decreases the salary CEO-to-worker pay ratio with 1.629. Hence, the results from the robustness check confirm the conclusion regarding Hypothesis 2: CEO characteristics do not seem to affect the CEO-to-worker pay ratios significantly.

6.5.3 Hypothesis 3

Hypothesis 3 tests the effect of within-firm pay inequality on firm performance. In the main results, this relation is studied with the one-year-lag total CEO-to-worker pay ratio, Tobin's Q and return on assets. As robustness check to these results, the same type of regression models are calculated with different dependent and independent variables. For the dependent variable, I add stock returns, a market performance measure, as robustness. I also run the models with another independent variable, namely the one-year-lag salary CEO-to-worker pay ratio instead of the one-year-lag total CEO-to-worker pay ratio. The tables containing the results of these regressions are shown in Appendix B.3.

First, I take a look at the regressions with Tobin's Q and return on assets as dependent variables, like the main results (Tables B.8 and B.9). However, I change the independent variable from total pay ratio to salary pay ratio. The results of the robustness check are similar to the main results. Most coefficients of the salary pay ratio are a fraction larger compared to the total pay ratio. For the regressions on Tobin's Q, the main results had four models with significant positive results. The robustness check with one-year-lag salary pay ratio shows only one significant result: namely in the OLS regression with all possible control variables (Column 9). The salary pay ratio has a significant positive effect of 0.00179 on Tobin's Q in

this model. For Tobin's Q, the coefficients of the one-year-lag salary pay ratio vary again from negative to positive: from -0.00720 to 0.00506. The control variables show the same effects compared to the main results with the total pay ratio: only one-year-lag Tobin's Q and R&D ratio are significant in all models. All other controls show both significant and insignificant effects. Thus, the conclusion regarding these models does not change when another independent variable is used compared to the total CEO-to-worker pay ratio, on which the main results are based.

Besides a robustness check for the independent variable, I test whether another dependent variable shows the same results. As robustness check, I run the same type of regressions with both the one-year-lag total and salary CEO-to-worker pay ratio on stock returns. These results can be found in Tables B.10 and B.11 in Appendix B.3. The regressions on stock returns show even less significant results. With the one-year-lag total pay ratio, only two significant results are found in the twelve regression models for this variable. In the OLS and year fixed effects regressions with six control regressions, the effect of the one year lagged total pay ratio positively affects stock returns. In Column 5, stock returns go up by 0.000134 if the one-year-lag total pay ratio goes up by one. In Column 6, the positive significant impact is 0.000150. When the salary pay ratio is used as dependent variable, there are no significant results found for the salary pay ratio on stock returns.

Based on the robustness checks, the conclusion for Hypothesis 3 does not change. The results vary enormously and only some of them are significant. No consistent relation is found between the two pay ratios, one-year-lag total and salary CEO-to-worker pay ratio, and the three performance measures, Tobin's Q, return on assets and stock returns.

6.5.4 Hypotheses 4 to 6

For the last three hypotheses of this thesis, robustness checks are done with similar methodologies. For all hypotheses, the main results are based on regressions with the one-year-lag total CEO-to-worker pay ratio on Tobin's Q or return on assets. As robustness check to the independent variable, the one-year-lag salary CEO-to-worker pay ratio is used and for the dependent variable stock returns is used.

The results for Hypothesis 4 can be found in Appendix B.4. For the regressions on Tobin's Q with the one-year-lag salary pay ratio, the coefficients of the pay ratio are only significant in Columns 3 and 7: in the models with year and industry fixed effects. The effects in the Netherlands are 0.0196 and 0.0101, respectively if the one-year-lag salary pay ratio goes up by one. In both models, the interaction terms between Germany and the pay ratio and

the United States and the pay ratio are significant. This means that the effects between countries can be compared. In Germany and the United States, the effect of the salary pay ratio on Tobin's Q is negative. In the model without controls, the effects are -0.0039 and -0.0056. This means that in those countries the firm performance decreases when the one-year-lagged salary pay ratio increases. In the model with control variables, the effects are -0.0023 for Germany and -0.0036 for the United States. However, in all other models, the effects for the Netherlands and Germany are insignificant. For the United States, the interaction term between DOW and the salary pay ratio is significant in some models, but not consistent in all regressions.

The regressions of the one year lagged salary CEO-to-worker pay ratio on return on assets show many insignificant results. Only Column 3 of Table B.13 shows significant results for all three countries at the ten percent significance level. In the Netherlands, the effect of an increase of one in the one-year-lag salary pay ratio leads to an increase of return on assets of 0.00145. For Germany the effect is negative, namely -0.00023. For the United States, the effect is also negative: -0.00039. Thus for these regressions, only the Netherlands show a positive effect of the one-year-lag salary pay ratio on return on assets and Germany and the United States have negative effects.

Besides a robustness check for the independent variable, the dependent variable is also replaced by another one to test if the same results hold. Stock returns is the dependent variable for the regressions in Tables B.14 and B.15. These results only show significant effects for the Netherlands and the United States in Columns 1 and 3 of the regressions with the one-year-lag total pay ratio (Table B.14). In the OLS regression without controls, the Netherlands show a negative effect of the total pay ratio of -0.00101 on stock returns. The United States have a smaller negative effect, namely -0.000038. In Column 3 the effect of the Netherlands is again negative, however for the United States the result is positive, namely an effect of 0.000114. All other effects of the salary pay ratio of each country are not significant at the five percent significance level. If the one-year-lag salary pay ratio is used in combination with stock returns, no significant results are found (at the five percent significance level) for the relation between pay ratio and stock returns of each country. So, the conclusion of Hypothesis 4 remains the same: Too many insignificant results occur and therefore the hypothesis is rejected. The pay-performance relation does not differ between countries.

The fifth hypothesis studies the differences between industries and this hypothesis is not rejected. With the main results, significant effects are found for some industries. The

methodology for this robustness check is similar to the one of Hypothesis 4. Tobin's Q and return on assets are used as dependent variables with the one-year-lag salary pay ratio and regressions on stock returns are calculated with the one year lagged total and salary pay ratios. Because of the (large) size of the tables, these are not added in this thesis, but the tables can be obtained on request. From the robustness checks it follows that in these regression models, some industries show significant effects in all regression models as well. The regressions on Tobin's Q and return on assets with the one-year-lag salary pay ratio and interaction terms show consistent significant results for respectively two and four industries. The regressions on stock returns with the one-year-lag total pay ratio and salary pay ratio report consistent significant coefficients for twelve and three industries, respectively. Therefore, the conclusion regarding Hypothesis 5 does not change based on the results from these robustness checks: the results only strengthen the outcome of the main results part.

Once again robustness checks are done for Hypothesis 6. The methodology of the robustness checks is similar to those of Hypothesis 4 and 5. The main results of this hypothesis show almost no significant effects. The robustness checks are in line with these findings. The regressions of the one-year-lag salary pay ratio and interaction terms between years and this ratio on Tobin's Q and return on assets show few significant results.

For the regressions on Tobin's Q (Table B.16), only the models with controls show significant results in all type of regressions for the interaction term between 2016 and the one-year lagged salary CEO-to-worker pay ratio. The coefficients are positive in these models, which means that relative to 2009, the effect of the one-year-lagged salary pay ratio on Tobin's Q is larger in 2016 compared to 2009. The coefficient varies from 0.00833 to 0.0119. Other years do not show consistent significant results in both types of models (without and with control variables).

The regressions on return on assets (Table B.17) do not show significant results for almost all years, only in the industry fixed effects regression model without controls (Column 2), the coefficients of 2013 and 2015 are significant at least at the five percent significance level and those coefficients are negative. The negative coefficients imply that the relation between the one year lagged salary pay ratio and Tobin's Q is smaller in 2013 and 2015 compared to 2009.

The last robustness checks are regressions on stock returns with the one-year-lag total CEO-to-worker pay ratio or the salary pay ratio. These results are reported in Tables B.18 and B.19 in Appendix B.5. The regressions with the total pay ratio (Table B.18) show consistent significant results for the interaction terms between 2010 and the pay ratio and 2011 and the

pay ratio. However, some results are only significant at the ten percent significance level. Hence, it cannot be concluded that these effects are consistent, because conclusions are based on the five percent significance level. All coefficients show positive signs, so the relation between the one year lagged total pay ratio and stock returns is higher in 2010 and 2011 compared to 2009.

The last table (Table B.19) with results on stock returns has interaction terms between the one-year-lagged salary pay ratio and yearly dummies. All years, except 2016 show insignificant results. Only 2016 shows significant results for the OLS, industry and industry and country fixed effects models without controls and the OLS regression with controls (Columns 1, 2, 4 and 5). The coefficients all have positive signs and thus the relation between the one-year-lag salary pay ratio and stock returns is higher in 2016 compared to 2009 in these models. In the other models, no significant differences between years are found. Therefore, the conclusion regarding Hypothesis 6 remains the same: no significant differences between years regarding the effect of within-firm pay inequality on firm performance.

7 Conclusion

In the previous chapter, all results regarding Hypothesis 1 to 6 are discussed. This chapter summarizes the results, answers the research question and draws a conclusion for this thesis. Besides this, limitations of the study and ideas for further research are described. A summary and answer to the research question are illustrated in Section 7.1. The limitations and recommendations for further research are described in Section 7.2.

7.1 Answer to research question

Previous literature shows varying outcomes regarding the pay-performance relation. Bebchuk et al. (2011) find significant negative results of CPS on firm value and performance. Faleye et al. (2012) conclude that when the relative pay (of CEO payment to average employee compensation) increases, firm value and firm performance increase too. Yarram (2014) finds no relation between CPS and Tobin's Q and a positive relation between CPS and return on assets and between CPS and stock returns. Because there are so many contradicting results in the existing literature, I expand the existing literature by studying the pay-performance relation in another research area during another time period, namely: The Netherlands, Germany and the United States during 2008 to 2017.

I use correlations, OLS regressions and multiple fixed effects regressions without and with control variables in this research. These are used to study the factors that influence the

CEO-to-worker pay ratio and to study the potential relation between within-firm inequality, measured by the one-year-lag CEO-to-worker pay ratio, and firm performance, measured by Tobin's Q and return on assets. For the part that examines the differences between countries, industries and years, I add interaction terms to the regression models. Countries are equal to indices: AEX represent the Netherlands, DAX Germany and DOW the United States. Industries are grouped based on the four-digit standard industrial classification (SIC) code.

It follows that firm size, measured by the logarithm of total assets, does not significantly influence the total CEO-to-worker pay ratio. Besides, CEO characteristics do not influence this ratio. Some have significant results in one of the regression models, but no consistent effect is found. Regarding the pay-performance relation: no consistent significant effects are found for Tobin's Q and return on assets. Therefore, within-firm pay inequality does not seem to affect firm performance.

When I look at differences between countries, industries and years, only the differences between industries are significant. Some industries are significant in all models and thus the pay-performance relation differs between these industries. It varies what type of industries have significant positive or negative impact on the pay-performance relation. The largest industry in number of firms of this study is the scheduled air transportation industry (SIC=4512). This industry shows a significant positive effect of one-year-lag total pay ratio on firm performance measured by return on assets. A positive relation may be found in industries that are growing and a negative relation in industries that are declining or becoming less profitable. Differences between countries and years are not found to be significant.

The robustness checks to the main results of this thesis show the same results. Based on the found outcomes regarding Hypotheses 1 to 6, the research question can be answered. It is stated in Section 1.1 and described as follows:

Does within-firm pay inequality affect firm performance?

This study shows no significant results of the one-year-lagged CEO-to-worker pay ratios on the performance measures. The total pay ratio in the main results and salary pay ratio in the robustness checks have similar results regarding significance of the pay-performance relation. Both market and accounting performance measures are not significantly affected by the within-firm pay inequality. This is reported in the regressions on Tobin's Q, return on assets and stock returns. Therefore, the answer to the research question is no: within-firm pay inequality does not affect firm performance significantly in this study. The only significant

result that is found is that the effects of the CEO-to-worker pay ratios on firm performance measures differ between industries.

The results on Tobin's Q are in line with the outcome of Yarram (2014). He did not find a significant effect of CPS on firm value (measured by Tobin's Q). In the existing literature, the results regarding the pay-performance relationship differ enormously. Bebchuk et al. (2011) find a negative pay-performance relation and Faleye et al. (2012) find a positive relation. These three papers are just a small fraction of all studies done relating the pay-performance relation. However, the varying outcomes imply that there is not yet a general conclusion regarding this relation. The debate regarding this phenomenon is still going on. Thus, my thesis confirms the findings of Yarram (2014) regarding the effect on Tobin's Q. Compared to other literature, my results are surprising. Hence, it is an extra study that can be added to the ongoing discussion regarding CEO payments, pay inequality within firms and firm performance. I use other within-firm pay inequality measures as used in the above mentioned studies, and thus even with another 'pay' measure, no definitive answer can be given whether the effect of within-firm pay inequality is significantly positive, negative or not existent regarding firm performance.

7.2 Limitations and recommendations

This thesis has several limitations. Unless that this dataset is not small, most studies in the existing literature have even larger datasets. My dataset contains 580 datapoints. For example, the studies of Bebchuk et al. (2011), Faleye et al. (2012) and Yarram (2014) contain 8,683, 2,153 and 3,121 observations, respectively. However, because I had to collect the CEO compensation data for the European countries manually, I could not expand the dataset any further because of time limits.

An idea for further research can be an expansion of this study with not just one or two indices per country, but gather data of firms listed on more indices in the Netherlands, Germany and the United States. The same methodology can be applied to more countries as well. Then the differences between countries can be further elaborated. An interesting country should be the United Kingdom (U.K.), because of the 'Brexit'. From the introduction it follows that in the U.K. CEOs receive the highest total compensation relative to European countries in 2012 (Vlerick Business School, 2013). It is expected that they will leave the European Union in 2019. This has a large impact on the economies of this country and European countries. This makes it interesting to take a closer look at the development of the

pay-performance relation in these countries. To see if firms in the U.K. try to keep their CEOs by paying them more compared to CEOs in other, for example European, countries.

A second limitation is that I manually collect CEO compensation data for the Netherlands and Germany. I collect them from annual reports, but every firm publishes those number in their own way. There are regulations which data needs to be published, but some firms do report it more precise than others. Because of this, there can be potential errors in the CEO compensation data. For example in the comparison with collected data from ExecuComp for firms in the United States, errors in the data can occur. An idea for further research is that those variables are collected more precisely: compare every annual report of all firms, also those of firms in the United States to make sure that especially the total CEO-to-worker pay ratio contains the right amount of total CEO compensation.

Another recommendation for further research regarding the pay ratio is that a better analysis should be done on the factors that influence the within-firm pay inequality. Where Zhou (2000) and Merhebi et al. (2006) find a positive relation between firm size and CEO compensation, I do not find significant effects of firm size on the pay ratios. The CEO characteristics do not influence the pay ratios as well. Research can be done to other factors that influence the CEO payment, for example profits of firms: most bonusses of CEOs are related to profits. Besides financial measures, behavioral factors may influence the CEO-to-worker pay ratio as well. This follows from the studies described in Section 2.6. Wade et al. (2006) show that CEOs use their own power to influence their payments and those of others. This 'power' cannot be measured with a (financial) number. Therefore, an idea for further research is to take a closer look at the behavioral factors that potentially influence the CEO-to-worker pay ratio.

Another limitation of this study is the fact that I cannot completely exclude the endogeneity problem. The total and salary CEO-to-worker pay ratio are endogenously determined variables: it could be determined by factors that are related to firm performance as well. Bebchuk et al. (2011) industry-adjust their pay inequality measure. I do not industry-adjust the pay ratios, because not all data to do this was available for this study. In the future, this study can be done again, but then with industry-adjustment of the pay ratios. This can be done by deducting the median pay ratio of an industry (if this data can be obtained) from the pay ratio of a firm that operates in that industry in a specific year.

I add some control variables in my regression models and use OLS and fixed effects regressions. Nevertheless, this analysis can be even more expanded with more regression models and more control variables. For example, Bebchuk et al. (2011) add industry-adjusted

measures and company age to their regressions. Those variables are significant in their results. Faleye et al. (2012) add physical capital intensity and industry homogeneity to their regressions and those variables show significant results. A further analysis of which control variables are necessary to test the pay-performance relation without biases can lead to more significant results. Therefore, a recommendation for further research is to better analyse which controls are necessary and why.

The last recommendation for further research is based on the paper of Bebchuk et al. (2011). The authors take a look at the optimal CPS level versus the CPS level with agency problems. The optimal level depends on CEO candidates, quality and outside opportunities. Besides, it depends on whether a firm wants to have a dominant player model or a management model. The agency problem can be caused by the CEO, who uses his or her own power and influence to increase CEO compensation leading to a higher pay ratio than optimal for the company. I do not take into account an optimal ratio versus the actual CEO-to-worker pay ratio. Therefore, future research can take a look at this ratio and relation to firm performance from a behavioral point of view trying to find which agency problems cause a deviation of the actual ratio from the optimal ratio.

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Appendix A Main results Hypothesis 5 and 6

A.1 Main results of Hypothesis 5

Table A.1: Regressions on Tobin's Q with pay ratio (total), industry differences

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and country FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. This also holds for the dummy variables for each industry. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Dummy variables on the industry level and interaction terms between industries and the one-year-lagged total CEO-to-worker pay ratio are included. The dummy variables for industries are excluded from the table, because otherwise the size of the table would be too large. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	0.00187***	5.72e-06	-2.52e-05	-0.000139	0.000979***	0.000397	0.000255	0.000158
	(5.06e-10)	(0.000452)	(0.000449)	(0.000466)	(0.000289)	(0.000504)	(0.000582)	(0.000728)
2721* Pay ratio (total)$_{t-1}$	0.00226	0.00255***	0.00257***	0.00255***	0.00107***	0.000675	0.000988	0.00113
		(0.000246)	(0.000248)	(0.000250)	(0.000329)	(0.000646)	(0.000803)	(0.00101)
2800* Pay ratio (total)$_{t-1}$	0.00335	0.00398	0.00797	-0.00826***	-0.000122	0.00129	0.00244	-0.00632**
	(0.00355)	(0.00378)	(0.00661)	(0.00254)	(0.00254)	(0.00305)	(0.00492)	(0.00242)
2810* Pay ratio (total)$_{t-1}$	-0.00355	0.00162	0.00170	0.00205	-0.00207***	-0.000409	0.000125	0.000699
		(0.00131)	(0.00131)	(0.00136)	(0.000486)	(0.00120)	(0.00148)	(0.00169)
2834* Pay ratio (total)$_{t-1}$	0.00261	0.00119	0.00109	0.000850	0.000476	0.00179	0.00181	0.00243
		(0.00105)	(0.00104)	(0.00109)	(0.000976)	(0.00140)	(0.00145)	(0.00185)
2836* Pay ratio (total)$_{t-1}$	-0.294***	-0.287***	-0.287***	-0.285***	-0.138***	-0.154***	-0.163***	-0.192***
	(5.95e-10)	(0.00558)	(0.00554)	(0.00564)	(0.0138)	(0.0184)	(0.0225)	(0.0215)
2840* Pay ratio (total)$_{t-1}$	0.00298***	0.00377***	0.00258*	-0.000241	0.00101*	0.00146	0.00129	-0.000300
	(0.000717)	(0.000842)	(0.00142)	(0.000382)	(0.000602)	(0.000880)	(0.000968)	(0.000469)
2844* Pay ratio (total)$_{t-1}$	0.00707	0.00379***	0.00374***	0.00353***	0.00152***	0.000519	0.000645	0.000872
		(0.000758)	(0.000753)	(0.000780)	(0.000442)	(0.000602)	(0.000640)	(0.000864)
2851* Pay ratio (total)$_{t-1}$	-0.00508	-0.00150**	-0.00144**	-0.00129**	-0.00187***	-0.000584*	-0.000547	-0.000575
		(0.000623)	(0.000610)	(0.000637)	(0.000170)	(0.000345)	(0.000370)	(0.000443)
2911* Pay ratio (total)$_{t-1}$	-0.00228	-0.00143***	-0.00140***	-0.00135***	-0.00107*	-0.00113	-0.00122	-0.00171**
		(0.000333)	(0.000335)	(0.000336)	(0.000639)	(0.000850)	(0.000850)	(0.000744)
3021* Pay ratio (total)$_{t-1}$	-0.00906	-0.00471***	-0.00459***	-0.00449***	-0.00282***	-0.00122*	-0.00131*	-0.00175**
		(0.000746)	(0.000729)	(0.000750)	(0.000657)	(0.000672)	(0.000677)	(0.000724)
3241* Pay ratio (total)$_{t-1}$	-0.000300	-0.000605*	-0.000586	-0.000649*	-0.000183	-0.000371	-0.000334	-0.000399
		(0.000353)	(0.000352)	(0.000361)	(0.000193)	(0.000403)	(0.000427)	(0.000398)
3300* Pay ratio (total)$_{t-1}$	0.000668***	-0.00243***	-0.00250***	-0.00268***	0.000209	-0.00239**	-0.00192	-0.00298
	(5.08e-10)	(0.000884)	(0.000883)	(0.000914)	(0.00108)	(0.00116)	(0.00143)	(0.00223)
3312* Pay ratio (total)$_{t-1}$	0.00182	0.00497***	0.00503***	0.00523***	0.000625	0.00286***	0.00303***	0.00365***
		(0.000912)	(0.000906)	(0.000943)	(0.000451)	(0.000894)	(0.000949)	(0.00101)
3490* Pay ratio (total)$_{t-1}$	0.0290	0.0117**	0.0116**	0.0100*	0.0141***	0.00794**	0.00677*	0.00951**
		(0.00514)	(0.00513)	(0.00532)	(0.00491)	(0.00372)	(0.00354)	(0.00381)
3559* Pay ratio (total)$_{t-1}$	-0.0218***	-0.0218***	-0.0217***	-0.0221***	-0.0515***	-0.0448***	-0.0401**	-0.0301
	(2.59e-10)	(0.00253)	(0.00254)	(0.00259)	(0.0160)	(0.0159)	(0.0178)	(0.0187)
3577* Pay ratio (total)$_{t-1}$	0.0553	0.0752***	0.0753***	0.0768***	0.0308***	0.0411***	0.0447***	0.0484***
		(0.00555)	(0.00553)	(0.00567)	(0.00647)	(0.0101)	(0.0111)	(0.0132)
3674* Pay ratio (total)$_{t-1}$	-0.00330***	-0.00364***	-0.00369***	-0.00368***	-0.00780***	-0.00773***	-0.00750***	-0.00666***
	(3.94e-10)	(0.000832)	(0.000813)	(0.000837)	(0.00173)	(0.00175)	(0.00171)	(0.00216)
3711* Pay ratio (total)$_{t-1}$	-0.00270***	-0.000796	-0.000769	0.000357	-0.00133***	-0.000733	-0.000762	-0.000310
	(8.45e-05)	(0.000509)	(0.000510)	(0.00109)	(0.000265)	(0.000478)	(0.000478)	(0.00100)
3714* Pay ratio (total)$_{t-1}$	0.00952***	0.00629***	0.00622***	0.00602***	0.00469***	0.00386**	0.00382**	0.00443**
	(5.69e-10)	(0.000979)	(0.000967)	(0.00101)	(0.00168)	(0.00157)	(0.00163)	(0.00190)

3845* Pay ratio (total)$_{t-1}$	0.00429	-4.36e-05 (0.000739)	-0.000152 (0.000731)	-0.000197 (0.000745)	0.00195*** (0.000565)	-0.000683 (0.000739)	-0.000328 (0.000928)	-0.00137 (0.00165)
4011* Pay ratio (total)$_{t-1}$	-0.00324*** (0.000295)	-0.000204 (0.000763)	-0.000150 (0.000759)	-0.000198 (0.000748)	-0.00160*** (0.000426)	-0.000500 (0.000616)	-0.000345 (0.000701)	-0.000342 (0.000854)
4210* Pay ratio (total)$_{t-1}$	0.00119** (0.000445)	0.000720** (0.000304)	0.00114*** (0.000324)	0.00138*** (0.000313)	-0.000851 (0.00110)	-0.000805 (0.000828)	-0.000395 (0.000875)	-0.000345 (0.00107)
4213* Pay ratio (total)$_{t-1}$	-0.00523*** (4.26e-10)	0.00669** (0.00274)	0.00686** (0.00273)	0.00759*** (0.00282)	0.000674 (0.000998)	0.00524** (0.00219)	0.00599** (0.00257)	0.00508 (0.00398)
4220* Pay ratio (total)$_{t-1}$	-0.0173*** (5.27e-10)	-0.0294*** (0.00284)	-0.0293*** (0.00284)	-0.0300*** (0.00293)	-0.0130*** (0.00193)	-0.0215*** (0.00318)	-0.0222*** (0.00330)	-0.0242*** (0.00427)
4512* Pay ratio (total)$_{t-1}$	-0.00120*** (0.000416)	0.000302 (0.000505)	-0.000236 (0.000524)	6.82e-05 (0.000344)	-0.000792 (0.000586)	-0.000198 (0.000743)	-0.000308 (0.000695)	0.000296 (0.00105)
4513* Pay ratio (total)$_{t-1}$	-0.00209*** (3.36e-10)	-7.23e-05 (0.000479)	-3.39e-05 (0.000476)	6.66e-05 (0.000493)	-0.000970*** (0.000297)	-0.000442 (0.000564)	-0.000292 (0.000645)	-0.000182 (0.000792)
4731* Pay ratio (total)$_{t-1}$	-0.00251*** (1.69e-10)	0.000616 (0.000698)	0.000661 (0.000692)	0.000856 (0.000722)	-0.00352*** (0.000196)	-0.00194*** (0.000509)	-0.00165** (0.000627)	-0.00129* (0.000692)
4813* Pay ratio (total)$_{t-1}$	-0.00237 (0.00256)	0.00341 (0.00447)	0.00648 (0.00437)	0.00981*** (0.00169)	-0.00107 (0.00130)	0.00239 (0.00274)	0.00270 (0.00335)	0.00716* (0.00374)
4911* Pay ratio (total)$_{t-1}$	-0.000904	0.00405*** (0.00113)	0.00414*** (0.00112)	0.00439*** (0.00116)	-0.00110* (0.000641)	0.00141 (0.00156)	0.00160 (0.00160)	0.00297* (0.00171)
5411* Pay ratio (total)$_{t-1}$	-0.00500	-0.00610*** (0.000532)	-0.00608*** (0.000530)	-0.00612*** (0.000549)	-0.00309*** (0.000485)	-0.00426*** (0.000580)	-0.00468*** (0.000691)	-0.00374** (0.00147)
5812* Pay ratio (total)$_{t-1}$	-0.00213*** (4.91e-10)	-7.26e-05 (0.000492)	-3.73e-05 (0.000489)	8.97e-05 (0.000508)	-0.000938*** (0.000250)	-0.000236 (0.000510)	-0.000145 (0.000556)	-1.75e-05 (0.000679)
6020* Pay ratio (total)$_{t-1}$	-0.00187*** (4.91e-10)	-0.000106 (0.000299)	-7.03e-05 (0.000294)	-2.91e-05 (0.000304)	-0.000997*** (0.000256)	-0.000231 (0.000383)	-0.000100 (0.000466)	-0.000146 (0.000618)
6099* Pay ratio (total)$_{t-1}$	0.00151*** (5.11e-10)	0.00289*** (0.000467)	0.00291*** (0.000465)	0.00304*** (0.000481)	0.00216*** (0.000484)	0.00229*** (0.000747)	0.00249*** (0.000842)	0.00263** (0.00106)
6141* Pay ratio (total)$_{t-1}$	-0.00133	-0.000560** (0.000239)	-0.000556** (0.000239)	-0.000489* (0.000246)	-0.000807*** (0.000239)	-0.000693* (0.000392)	-0.000593 (0.000438)	-0.000610 (0.000595)
6211* Pay ratio (total)$_{t-1}$	-0.00187	-0.000333 (0.000366)	-0.000309 (0.000364)	-0.000220 (0.000377)	-0.000992*** (0.000265)	-0.000512 (0.000427)	-0.000382 (0.000504)	-0.000406 (0.000668)
7363* Pay ratio (total)$_{t-1}$	-0.00250*** (3.41e-10)	-0.00360*** (0.000632)	-0.00371*** (0.000637)	-0.00355*** (0.000652)	-0.00449*** (0.000838)	-0.00525*** (0.00118)	-0.00501*** (0.00128)	-0.00473*** (0.00174)
7372* Pay ratio (total)$_{t-1}$	-0.000364	-0.00258*** (0.000354)	-0.00261*** (0.000353)	-0.00256*** (0.000357)	-0.000403 (0.00108)	-0.00218 (0.00136)	-0.00249 (0.00149)	-0.00257 (0.00188)
8090* Pay ratio (total)$_{t-1}$	-0.00366	-0.00770*** (0.000935)	-0.00779*** (0.000924)	-0.00809*** (0.000961)	-0.000586 (0.000642)	-0.00256*** (0.000943)	-0.00340** (0.00131)	-0.00308 (0.00206)
8111* Pay ratio (total)$_{t-1}$	0.00560	0.00135 (0.00112)	0.00125 (0.00110)	0.00104 (0.00116)	0.00397*** (0.000516)	0.00183** (0.000849)	0.00183** (0.000869)	0.00135 (0.000986)
9997* Pay ratio (total)$_{t-1}$	0.00339* (0.00174)	0.00739*** (0.00128)	0.00747*** (0.00127)	0.00537*** (0.00184)	0.00127 (0.00128)	0.00288 (0.00190)	0.00365 (0.00230)	0.00372 (0.00234)
Tobin's Q$_{t-1}$					0.556*** (0.0439)	0.508*** (0.0446)	0.472*** (0.0564)	0.432*** (0.0740)
Firm size (assets)					0.00873 (0.0721)	-0.0597 (0.0746)	0.00112 (0.0977)	-0.367 (0.332)
RoA					0.730 (1.877)	0.763 (2.084)	0.259 (2.283)	-0.580 (2.575)
CAPEX/assets					0.0378 (1.171)	-0.371 (1.141)	0.0878 (1.380)	0.391 (1.408)
Leverage					0.345 (0.503)	0.400 (0.496)	0.203 (0.603)	0.262 (0.759)
R&D ratio					89.84*** (8.633)	42.61** (16.25)	40.87** (16.92)	20.79 (19.70)
CEO tenure					0.00126 (0.00366)	0.000141 (0.00291)	-0.000626 (0.00257)	-5.36e-05 (0.00268)
Constant	1.318	1.379*** (0.0267)	1.377*** (0.0266)	1.389*** (0.0270)	0.336 (0.778)	1.171 (0.840)	0.678 (0.927)	4.572 (3.172)
Observations	522	522	522	522	522	522	522	522
R-squared	0.797	0.831	0.850	0.873	0.869	0.880	0.883	0.892
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Country FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES

Table A.2: Regressions on return on assets with pay ratio (total), industry differences

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and country FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. This also holds for the dummy variables for each industry. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. Dummy variables on the industry level and interaction terms between industries and the one-year-lagged total CEO-to-worker pay ratio are included. The dummy variables for industries are excluded from the table, because otherwise the size of the table would be too large. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	-2.30e-05	-0.000105***	-0.000108***	-0.000110***	-6.01e-05*	-7.67e-05***	-9.46e-05***	-0.000105***
		(3.86e-05)	(3.92e-05)	(3.77e-05)	(3.21e-05)	(2.48e-05)	(2.73e-05)	(3.14e-05)
2721* Pay ratio (total)$_{t-1}$	9.51e-05	0.000226***	0.000229***	0.000224***	2.14e-05	0.000148***	0.000183***	0.000205***
		(2.91e-05)	(2.95e-05)	(3.06e-05)	(4.53e-05)	(5.55e-05)	(6.19e-05)	(7.44e-05)
2800* Pay ratio (total)$_{t-1}$	0.000834***	0.000878***	0.00126***	-0.000416	0.000536***	0.000610***	0.000808**	-0.000226
	(0.000179)	(0.000196)	(0.000426)	(0.000377)	(0.000174)	(0.000216)	(0.000351)	(0.000430)
2810* Pay ratio (total)$_{t-1}$	1.53e-05***	0.000296**	0.000304**	0.000313***	0.000131**	0.000256***	0.000320***	0.000370***
	(0)	(0.000114)	(0.000116)	(0.000112)	(5.46e-05)	(6.04e-05)	(7.41e-05)	(8.17e-05)
2834* Pay ratio (total)$_{t-1}$	-8.30e-05	-0.000288**	-0.000298**	-0.000293**	5.76e-05	-2.75e-05	-2.77e-06	6.49e-05
		(0.000120)	(0.000121)	(0.000119)	(6.74e-05)	(9.31e-05)	(9.74e-05)	(0.000106)
2836* Pay ratio (total)$_{t-1}$	-0.00499***	-0.00566***	-0.00568***	-0.00554***	-0.00534	-0.00712	-0.00732	-0.00852**
	(0)	(0.000714)	(0.000717)	(0.000727)	(0.00409)	(0.00443)	(0.00442)	(0.00407)
2840* Pay ratio (total)$_{t-1}$	0.000248***	0.000292***	0.000177*	0.000119**	0.000114**	0.000147**	0.000106	0.000116***
	(6.06e-05)	(6.30e-05)	(9.94e-05)	(5.05e-05)	(4.43e-05)	(6.04e-05)	(7.50e-05)	(3.29e-05)
2844* Pay ratio (total)$_{t-1}$	-2.52e-05	-0.000120*	-0.000124*	-0.000131*	-0.000116	-0.000108	-0.000105	-9.45e-05
		(7.04e-05)	(7.15e-05)	(6.92e-05)	(9.54e-05)	(7.63e-05)	(7.74e-05)	(7.43e-05)
2851* Pay ratio (total)$_{t-1}$	-4.23e-05	4.17e-05	4.74e-05	5.25e-05	-0.000101*	-8.90e-05**	-6.94e-05	-5.29e-05
		(6.67e-05)	(6.76e-05)	(6.66e-05)	(5.28e-05)	(4.44e-05)	(4.80e-05)	(5.58e-05)
2911* Pay ratio (total)$_{t-1}$	-0.000350	-0.000288***	-0.000285***	-0.000287***	-0.000416***	-0.000394***	-0.000371***	-0.000370***
		(2.57e-05)	(2.62e-05)	(2.80e-05)	(3.91e-05)	(3.32e-05)	(3.26e-05)	(3.50e-05)
3021* Pay ratio (total)$_{t-1}$	-0.000286	-0.000123**	-0.000111*	-0.000119**	-9.70e-06	-2.08e-05	-1.02e-05	-3.23e-05
		(5.65e-05)	(5.78e-05)	(5.56e-05)	(0.000127)	(6.30e-05)	(6.16e-05)	(6.22e-05)
3241* Pay ratio (total)$_{t-1}$	2.03e-05	1.09e-05	1.27e-05	6.75e-06	7.01e-05***	4.37e-05*	4.69e-05*	4.04e-05
		(2.46e-05)	(2.45e-05)	(2.57e-05)	(1.11e-05)	(2.61e-05)	(2.44e-05)	(2.81e-05)
3300* Pay ratio (total)$_{t-1}$	3.16e-05	9.01e-05*	8.35e-05	8.78e-05*	-0.000117	9.78e-05	0.000177	0.000173
		(5.07e-05)	(5.24e-05)	(4.82e-05)	(0.000113)	(0.000123)	(0.000131)	(0.000171)
3312* Pay ratio (total)$_{t-1}$	8.81e-05***	0.000114**	0.000120**	0.000121***	0.000260***	0.000102	0.000113	0.000143
	(0)	(4.50e-05)	(4.64e-05)	(4.07e-05)	(4.46e-05)	(8.94e-05)	(9.09e-05)	(9.21e-05)
3490* Pay ratio (total)$_{t-1}$	0.00144	0.000663*	0.000650	0.000590	0.000488	0.000297	8.00e-05	0.000175
		(0.000388)	(0.000396)	(0.000379)	(0.000518)	(0.000487)	(0.000497)	(0.000500)
3559* Pay ratio (total)$_{t-1}$	0.00869	0.00780***	0.00780***	0.00776***	0.0105***	0.00932***	0.00895***	0.00868***
		(0.000246)	(0.000248)	(0.000253)	(0.000416)	(0.000438)	(0.000517)	(0.000680)
3577* Pay ratio (total)$_{t-1}$	0.00223	0.00332***	0.00333***	0.00342***	0.000202	0.00146	0.00183	0.00231
		(0.000442)	(0.000448)	(0.000445)	(0.00112)	(0.00149)	(0.00154)	(0.00176)
3674* Pay ratio (total)$_{t-1}$	0.00139***	0.00119***	0.00118***	0.00119***	0.000131	-4.57e-05	1.19e-05	0.000102
	(0)	(6.92e-05)	(6.85e-05)	(7.21e-05)	(0.000170)	(0.000198)	(0.000192)	(0.000211)
3711* Pay ratio (total)$_{t-1}$	-7.06e-05**	1.55e-05	1.81e-05	0.000130***	1.29e-05	5.44e-05	4.66e-05	0.000178*
	(2.85e-05)	(5.40e-05)	(5.47e-05)	(4.83e-05)	(4.36e-05)	(3.61e-05)	(3.89e-05)	(9.41e-05)
3714* Pay ratio (total)$_{t-1}$	0.000855	0.000681***	0.000674***	0.000671***	-4.71e-05	-1.79e-05	-2.79e-06	0.000118
		(6.88e-05)	(6.92e-05)	(6.62e-05)	(0.000208)	(0.000196)	(0.000192)	(0.000211)
3845* Pay ratio (total)$_{t-1}$	7.31e-05	1.37e-05	3.34e-06	1.50e-05	-0.000120	-6.48e-05	2.71e-06	-2.03e-05
		(4.91e-05)	(5.08e-05)	(4.91e-05)	(9.34e-05)	(6.77e-05)	(7.55e-05)	(0.000109)
4011* Pay ratio (total)$_{t-1}$	-1.24e-05	0.000130*	0.000135*	0.000119	4.49e-05	9.70e-05**	0.000117***	0.000120**
	(5.35e-05)	(7.64e-05)	(7.72e-05)	(7.16e-05)	(5.67e-05)	(4.03e-05)	(4.28e-05)	(4.74e-05)
4210* Pay ratio (total)$_{t-1}$	0.000221*	0.000159	0.000199*	0.000221**	6.20e-05	2.09e-05	7.59e-05	9.55e-05
	(0.000116)	(0.000112)	(0.000106)	(0.000102)	(7.50e-05)	(6.92e-05)	(7.84e-05)	(9.21e-05)

4213* Pay ratio (total)$_{t-1}$	0.000414	0.000853*** (0.000239)	0.000869*** (0.000242)	0.000890*** (0.000233)	0.000427*** (0.000148)	0.000505*** (0.000153)	0.000596*** (0.000168)	0.000483** (0.000220)
4220* Pay ratio (total)$_{t-1}$	-0.000500	-0.000922*** (0.000156)	-0.000916*** (0.000160)	-0.000967*** (0.000154)	0.000353 (0.000230)	0.000133 (0.000357)	-6.62e-05 (0.000367)	-0.000247 (0.000465)
4512* Pay ratio (total)$_{t-1}$	0.000148*** (4.88e-05)	0.000212*** (5.66e-05)	0.000161** (7.23e-05)	0.000334*** (5.13e-05)	0.000139*** (4.22e-05)	0.000151*** (4.18e-05)	0.000137*** (4.20e-05)	0.000232*** (5.06e-05)
4513* Pay ratio (total)$_{t-1}$	4.90e-06	0.000122*** (4.09e-05)	0.000126*** (4.15e-05)	0.000127*** (4.01e-05)	5.48e-05 (3.53e-05)	0.000107*** (2.88e-05)	0.000123*** (3.12e-05)	0.000133*** (3.51e-05)
4731* Pay ratio (total)$_{t-1}$	-9.49e-05*** (0)	3.13e-05 (6.19e-05)	3.57e-05 (6.28e-05)	4.24e-05 (6.06e-05)	7.74e-06 (3.27e-05)	4.83e-05 (3.31e-05)	6.64e-05 (4.02e-05)	8.39e-05* (4.32e-05)
4813* Pay ratio (total)$_{t-1}$	0.000452 (0.000418)	0.000824 (0.000532)	0.00112** (0.000466)	0.00151*** (0.000182)	0.000335 (0.000253)	0.000613** (0.000288)	0.000661* (0.000347)	0.00121*** (0.000235)
4911* Pay ratio (total)$_{t-1}$	0.000490	0.000698*** (9.25e-05)	0.000707*** (9.38e-05)	0.000710*** (8.98e-05)	0.000219*** (5.56e-05)	0.000260*** (7.61e-05)	0.000278*** (7.51e-05)	0.000360*** (9.67e-05)
5411* Pay ratio (total)$_{t-1}$	-0.000213	-0.000128** (5.16e-05)	-0.000126** (5.14e-05)	-0.000131** (5.30e-05)	7.27e-05 (8.74e-05)	0.000151 (0.000134)	5.41e-05 (0.000154)	6.68e-05 (0.000208)
5812* Pay ratio (total)$_{t-1}$	3.12e-05	0.000112** (4.26e-05)	0.000116*** (4.33e-05)	0.000118*** (4.16e-05)	5.71e-05* (3.19e-05)	6.79e-05*** (2.30e-05)	7.97e-05*** (2.73e-05)	9.36e-05*** (3.21e-05)
6020* Pay ratio (total)$_{t-1}$	2.34e-05	8.66e-05*** (2.94e-05)	9.00e-05*** (2.99e-05)	8.96e-05*** (2.95e-05)	5.58e-05* (2.92e-05)	8.29e-05*** (2.15e-05)	9.91e-05*** (2.51e-05)	9.81e-05*** (3.32e-05)
6099* Pay ratio (total)$_{t-1}$	0.000165	0.000222*** (4.41e-05)	0.000224*** (4.48e-05)	0.000227*** (4.37e-05)	0.000121*** (3.45e-05)	0.000137*** (4.36e-05)	0.000168*** (5.11e-05)	0.000190*** (6.73e-05)
6141* Pay ratio (total)$_{t-1}$	6.22e-05	0.000115*** (1.76e-05)	0.000116*** (1.80e-05)	0.000118*** (1.76e-05)	4.39e-05** (2.10e-05)	7.19e-05*** (1.92e-05)	8.35e-05*** (2.29e-05)	9.17e-05*** (2.74e-05)
6211* Pay ratio (total)$_{t-1}$	1.62e-05	7.99e-05** (3.10e-05)	8.21e-05** (3.15e-05)	8.43e-05*** (3.03e-05)	5.99e-05* (3.07e-05)	7.09e-05*** (2.41e-05)	8.71e-05*** (2.44e-05)	8.78e-05*** (2.74e-05)
7363* Pay ratio (total)$_{t-1}$	0.000319	0.000411*** (3.64e-05)	0.000401*** (3.66e-05)	0.000428*** (3.99e-05)	0.000156** (6.28e-05)	0.000331*** (7.82e-05)	0.000323*** (8.22e-05)	0.000335*** (7.72e-05)
7372* Pay ratio (total)$_{t-1}$	-0.000545*** (0)	-0.000592*** (2.86e-05)	-0.000595*** (2.90e-05)	-0.000589*** (2.92e-05)	-0.000381*** (3.65e-05)	-0.000364*** (6.63e-05)	-0.000406*** (7.74e-05)	-0.000431*** (0.000102)
8090* Pay ratio (total)$_{t-1}$	-0.000171	-0.000280*** (9.08e-05)	-0.000288*** (9.23e-05)	-0.000294*** (8.89e-05)	-6.16e-05 (0.000103)	-3.17e-05 (0.000175)	-0.000148 (0.000201)	-0.000161 (0.000247)
8111* Pay ratio (total)$_{t-1}$	0.000188	2.11e-06 (8.74e-05)	-7.64e-06 (8.82e-05)	-9.22e-06 (8.57e-05)	3.31e-06 (0.000108)	8.56e-06 (7.99e-05)	1.49e-05 (7.97e-05)	1.24e-05 (8.35e-05)
9997* Pay ratio (total)$_{t-1}$	0.000379*** (4.55e-05)	0.000558*** (9.63e-05)	0.000566*** (9.66e-05)	0.000681*** (0.000238)	0.000272*** (9.93e-05)	0.000346** (0.000150)	0.000444** (0.000180)	0.000507** (0.000214)
RoA$_{t-1}$					0.364*** (0.0546)	0.379*** (0.0572)	0.316*** (0.0722)	0.222*** (0.0829)
Firm size (assets)					-0.00876 (0.0105)	-0.0131 (0.0111)	-0.00415 (0.0113)	-0.0289 (0.0226)
Tobin's Q					0.0183 (0.0147)	0.0151 (0.0160)	0.0100 (0.0168)	0.00483 (0.0180)
CAPEX/assets					0.287** (0.124)	0.315** (0.122)	0.365*** (0.127)	0.443*** (0.159)
Leverage					-0.0589* (0.0298)	-0.0454 (0.0307)	-0.0750*** (0.0233)	-0.0681*** (0.0255)
R&D ratio					-9.546*** (2.478)	-9.087*** (1.572)	-8.423*** (1.594)	-8.936*** (1.999)
CEO tenure					-0.000168 (0.000388)	-0.000272 (0.000387)	-0.000366 (0.000392)	-0.000392 (0.000394)
Constant	0.0811*** (6.72e-09)	0.0673*** (0.00377)	0.0671*** (0.00379)	0.0678*** (0.00384)	0.129 (0.106)	0.157 (0.116)	0.0859 (0.111)	0.354 (0.218)
Observations	522	522	522	522	522	522	522	522
R-squared	0.723	0.746	0.777	0.820	0.815	0.833	0.844	0.860
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Country FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES
Industry dummies	YES	YES	YES	YES	YES	YES	YES	YES

A.2 Main results of Hypothesis 6

Table A.3: Regressions on Tobin's Q with pay ratio (total), year differences

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Year dummy variables and interaction terms between years and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	0.000611	-0.000261	-0.000402	-0.000337	-0.000197	-0.000382	-0.000457	-0.000477
	(0.000565)	(0.000403)	(0.000434)	(0.000412)	(0.000194)	(0.000317)	(0.000353)	(0.000349)
Year = 2010	0.00687	0.0120	0.00471	0.00810	-0.183***	-0.128*	-0.0835	-0.120
	(0.0629)	(0.0434)	(0.0457)	(0.0440)	(0.0670)	(0.0721)	(0.0668)	(0.0724)
Year = 2011	-0.128***	-0.106***	-0.106**	-0.107**	-0.308***	-0.240***	-0.200***	-0.239***
	(0.0471)	(0.0396)	(0.0432)	(0.0406)	(0.0595)	(0.0660)	(0.0518)	(0.0631)
Year = 2012	0.0683	0.0661	0.0808	0.0718	-0.0294	0.0122	0.0523	0.0127
	(0.0636)	(0.0480)	(0.0511)	(0.0487)	(0.0404)	(0.0543)	(0.0505)	(0.0540)
Year = 2013	0.211***	0.239***	0.244***	0.240***	-0.0317	0.0661	0.116**	0.0660
	(0.0640)	(0.0647)	(0.0669)	(0.0651)	(0.0582)	(0.0571)	(0.0531)	(0.0569)
Year = 2014	0.288***	0.269***	0.282***	0.279***	-0.163*	-0.0164	0.0493	-0.0106
	(0.0953)	(0.0793)	(0.0804)	(0.0786)	(0.0833)	(0.0842)	(0.0754)	(0.0836)
Year = 2015	0.380**	0.325**	0.338**	0.332**	-0.128	0.0299	0.113	0.0372
	(0.170)	(0.155)	(0.158)	(0.155)	(0.155)	(0.177)	(0.145)	(0.174)
Year = 2016	0.373***	0.242***	0.247***	0.245***	-0.212***	-0.0787	0.0137	-0.0753
	(0.0897)	(0.0850)	(0.0872)	(0.0849)	(0.0627)	(0.0591)	(0.0574)	(0.0621)
Year = 2017	0.314**	0.302**	0.308**	0.306**	-0.0865	0.0397	0.122	0.0374
	(0.149)	(0.121)	(0.125)	(0.122)	(0.0706)	(0.0995)	(0.0849)	(0.0995)
2010* Pay ratio (total)$_{t-1}$	0.000336	0.000155	0.000209	0.000184	0.000496***	0.000408*	0.000403	0.000429
	(0.000564)	(0.000242)	(0.000285)	(0.000261)	(0.000178)	(0.000238)	(0.000254)	(0.000263)
2011* Pay ratio (total)$_{t-1}$	0.000506	0.000518*	0.000546	0.000534*	0.000612***	0.000599**	0.000621*	0.000635*
	(0.000425)	(0.000271)	(0.000333)	(0.000298)	(0.000195)	(0.000292)	(0.000312)	(0.000319)
2012* Pay ratio (total)$_{t-1}$	-1.77e-05	1.92e-05	-0.000108	-2.91e-05	-0.000224	-0.000239	-0.000267	-0.000254
	(0.000475)	(0.000217)	(0.000276)	(0.000242)	(0.000180)	(0.000214)	(0.000229)	(0.000231)
2013* Pay ratio (total)$_{t-1}$	0.000312	0.000129	9.63e-05	0.000120	0.000563**	0.000337*	0.000316	0.000345
	(0.000469)	(0.000160)	(0.000200)	(0.000177)	(0.000254)	(0.000201)	(0.000198)	(0.000209)
2014* Pay ratio (total)$_{t-1}$	-2.91e-05	0.000179	7.12e-05	9.17e-05	0.000687**	0.000429	0.000407	0.000416
	(0.000664)	(0.000276)	(0.000281)	(0.000263)	(0.000288)	(0.000331)	(0.000346)	(0.000336)
2015* Pay ratio (total)$_{t-1}$	-0.000669	-0.000124	-0.000205	-0.000168	0.000262	8.29e-06	-1.08e-05	3.36e-05
	(0.000959)	(0.000629)	(0.000663)	(0.000640)	(0.000582)	(0.000652)	(0.000606)	(0.000646)
2016* Pay ratio (total)$_{t-1}$	-0.000776	0.000361	0.000335	0.000347	0.000686*	0.000583	0.000592	0.000651
	(0.000565)	(0.000523)	(0.000543)	(0.000525)	(0.000344)	(0.000385)	(0.000424)	(0.000419)
2017* Pay ratio (total)$_{t-1}$	0.000729	0.000925	0.000889	0.000901	0.000903**	0.000760	0.000860	0.000872
	(0.00112)	(0.000823)	(0.000878)	(0.000845)	(0.000341)	(0.000516)	(0.000562)	(0.000553)
Tobin's Q$_{t-1}$					0.868***	0.590***	0.525***	0.565***
					(0.0317)	(0.0479)	(0.0611)	(0.0477)
Firm size (assets)					-0.126***	-0.0210	-0.202	0.0434
					(0.0242)	(0.0594)	(0.284)	(0.0835)
RoA					0.618	0.650	-0.432	0.177
					(0.769)	(1.884)	(2.215)	(2.024)
CAPEX/assets					-0.468	-0.405	0.182	-0.0280
					(0.403)	(1.035)	(1.170)	(1.158)
Leverage					-0.206	0.161	-0.142	-0.0990
					(0.147)	(0.273)	(0.447)	(0.308)
R&D missing					-0.159***	0.210*	1.113*	0.121
					(0.0332)	(0.109)	(0.640)	(0.135)
R&D ratio					-7.852***	53.68***	46.12***	54.84***
					(1.631)	(9.163)	(15.87)	(9.581)
CEO tenure					-0.00188	-0.000163	-0.000125	-0.000726
					(0.00218)	(0.00239)	(0.00238)	(0.00218)
Constant	1.393***	1.423***	1.455***	1.435***	1.870***	0.646	1.640	0.206
	(0.102)	(0.0538)	(0.0575)	(0.0529)	(0.291)	(0.614)	(3.131)	(0.777)
Observations	522	522	522	522	522	522	522	522
R-squared	0.086	0.796	0.844	0.816	0.846	0.871	0.881	0.874
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO

Table A.4: Regressions on return on assets with pay ratio (total), year differences

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. Year dummy variables and interaction terms between years and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	0.000101*	2.45e-05	3.09e-05	1.80e-05	2.06e-05	9.53e-06	4.14e-06	-2.38e-06
	(5.72e-05)	(2.57e-05)	(3.07e-05)	(2.43e-05)	(1.98e-05)	(1.91e-05)	(2.42e-05)	(2.03e-05)
Year = 2010	0.0301***	0.0289***	0.0293***	0.0286***	0.0390***	0.0344***	0.0327***	0.0325***
	(0.00745)	(0.00687)	(0.00707)	(0.00684)	(0.00913)	(0.00821)	(0.00794)	(0.00794)
Year = 2011	0.0251**	0.0250**	0.0254**	0.0250**	0.0170	0.0196*	0.0198*	0.0183*
	(0.00977)	(0.0101)	(0.0103)	(0.0101)	(0.0109)	(0.0104)	(0.0109)	(0.0105)
Year = 2012	0.0263***	0.0256***	0.0266***	0.0262***	0.0189***	0.0187***	0.0197***	0.0179***
	(0.00747)	(0.00666)	(0.00683)	(0.00669)	(0.00572)	(0.00584)	(0.00585)	(0.00572)
Year = 2013	0.0258***	0.0268***	0.0272***	0.0269***	0.0150**	0.0156**	0.0180***	0.0152**
	(0.00709)	(0.00659)	(0.00673)	(0.00657)	(0.00673)	(0.00600)	(0.00636)	(0.00588)
Year = 2014	0.0248**	0.0229**	0.0220**	0.0239**	0.00863	0.00992	0.0121	0.0101
	(0.0108)	(0.00927)	(0.00946)	(0.00933)	(0.00865)	(0.00693)	(0.00780)	(0.00701)
Year = 2015	0.0387***	0.0351***	0.0349**	0.0358***	0.0229**	0.0219**	0.0247**	0.0217**
	(0.0141)	(0.0131)	(0.0132)	(0.0132)	(0.00994)	(0.00924)	(0.0104)	(0.00926)
Year = 2016	0.0412***	0.0304***	0.0300***	0.0307***	0.0159**	0.0192***	0.0231***	0.0188***
	(0.0105)	(0.00909)	(0.00918)	(0.00917)	(0.00664)	(0.00702)	(0.00692)	(0.00685)
Year = 2017	0.0338***	0.0316***	0.0310***	0.0320***	0.0168*	0.0188**	0.0220***	0.0180**
	(0.0105)	(0.00914)	(0.00925)	(0.00928)	(0.00868)	(0.00722)	(0.00784)	(0.00724)
2010*Pay ratio (total)$_{t-1}$	-1.94e-05	-1.82e-05	-2.18e-05	-1.59e-05	-1.77e-05	-1.45e-05	-1.34e-05	-9.84e-06
	(5.65e-05)	(1.95e-05)	(2.05e-05)	(1.89e-05)	(2.10e-05)	(1.89e-05)	(1.88e-05)	(1.84e-05)
2011*Pay ratio (total)$_{t-1}$	-1.82e-05	-2.16e-06	-6.56e-06	-1.15e-06	6.79e-07	-7.49e-07	1.29e-06	4.51e-06
	(5.16e-05)	(2.40e-05)	(2.50e-05)	(2.34e-05)	(2.70e-05)	(2.64e-05)	(2.59e-05)	(2.59e-05)
2012*Pay ratio (total)$_{t-1}$	-1.09e-05	-3.98e-06	-1.22e-05	-8.60e-06	-2.40e-05	-1.27e-05	-1.55e-05	-1.35e-05
	(4.58e-05)	(1.89e-05)	(1.86e-05)	(1.91e-05)	(1.58e-05)	(1.67e-05)	(1.57e-05)	(1.51e-05)
2013*Pay ratio (total)$_{t-1}$	6.60e-06	3.07e-06	-6.76e-07	1.95e-06	7.12e-06	6.06e-06	5.61e-06	8.17e-06
	(5.14e-05)	(2.24e-05)	(2.20e-05)	(2.10e-05)	(2.73e-05)	(2.44e-05)	(2.33e-05)	(2.25e-05)
2014*Pay ratio (total)$_{t-1}$	-1.34e-06	1.85e-05	2.56e-05	1.01e-05	2.41e-05	2.22e-05	3.04e-05	2.12e-05
	(6.52e-05)	(3.08e-05)	(3.73e-05)	(2.91e-05)	(3.23e-05)	(3.11e-05)	(3.59e-05)	(3.00e-05)
2015*Pay ratio (total)$_{t-1}$	-7.86e-05	-4.00e-05	-3.91e-05	-4.42e-05	-3.94e-05	-2.21e-05	-1.33e-05	-1.64e-05
	(6.11e-05)	(3.98e-05)	(4.09e-05)	(3.91e-05)	(3.51e-05)	(3.91e-05)	(3.87e-05)	(3.70e-05)
2016*Pay ratio (total)$_{t-1}$	-0.000100	-5.12e-06	-2.96e-06	-6.66e-06	-9.83e-06	1.75e-06	1.40e-05	1.17e-05
	(6.09e-05)	(2.29e-05)	(2.61e-05)	(2.17e-05)	(1.95e-05)	(1.84e-05)	(2.35e-05)	(1.89e-05)
2017*Pay ratio (total)$_{t-1}$	-2.88e-05	-2.84e-06	1.10e-06	-5.32e-06	-2.06e-05	-4.42e-06	2.07e-05	1.24e-05
	(6.02e-05)	(2.20e-05)	(2.40e-05)	(2.23e-05)	(3.01e-05)	(3.20e-05)	(3.52e-05)	(3.14e-05)
RoA$_{t-1}$					0.673***	0.372***	0.232**	0.314***
					(0.0483)	(0.0649)	(0.0920)	(0.0801)
Firm size (assets)					0.000948	-0.00313	-0.00872	0.00208
					(0.00341)	(0.00865)	(0.0244)	(0.00943)
Tobin's Q					0.0159***	0.0186	0.00974	0.0143
					(0.00411)	(0.0115)	(0.0133)	(0.0120)
CAPEX/assets					0.107**	0.344***	0.464***	0.386***
					(0.0498)	(0.110)	(0.154)	(0.115)
Leverage					0.00345	-0.0415*	-0.0779**	-0.0722***
					(0.0129)	(0.0241)	(0.0295)	(0.0204)
R&D missing					-0.00980	-0.0482***	-0.110	-0.0451***
					(0.00689)	(0.0140)	(0.0770)	(0.0161)
R&D ratio					-0.497**	-5.923***	-5.032**	-5.305***
					(0.241)	(1.598)	(2.234)	(1.628)
CEO tenure					-0.000530*	-0.000324	-0.000413	-0.000384
					(0.000275)	(0.000325)	(0.000362)	(0.000333)
Constant	0.0485***	0.0503***	0.0653***	0.0513***	-0.0188	0.0840	0.227	0.0468
	(0.00912)	(0.00749)	(0.00718)	(0.00728)	(0.0300)	(0.0886)	(0.278)	(0.0879)
Observations	522	522	522	522	522	522	522	522
R-squared	0.088	0.712	0.784	0.743	0.753	0.813	0.838	0.824
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO

Appendix B Robustness checks

B.1 Robustness checks for Hypothesis 1

Table B.1: Pay ratio (total) regressions without controls, firm size (sales)

This table presents regressions on the total CEO-to-worker pay ratio without control variables. Column 1 is an OLS regression, Column 2 is a year fixed effects (FE) regression, Column 3 is a year and industry FE regression and Column 4 is a year and firm FE regression. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total net sales. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (total)			
	(1)	(2)	(3)	(4)
Firm size (sales)	65.82***	64.85***	56.46***	-43.27
	(17.47)	(17.55)	(19.47)	(86.06)
Constant	-551.5***	-549.4***	-438.0**	412.4
	(166.4)	(169.2)	(197.5)	(790.0)
Observations	580	580	580	580
R-squared	0.045	0.049	0.734	0.750
Year FE	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES

Table B.2: Pay ratio (total) regressions with controls, firm size (sales)

This table presents regressions on the total CEO-to-worker pay ratio with control variables. Column 1 to 4 show regressions with controls based on Faleye et al. (2012). Models in Columns 5 to 8 are based on the models from Bebchuk et al. (2011). Column 1 and 5 are OLS regressions, Column 2 and 6 are year fixed effects (FE) regressions, Column 3 and 7 are year and industry FE regressions and Column 4 to 8 are year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total net sales. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (total)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm size (sales)	87.82***	90.28***	52.67***	-104.9	93.71***	96.26***	58.25***	-83.76
	(28.42)	(31.77)	(19.27)	(94.22)	(28.21)	(30.71)	(19.48)	(88.69)
Tobin's Q	61.37	65.30	1.142	0.603	59.75	64.82	5.113	-3.316
	(47.88)	(54.05)	(11.76)	(13.71)	(38.76)	(44.84)	(11.27)	(13.57)
RoA	276.3	249.4	85.46	292.9*	367.1	330.6	95.41	263.7
	(392.2)	(380.7)	(124.5)	(163.1)	(355.8)	(342.2)	(115.1)	(187.9)
B/M-ratio	9.145	8.624	-8.818	14.07				
	(21.41)	(21.67)	(11.17)	(19.67)				
R&D ratio	-1,477*	-1,440*	-9,948***	-14,033**	2,448	2,610	-3,271	-8,351
	(789.7)	(806.8)	(3,617)	(5,610)	(1,563)	(1,817)	(3,846)	(5,108)
R&D missing					57.12*	59.52	36.90	-371.8**
					(33.87)	(36.48)	(41.19)	(182.6)
CAPEX/assets					-530.9	-536.7	9.016	111.5
					(464.3)	(468.5)	(239.0)	(206.7)
Leverage					430.9	433.8	-10.29	-77.85
					(272.0)	(270.3)	(82.78)	(64.52)
CEO tenure					6.332**	6.353**	3.994**	4.248**
					(2.893)	(2.986)	(1.707)	(1.821)
Constant	-902.8**	-917.3**	-401.9*	946.4	-1,117***	-1,132***	-530.9**	1,089
	(363.6)	(399.3)	(209.2)	(869.1)	(380.8)	(414.4)	(209.1)	(973.5)
Observations	580	580	580	580	580	580	580	580
R-squared	0.128	0.132	0.735	0.752	0.224	0.228	0.742	0.760
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Table B.3: Pay ratio (salary) regressions without controls, firm size (assets)

This table presents regressions on the salary CEO-to-worker pay ratio without control variables. Column 1 is an OLS regression, Column 2 is a year fixed effects (FE) regression, Column 3 is a year and industry FE regression and Column 4 is a year and firm FE regression. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total assets. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (salary)			
	(1)	(2)	(3)	(4)
Firm size (assets)	6.540***	6.724***	6.802***	6.522*
	(2.177)	(2.244)	(2.005)	(3.293)
Constant	-48.93**	-49.63**	-44.62**	-47.08
	(22.11)	(22.56)	(20.77)	(30.16)
Observations	580	580	580	580
R-squared	0.067	0.073	0.870	0.922
Year FE	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES

Table B.4: Pay ratio (salary) regressions with controls, firm size (assets)

This table presents regressions on the salary CEO-to-worker pay ratio with control variables. Column 1 to 4 show regressions with controls based on Faleye et al. (2012). Models in Columns 5 to 8 are based on the models from Bebchuk et al. (2011). Column 1 and 5 are OLS regressions, Column 2 and 6 are year fixed effects (FE) regressions, Column 3 and 7 are year and industry FE regressions and Column 4 to 8 are year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total assets. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (salary)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm size (assets)	8.172**	8.967**	7.052***	7.162**	7.382**	8.149**	6.312***	7.039**
	(3.379)	(3.851)	(1.902)	(3.383)	(2.792)	(3.191)	(1.931)	(3.348)
Tobin's Q	4.409	5.478	-1.212	-0.345	3.599	4.691	-0.961	-0.0623
	(4.775)	(5.491)	(1.555)	(0.999)	(3.875)	(4.571)	(1.177)	(0.673)
RoA	24.13	21.65	-19.04	10.22*	24.46	21.34	-24.61	3.982
	(40.48)	(39.00)	(15.13)	(5.511)	(37.03)	(35.80)	(15.22)	(5.671)
CAPEX/assets					-40.59	-40.67	2.561	12.20
					(29.89)	(31.07)	(20.90)	(19.16)
Leverage					34.32	34.34	-19.94**	-6.724
					(26.27)	(26.26)	(7.655)	(7.854)
R&D ratio	246.5	266.5	1,518***	1,345**	-1,078***	-1,032***	1,430***	1,415***
	(267.2)	(268.4)	(515.4)	(529.8)	(116.7)	(145.8)	(388.2)	(483.6)
R&D missing					-28.62***	-28.07***	4.315	36.07***
					(2.556)	(2.947)	(3.826)	(13.51)
CEO tenure					-0.0904	-0.0769	0.0617	0.0555
					(0.160)	(0.169)	(0.0940)	(0.0971)
B/M-ratio	2.801	2.698	1.180	-0.586				
	(2.211)	(2.275)	(0.910)	(0.598)				
Constant	-76.79*	-83.77*	-45.04**	-52.94*	-41.93	-49.29	-34.97	-88.15**
	(42.44)	(46.36)	(19.78)	(31.27)	(36.55)	(40.60)	(21.12)	(40.32)
Observations	580	580	580	580	580	580	580	580
R-squared	0.117	0.136	0.874	0.922	0.182	0.199	0.880	0.923
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Table B.5: Pay ratio (salary) regressions without controls, firm size (sales)

This table presents regressions on the salary CEO-to-worker pay ratio without control variables. Column 1 is an OLS regression, Column 2 is a year fixed effects (FE) regression, Column 3 is a year and industry FE regression and Column 4 is a year and firm FE regression. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total net sales. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (salary)			
	(1)	(2)	(3)	(4)
Firm size (sales)	8.198***	8.374***	5.905***	5.970
	(1.914)	(1.985)	(1.997)	(4.785)
Constant	-64.68***	-65.27***	-34.02*	-41.96
	(18.62)	(19.17)	(20.24)	(43.89)
Observations	580	580	580	580
R-squared	0.087	0.094	0.869	0.921
Year FE	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES

Table B.6: Pay ratio (salary) regressions with controls, firm size (sales)

This table presents regressions on the salary CEO-to-worker pay ratio with control variables. Column 1 to 4 show regressions with controls based on Faleye et al. (2012). Models in Columns 5 to 8 are based on the models from Bebchuk et al. (2011). Column 1 and 5 are OLS regressions, Column 2 and 6 are year fixed effects (FE) regressions, Column 3 and 7 are year and industry FE regressions and Column 4 to 8 are year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All models have *t*–statistics based on robust standard errors clustered at the firm level and these standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. The independent variable is firm size and calculated as the logarithm of total net sales. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker pay ratio (Salary)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm size (sales)	9.556***	10.27***	6.794***	6.147	9.151***	9.850***	5.893***	6.110
	(2.792)	(3.177)	(2.006)	(5.443)	(2.620)	(2.942)	(2.007)	(5.373)
Tobin's Q	5.194	6.227	-0.785	0.0843	4.310	5.383	-0.675	0.283
	(4.753)	(5.433)	(1.601)	(1.135)	(3.836)	(4.495)	(1.186)	(0.826)
RoA	4.498	0.799	-27.18*	2.896	8.215	4.041	-31.01**	-2.199
	(37.72)	(35.70)	(15.87)	(6.203)	(36.38)	(35.05)	(15.46)	(7.262)
CAPEX/assets					-55.91*	-57.91*	0.269	8.793
					(32.46)	(34.21)	(20.65)	(20.02)
Leverage					37.75	38.16	-20.09**	-6.648
					(26.42)	(26.59)	(7.883)	(8.219)
R&D ratio	187.8	200.6	1,493***	1,289**	-990.9***	-939.2***	1,395***	1,363**
	(240.9)	(238.4)	(489.5)	(563.9)	(131.3)	(164.8)	(369.9)	(520.2)
R&D missing					-25.83***	-25.03***	6.113	33.56**
					(2.854)	(3.398)	(3.788)	(16.14)
CEO tenure					-0.0490	-0.0366	0.0626	0.0599
					(0.151)	(0.165)	(0.0939)	(0.0963)
B/M-ratio	3.282	3.247	1.422	-0.344				
	(2.632)	(2.731)	(0.930)	(0.585)				
Constant	-89.27**	-95.27**	-41.02*	-43.62	-61.37*	-67.86*	-30.92	-76.85
	(35.89)	(39.05)	(20.51)	(50.04)	(35.18)	(38.58)	(21.90)	(61.88)
Observations	580	580	580	580	580	580	580	580
R-squared	0.130	0.147	0.874	0.921	0.204	0.221	0.880	0.922
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

B.2 Robustness check for Hypothesis 2

Table B.7: Pay ratio (salary) regressions, CEO characteristics

This table presents regressions on the salary pay ratio. Columns 1 to 5 show OLS regressions with CEO characteristics, separately and together. Column 6 is a firm FE regression, Column 7 a year and firm FE regression and Column 8 reports a year and industry FE regression model. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. For further variable descriptions, see Table 1. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	CEO-to-worker Pay Ratio (salary)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender (dummy)	7.080***				4.534**	4.388**	-0.181	13.23***
	(2.139)				(1.992)	(2.007)	(0.740)	(0.257)
CEO age		0.165			0.342	0.372	0.264	0.153
		(0.174)			(0.259)	(0.263)	(0.269)	(0.280)
CEO tenure			-0.236		-0.441	-0.459	-0.170	-0.0897
			(0.211)		(0.307)	(0.314)	(0.182)	(0.207)
CEO change				-0.783	-1.827	-1.906	-1.381*	-1.629**
				(1.446)	(1.158)	(1.165)	(0.737)	(0.727)
Constant	12.38	10.09	20.60***	19.43***	-1.703	-2.349	0.738	5.903
	(0)	(9.653)	(2.864)	(2.040)	(11.64)	(11.75)	(12.46)	(12.97)
Observations	580	580	580	580	580	580	580	580
R-squared	0.003	0.003	0.005	0.000	0.018	0.023	0.923	0.865
Year FE	NO	NO	NO	NO	NO	YES	YES	YES
Industry FE	NO	NO	NO	NO	NO	NO	NO	YES
Firm FE	NO	NO	NO	NO	NO	NO	YES	NO

B.3 Robustness checks for Hypothesis 3

Table B.8: Regressions of one year lagged (salary) pay ratio on Tobin's Q

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. The main independent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (salary)$_{t-1}$	0.00360	0.00385	-0.00720	-0.000406	0.00455	0.00506	-0.00306	-0.000399	0.00179**	0.00180*	-0.00269	-0.000842
	(0.00998)	(0.0101)	(0.00594)	(0.00362)	(0.00311)	(0.00326)	(0.00430)	(0.00277)	(0.000858)	(0.000936)	(0.00278)	(0.00220)
Tobin's Q$_{t-1}$									0.872***	0.869***	0.570***	0.512***
									(0.0323)	(0.0308)	(0.0479)	(0.0589)
Firm size (assets)					-0.389***	-0.411***	0.165	0.351	-0.115***	-0.116***	-0.00606	-0.245
					(0.107)	(0.112)	(0.138)	(0.620)	(0.0227)	(0.0275)	(0.0583)	(0.296)
RoA					7.686***	7.536***	3.571*	1.714	0.686	0.774	0.717	-0.231
					(1.675)	(1.729)	(1.970)	(2.259)	(0.756)	(0.783)	(1.889)	(2.197)
CAPEX/assets					-1.871	-1.946	0.253	1.030	-0.460	-0.530	-0.225	0.388
					(1.876)	(1.940)	(1.206)	(1.184)	(0.402)	(0.418)	(1.042)	(1.172)
Leverage					-0.413	-0.424	0.956**	0.586	-0.122	-0.128	0.245	0.109
					(0.470)	(0.444)	(0.457)	(0.784)	(0.186)	(0.180)	(0.392)	(0.641)
R&D missing					-0.0291	-0.0287	0.0957	2.717**	-0.0910***	-0.0972***	0.0979	0.862
					(0.131)	(0.128)	(0.211)	(1.237)	(0.0337)	(0.0274)	(0.129)	(0.646)
R&D ratio					-10.82***	-11.54***	80.61***	89.30***	-4.723***	-5.200***	44.91***	38.20**
					(3.754)	(3.533)	(18.73)	(28.64)	(1.533)	(1.305)	(11.44)	(16.03)
CEO tenure									0.000151	0.000315	0.00115	0.000683
									(0.00217)	(0.00194)	(0.00254)	(0.00241)
Constant	1.569***	1.384***	1.589***	1.434***	5.175***	5.386***	-0.836	-4.804	1.513***	1.605***	0.615	2.193
	(0.204)	(0.219)	(0.149)	(0.0557)	(1.137)	(1.124)	(1.296)	(6.731)	(0.262)	(0.298)	(0.585)	(3.200)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.006	0.050	0.795	0.840	0.513	0.552	0.822	0.847	0.828	0.839	0.867	0.877
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Table B.9: Regressions of one year lagged (salary) pay ratio on Return on Assets (RoA)

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. The main independent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (salary)$_{t-1}$	0.000438	0.000448	-0.000689	0.000369	0.000169	0.000146	-0.000651*	4.88e-05	3.55e-05	2.87e-05	-0.000382	8.15e-05
	(0.000692)	(0.000696)	(0.000532)	(0.000369)	(0.000219)	(0.000213)	(0.000359)	(0.000208)	(8.10e-05)	(7.26e-05)	(0.000257)	(0.000175)
RoA $_{t-1}$									0.661***	0.675***	0.361***	0.234**
									(0.0502)	(0.0455)	(0.0657)	(0.0914)
Firm size (assets)					0.00989	0.0107	0.00290	-0.00466	0.00204	0.00206	-0.000473	-0.0117
					(0.0113)	(0.0119)	(0.0119)	(0.0250)	(0.00332)	(0.00336)	(0.00852)	(0.0234)
Tobin's Q					0.0499***	0.0512***	0.0261	0.0115	0.0171***	0.0168***	0.0184	0.0103
					(0.00580)	(0.00586)	(0.0165)	(0.0157)	(0.00418)	(0.00387)	(0.0113)	(0.0129)
CAPEX/assets					0.336**	0.337**	0.566***	0.615***	0.106**	0.110**	0.356***	0.474***
					(0.128)	(0.132)	(0.132)	(0.177)	(0.0479)	(0.0510)	(0.115)	(0.158)
Leverage					0.0124	0.0165	-0.0697**	-0.0873**	0.00304	0.00428	-0.0510***	-0.0685**
					(0.0326)	(0.0328)	(0.0273)	(0.0333)	(0.0122)	(0.0118)	(0.0183)	(0.0269)
R&D missing					-0.00214	-0.00208	-0.0542***	-0.0791	-0.00798	-0.00805	-0.0580***	-0.126*
					(0.0165)	(0.0165)	(0.0145)	(0.0667)	(0.00782)	(0.00719)	(0.0143)	(0.0702)
R&D ratio					-0.0407	0.00578	-6.240***	-3.970**	-0.435	-0.418	-6.846***	-5.557***
					(0.424)	(0.411)	(1.522)	(1.950)	(0.278)	(0.252)	(1.453)	(2.077)
CEO tenure									-0.000420	-0.000463*	-0.000240	-0.000392
									(0.000279)	(0.000263)	(0.000311)	(0.000339)
Constant	0.0759***	0.0508***	0.0711***	0.0615***	-0.120	-0.146	0.0595	0.165	-0.0156	-0.0324	0.0803	0.266
	(0.0145)	(0.0147)	(0.0136)	(0.00756)	(0.112)	(0.116)	(0.120)	(0.283)	(0.0304)	(0.0295)	(0.0834)	(0.265)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.017	0.042	0.715	0.782	0.456	0.477	0.777	0.823	0.725	0.750	0.814	0.836
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Table B.10: Regressions of one year lagged (total) pay ratio on stock returns (Ret)

This table presents regressions on Stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. The main independent variable is CEO-to-worker pay ratio (total) for all regressions. It is defined as total CEO compensation in a year divided by average employee year salary. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (total)$_{t-1}$	-5.34e-05	-2.23e-05	8.48e-06	1.78e-05	0.000134**	0.000150**	4.97e-05	4.83e-05	0.000111	0.000127*	1.99e-05	1.07e-05
	(5.91e-05)	(5.27e-05)	(0.000143)	(0.000146)	(5.94e-05)	(6.08e-05)	(0.000156)	(0.000171)	(7.38e-05)	(7.26e-05)	(0.000166)	(0.000184)
Ret$_{t-1}$									-0.0532	0.0313	-0.0257	-0.0290
									(0.0604)	(0.0634)	(0.0861)	(0.0976)
Firm size (assets)					-0.0921***	-0.0838***	-0.0632	-0.324*	-0.0857***	-0.0752***	-0.0542	-0.308*
					(0.0240)	(0.0241)	(0.0457)	(0.190)	(0.0280)	(0.0256)	(0.0466)	(0.164)
RoA					-1.041**	-0.853*	-1.225	-1.511	-0.941**	-0.800	-1.132	-1.384
					(0.398)	(0.471)	(1.207)	(1.626)	(0.468)	(0.499)	(1.343)	(1.831)
CAPEX/assets					-0.0822	-0.0773	-1.173	-1.231	-0.0262	-0.0528	-1.119	-1.220
					(0.366)	(0.347)	(1.460)	(1.797)	(0.374)	(0.337)	(1.491)	(1.835)
Leverage					-0.135	-0.186	-0.159	-0.298	-0.146	-0.168	-0.173	-0.331
					(0.140)	(0.140)	(0.232)	(0.400)	(0.147)	(0.139)	(0.232)	(0.401)
R&D missing					-0.115***	-0.120***	-0.0404	-0.372	-0.0899**	-0.0877**	0.0464	-0.178
					(0.0300)	(0.0263)	(0.188)	(0.611)	(0.0373)	(0.0348)	(0.192)	(0.577)
R&D ratio					-7.400***	-7.653***	-0.0940	-11.38	-6.101***	-5.887***	8.718	-1.943
					(1.087)	(0.878)	(21.51)	(21.80)	(2.010)	(1.823)	(21.12)	(21.55)
CEO tenure									0.00371	0.00355	0.00517	0.00535
									(0.00349)	(0.00338)	(0.00374)	(0.00400)
Constant	0.199***	0.419***	0.428***	0.530***	1.373***	1.483***	1.280**	4.107*	1.263***	1.348***	1.052*	3.684**
	(0.0192)	(0.0703)	(0.0712)	(0.0672)	(0.263)	(0.281)	(0.540)	(2.057)	(0.340)	(0.334)	(0.568)	(1.783)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.001	0.140	0.224	0.236	0.043	0.174	0.242	0.259	0.048	0.177	0.245	0.262
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Table B.11: Regressions of one year lagged (salary) pay ratio on stock returns (Ret)

This table presents regressions on Stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 12 show regressions with controls based on Bebchuk et al. (2011). Columns 1, 5, and 9 show OLS regressions. Columns 2, 6 and 10 illustrate year FE regressions, Columns 3, 7 and 11 show year and industry FE regressions and Columns 4, 8 and 12 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. The main independent variable is CEO-to-worker pay ratio (salary) for all regressions. It is defined as total CEO salary in a year divided by average employee year salary. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Pay ratio (salary)$_{t-1}$	-0.000778	-0.000778	0.00104	0.00158	0.000612	0.000511	3.92e-06	0.00231	0.000567	0.000491	-0.000391	0.00168
	(0.000582)	(0.000610)	(0.00144)	(0.00193)	(0.000819)	(0.000831)	(0.00212)	(0.00194)	(0.000859)	(0.000828)	(0.00220)	(0.00198)
Ret$_{t-1}$									-0.0537	0.0316	-0.0258	-0.0289
									(0.0607)	(0.0638)	(0.0858)	(0.0973)
Firm size (assets)					-0.0858***	-0.0757***	-0.0596	-0.329*	-0.0796***	-0.0673***	-0.0506	-0.313*
					(0.0245)	(0.0254)	(0.0470)	(0.192)	(0.0270)	(0.0251)	(0.0469)	(0.166)
RoA					-0.955**	-0.745	-1.221	-1.513	-0.864*	-0.702	-1.142	-1.390
					(0.411)	(0.486)	(1.253)	(1.623)	(0.464)	(0.497)	(1.385)	(1.827)
CAPEX/assets					-0.0865	-0.0928	-1.156	-1.257	-0.0171	-0.0523	-1.106	-1.248
					(0.366)	(0.347)	(1.461)	(1.812)	(0.370)	(0.332)	(1.490)	(1.848)
Leverage					-0.115	-0.157	-0.165	-0.285	-0.131	-0.145	-0.185	-0.314
					(0.149)	(0.153)	(0.240)	(0.385)	(0.154)	(0.150)	(0.240)	(0.384)
R&D missing					-0.101**	-0.109***	-0.0433	-0.262	-0.0705*	-0.0699*	0.0379	-0.0997
					(0.0393)	(0.0375)	(0.192)	(0.591)	(0.0420)	(0.0391)	(0.192)	(0.559)
R&D ratio					-6.936***	-7.330***	-0.713	-7.093	-5.306***	-5.141***	7.880	1.016
					(1.360)	(1.227)	(21.67)	(20.91)	(1.975)	(1.763)	(21.24)	(20.81)
CEO tenure									0.00449	0.00444	0.00530	0.00507
									(0.00323)	(0.00313)	(0.00362)	(0.00382)
Constant	0.208***	0.432***	0.403***	0.510***	1.288***	1.384***	1.253**	4.009*	1.169***	1.237***	1.038*	3.629**
	(0.0210)	(0.0695)	(0.0837)	(0.0805)	(0.259)	(0.281)	(0.545)	(2.068)	(0.314)	(0.310)	(0.558)	(1.788)
Observations	522	522	522	522	522	522	522	522	522	522	522	522
R-squared	0.001	0.142	0.224	0.236	0.040	0.170	0.242	0.260	0.046	0.175	0.245	0.262
Year FE	NO	YES	YES	YES	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

B.4 Robustness checks for Hypothesis 4

Table B.12: Regressions on Tobin's Q with pay ratio (salary), country differences

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Dummy variables on the country level and interaction terms between countries and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	-0.0173	-0.0164	0.0196**	-0.000798	-0.00107	-0.00107	0.0101**	0.00199
	(0.0111)	(0.0112)	(0.00868)	(0.00816)	(0.00220)	(0.00237)	(0.00444)	(0.00599)
I = DAX (GER)	-0.120	-0.138	0.291	-1.020***	0.0283	0.0230	0.171	0.0236
	(0.468)	(0.479)	(0.281)	(0.167)	(0.0797)	(0.0853)	(0.135)	(0.779)
I = DOW (U.S.)	-0.204	-0.190	0.907***	1.112***	0.0315	0.0324	0.419**	1.045***
	(0.342)	(0.348)	(0.325)	(0.100)	(0.0590)	(0.0658)	(0.183)	(0.310)
DAX * Pay ratio (salary)$_{t-1}$	0.00267	0.00325	-0.0235**	0.0102	2.88e-05	0.000307	-0.0124**	0.00185
	(0.0172)	(0.0175)	(0.0109)	(0.00933)	(0.00308)	(0.00328)	(0.00505)	(0.00719)
DOW * Pay ratio (salary) $_{t-1}$	0.0279**	0.0271**	-0.0252***	-0.00581	0.00433**	0.00434*	-0.0137***	-0.00640
	(0.0126)	(0.0128)	(0.00892)	(0.00821)	(0.00212)	(0.00220)	(0.00442)	(0.00525)
Tobin's Q $_{t-1}$					0.849***	0.844***	0.547***	0.510***
					(0.0329)	(0.0326)	(0.0490)	(0.0599)
Firm size (assets)					-0.132***	-0.135***	-0.0191	-0.263
					(0.0242)	(0.0304)	(0.0781)	(0.297)
RoA					0.577	0.676	0.292	-0.308
					(0.726)	(0.763)	(2.014)	(2.204)
CAPEX/assets					-0.735*	-0.817*	-0.139	0.295
					(0.428)	(0.449)	(1.141)	(1.139)
Leverage					-0.211	-0.216	0.0801	0.0768
					(0.184)	(0.176)	(0.468)	(0.625)
R&D missing					-0.163***	-0.164***	0.202	1.000
					(0.0510)	(0.0465)	(0.136)	(0.678)
R&D ratio					-6.981***	-7.286***	70.75***	43.85**
					(2.612)	(2.478)	(12.05)	(19.85)
CEO tenure					-0.00139	-0.00128	0.000643	0.000730
					(0.00230)	(0.00215)	(0.00227)	(0.00236)
Constant	1.904***	1.725***	0.898***	1.437***	1.856***	1.960***	0.423	2.203
	(0.264)	(0.278)	(0.227)	(0.102)	(0.281)	(0.330)	(0.653)	(3.138)
Observations	522	522	522	522	522	522	522	522
R-squared	0.129	0.167	0.816	0.842	0.832	0.843	0.871	0.877
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Table B.13: Regressions on return on assets with pay ratio (salary), country differences

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. Dummy variables on the country level and interaction terms between countries and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	0.00111	0.00118	0.00145**	0.000566	0.000578	0.000605*	0.000180	-0.000188
	(0.00155)	(0.00157)	(0.000695)	(0.000937)	(0.000359)	(0.000355)	(0.000492)	(0.000598)
I = DAX (GER)	0.0444	0.0449	0.0298	-0.0888***	0.0124	0.0130	0.000960	-0.0310
	(0.0385)	(0.0391)	(0.0266)	(0.0183)	(0.00809)	(0.00791)	(0.0175)	(0.0638)
I = DOW (U.S.)	0.0427	0.0439	0.0936***	0.0886***	0.0203***	0.0206***	0.0462**	0.0695***
	(0.0352)	(0.0355)	(0.0295)	(0.0117)	(0.00750)	(0.00724)	(0.0215)	(0.0217)
DAX * Pay ratio (salary)$_{t-1}$	-0.00221	-0.00225	-0.00168*	0.000837	-0.000563	-0.000595	-0.000190	0.000916
	(0.00170)	(0.00173)	(0.000922)	(0.00104)	(0.000389)	(0.000390)	(0.000535)	(0.000693)
DOW * Pay ratio (salary)$_{t-1}$	-0.000398	-0.000469	-0.00184**	-0.000906	-0.000524	-0.000561	-0.000363	-8.53e-05
	(0.00163)	(0.00165)	(0.000776)	(0.000984)	(0.000381)	(0.000374)	(0.000536)	(0.000609)
RoA$_{t-1}$					0.643***	0.657***	0.310***	0.229**
					(0.0461)	(0.0420)	(0.0802)	(0.0922)
Firm size (assets)					-0.00171	-0.00193	0.000982	-0.0129
					(0.00303)	(0.00301)	(0.00959)	(0.0236)
Tobin's Q					0.0159***	0.0155***	0.0147	0.00972
					(0.00390)	(0.00367)	(0.0117)	(0.0129)
CAPEX/assets					0.0675	0.0716	0.390***	0.462***
					(0.0452)	(0.0475)	(0.113)	(0.152)
Leverage					0.00116	0.00303	-0.0686***	-0.0717***
					(0.0129)	(0.0120)	(0.0182)	(0.0259)
R&D missing					-0.00847	-0.00838	-0.0450**	-0.140*
					(0.00714)	(0.00681)	(0.0206)	(0.0799)
R&D ratio					-0.338	-0.321	-5.295**	-6.064**
					(0.259)	(0.245)	(2.055)	(2.674)
CEO tenure					-0.000572*	-0.000607**	-0.000358	-0.000398
					(0.000303)	(0.000290)	(0.000318)	(0.000341)
Constant	0.0535	0.0273	0.0159	0.0587***	0.0163	0.000319	0.0519	0.297
	(0.0320)	(0.0314)	(0.0201)	(0.0143)	(0.0296)	(0.0289)	(0.0842)	(0.264)
Observations	522	522	522	522	522	522	522	522
R-squared	0.141	0.166	0.745	0.786	0.732	0.756	0.823	0.838
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Table B.14: Regressions on stock returns with pay ratio (total), country differences

This table presents regressions on stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Dummy variables on the country level and interaction terms between countries and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	-0.00101**	-0.000962*	-0.000916**	-0.00103*	-0.000156	-0.000210	-0.000795	-0.00124*
	(0.000481)	(0.000514)	(0.000390)	(0.000572)	(0.000498)	(0.000451)	(0.000510)	(0.000708)
I = DAX (GER)	-0.0169	-0.0198	0.0205	-0.0644	0.0770	0.0663	0.0470	0.493
	(0.0881)	(0.0890)	(0.0627)	(0.157)	(0.102)	(0.0933)	(0.0743)	(0.402)
I = DOW (U.S.)	-0.0348	-0.0386	-0.0474	-0.126***	0.0891	0.0667	0.0747	0.340*
	(0.0563)	(0.0584)	(0.0732)	(0.0170)	(0.0673)	(0.0606)	(0.0952)	(0.181)
DAX * Pay ratio (total)$_{t-1}$	0.000255	0.000276	0.000292	0.000197	-0.000473	-0.000396	-7.37e-05	0.000560
	(0.000721)	(0.000742)	(0.000542)	(0.000885)	(0.000798)	(0.000742)	(0.000697)	(0.000918)
DOW * Pay ratio (total) $_{t-1}$	0.000972**	0.000961*	0.00103**	0.00112*	0.000240	0.000318	0.000903*	0.00131*
	(0.000483)	(0.000515)	(0.000410)	(0.000587)	(0.000468)	(0.000421)	(0.000511)	(0.000728)
Ret$_{t-1}$					-0.0543	0.0293	-0.0245	-0.0262
					(0.0599)	(0.0619)	(0.0838)	(0.0961)
Firm size (assets)					-0.0934**	-0.0799**	-0.0372	-0.288*
					(0.0367)	(0.0325)	(0.0607)	(0.158)
RoA					-1.097**	-0.930*	-1.334	-1.414
					(0.513)	(0.539)	(1.509)	(1.828)
CAPEX/assets					-0.395	-0.370	-1.014	-1.121
					(0.429)	(0.372)	(1.460)	(1.805)
Leverage					-0.145	-0.166	-0.265	-0.339
					(0.125)	(0.120)	(0.295)	(0.406)
R&D missing					-0.0918	-0.0910	0.0337	-0.641
					(0.0661)	(0.0622)	(0.219)	(0.652)
R&D ratio					-4.802	-4.869*	-3.692	-18.93
					(3.125)	(2.910)	(24.31)	(25.34)
CEO tenure					0.00290	0.00295	0.00584	0.00627
					(0.00346)	(0.00335)	(0.00380)	(0.00406)
Constant	0.257***	0.475***	0.556***	0.551***	1.353***	1.407***	1.031*	3.974**
	(0.0536)	(0.0752)	(0.0833)	(0.0661)	(0.371)	(0.359)	(0.607)	(1.691)
Observations	522	522	522	522	522	522	522	522
R-squared	0.014	0.153	0.230	0.240	0.063	0.189	0.253	0.267
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

Table B.15: Regressions on stock returns with pay ratio (salary), country differences

This table presents regressions on stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate year FE regressions, Columns 3 and 7 show year and industry FE regressions and Columns 4 and 8 show year and firm FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Dummy variables on the country level and interaction terms between countries and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	-0.00548*	-0.00551*	-0.00308	-0.00171	-0.000352	-0.000577	0.00163	0.000572
	(0.00313)	(0.00310)	(0.00354)	(0.00633)	(0.00278)	(0.00259)	(0.00472)	(0.00752)
I = DAX (GER)	-0.131	-0.129	-0.0432	-0.309**	0.0353	0.0266	0.0954	0.279
	(0.0984)	(0.0978)	(0.105)	(0.142)	(0.112)	(0.104)	(0.128)	(0.491)
I = DOW (U.S.)	-0.0648	-0.0656	-0.0217	-0.128	0.0909	0.0739	0.191	0.406*
	(0.0799)	(0.0797)	(0.106)	(0.0776)	(0.0814)	(0.0766)	(0.155)	(0.221)
DAX * Pay ratio (salary)$_{t-1}$	0.00638*	0.00628*	0.00508	0.00338	5.33e-05	0.000241	-0.00116	0.00401
	(0.00370)	(0.00369)	(0.00423)	(0.00700)	(0.00389)	(0.00368)	(0.00581)	(0.00821)
DOW * Pay ratio (salary)$_{t-1}$	0.00517	0.00521*	0.00532	0.00395	0.00180	0.00189	-0.000740	-0.000496
	(0.00314)	(0.00310)	(0.00364)	(0.00633)	(0.00249)	(0.00227)	(0.00514)	(0.00755)
Ret$_{t-1}$					-0.0554	0.0262	-0.0271	-0.0289
					(0.0598)	(0.0634)	(0.0866)	(0.0975)
Firm size (assets)					-0.100***	-0.0853**	-0.0765	-0.320*
					(0.0374)	(0.0336)	(0.0641)	(0.166)
RoA					-1.152**	-0.964*	-1.303	-1.437
					(0.502)	(0.536)	(1.525)	(1.844)
CAPEX/assets					-0.360	-0.347	-1.042	-1.294
					(0.432)	(0.372)	(1.513)	(1.885)
Leverage					-0.185	-0.195	-0.196	-0.331
					(0.124)	(0.123)	(0.283)	(0.388)
R&D missing					-0.0929	-0.0934	0.143	-0.173
					(0.0678)	(0.0634)	(0.212)	(0.638)
R&D ratio					-4.923	-5.016*	10.47	-1.569
					(3.222)	(2.984)	(23.09)	(24.90)
CEO tenure					0.00254	0.00270	0.00512	0.00503
					(0.00342)	(0.00330)	(0.00368)	(0.00384)
Constant	0.286***	0.512***	0.509***	0.553***	1.433***	1.469***	1.161*	3.790**
	(0.0780)	(0.0912)	(0.117)	(0.108)	(0.376)	(0.367)	(0.597)	(1.717)
Observations	522	522	522	522	522	522	522	522
R-squared	0.008	0.149	0.226	0.236	0.062	0.187	0.248	0.263
Year FE	NO	YES	YES	YES	NO	YES	YES	YES
Industry FE	NO	NO	YES	NO	NO	NO	YES	NO
Firm FE	NO	NO	NO	YES	NO	NO	NO	YES

B.5 Robustness checks for Hypothesis 6

Table B.16: Regressions on Tobin's Q with pay ratio (salary), year differences

This table presents regressions on Tobin's Q. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is Tobin's Q and this is measured as the market value of equity minus book value of equity plus book value of assets, all divided by book value of assets. Year dummy variables and interaction terms between years and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Tobin's Q							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	0.00248	-0.00817	-0.00220	-0.00179	-0.00186	-0.00523	-0.00316	-0.00371
	(0.00716)	(0.00726)	(0.00561)	(0.00558)	(0.00172)	(0.00327)	(0.00351)	(0.00285)
Year = 2010	-0.0171	0.0142	0.0141	0.0199	-0.218**	-0.141	-0.0890	-0.127
	(0.0587)	(0.0696)	(0.0668)	(0.0667)	(0.100)	(0.101)	(0.0963)	(0.101)
Year = 2011	-0.150**	-0.115	-0.119	-0.110	-0.359***	-0.275***	-0.234***	-0.271***
	(0.0595)	(0.0853)	(0.0774)	(0.0796)	(0.0833)	(0.0892)	(0.0745)	(0.0852)
Year = 2012	0.104	0.0976	0.0848	0.0882	-0.0259	0.0188	0.0472	0.0102
	(0.0739)	(0.0769)	(0.0717)	(0.0716)	(0.0473)	(0.0632)	(0.0538)	(0.0595)
Year = 2013	0.312**	0.316***	0.266**	0.276**	-0.0433	0.0825	0.117	0.0678
	(0.124)	(0.109)	(0.107)	(0.106)	(0.0740)	(0.0783)	(0.0735)	(0.0762)
Year = 2014	0.366***	0.398***	0.363***	0.370***	-0.0937	0.0722	0.128	0.0623
	(0.131)	(0.133)	(0.127)	(0.128)	(0.111)	(0.118)	(0.104)	(0.111)
Year = 2015	0.369*	0.397*	0.361*	0.363*	-0.198	0.00301	0.0828	-0.00409
	(0.209)	(0.212)	(0.212)	(0.209)	(0.198)	(0.233)	(0.196)	(0.224)
Year = 2016	0.183	0.207	0.180	0.184	-0.357***	-0.172**	-0.0873	-0.182**
	(0.137)	(0.132)	(0.134)	(0.133)	(0.0819)	(0.0758)	(0.0855)	(0.0772)
Year = 2017	0.248	0.283	0.261	0.267	-0.120	0.00993	0.0779	-0.00478
	(0.164)	(0.180)	(0.176)	(0.176)	(0.0970)	(0.134)	(0.127)	(0.131)
2010* Pay ratio (salary)$_{t-1}$	0.00254	0.000617	0.000796	0.000508	0.00410	0.00283	0.00241	0.00274
	(0.00158)	(0.00247)	(0.00208)	(0.00217)	(0.00252)	(0.00255)	(0.00246)	(0.00247)
2011* Pay ratio (salary)$_{t-1}$	0.00545**	0.00364	0.00384	0.00343	0.00625**	0.00530	0.00517	0.00532*
	(0.00222)	(0.00433)	(0.00374)	(0.00391)	(0.00256)	(0.00319)	(0.00311)	(0.00307)
2012* Pay ratio (salary)$_{t-1}$	-0.00184	-0.00125	-0.000774	-0.000950	-0.00157	-0.00166	-0.00148	-0.00134
	(0.00279)	(0.00344)	(0.00289)	(0.00292)	(0.00112)	(0.00155)	(0.00155)	(0.00138)
2013* Pay ratio (salary)$_{t-1}$	-0.00302	-0.00391	-0.000857	-0.00136	0.00367*	0.000649	0.00124	0.00158
	(0.00553)	(0.00355)	(0.00336)	(0.00338)	(0.00205)	(0.00216)	(0.00247)	(0.00224)
2014* Pay ratio (salary)$_{t-1}$	-0.00394	-0.00604	-0.00399	-0.00436	9.72e-05	-0.00240	-0.00212	-0.00161
	(0.00566)	(0.00547)	(0.00488)	(0.00499)	(0.00350)	(0.00421)	(0.00399)	(0.00386)
2015* Pay ratio (salary)$_{t-1}$	-0.00327	-0.00488	-0.00293	-0.00304	0.00469	0.000929	0.000655	0.00176
	(0.00819)	(0.00800)	(0.00769)	(0.00762)	(0.00545)	(0.00685)	(0.00648)	(0.00646)
2016* Pay ratio (salary)$_{t-1}$	0.00577	0.00341	0.00549	0.00530	0.0119***	0.00833***	0.00854**	0.00957***
	(0.00747)	(0.00613)	(0.00622)	(0.00622)	(0.00272)	(0.00275)	(0.00382)	(0.00303)
2017* Pay ratio (salary)$_{t-1}$	0.00893	0.00649	0.00802	0.00769	0.00704*	0.00603	0.00708	0.00741
	(0.00858)	(0.00903)	(0.00871)	(0.00875)	(0.00403)	(0.00557)	(0.00614)	(0.00561)
Tobin's Q$_{t-1}$					0.873***	0.583***	0.516***	0.561***
					(0.0312)	(0.0495)	(0.0626)	(0.0514)
Firm size (assets)					-0.112***	0.00343	-0.145	0.0540
					(0.0259)	(0.0563)	(0.284)	(0.0760)

RoA					0.741	0.595	-0.368	0.202
					(0.841)	(1.990)	(2.279)	(2.099)
CAPEX/assets					-0.417	-0.238	0.258	0.116
					(0.372)	(0.995)	(1.138)	(1.092)
Leverage					-0.197*	0.0939	-0.155	-0.114
					(0.107)	(0.243)	(0.386)	(0.278)
R&D missing					-0.0953***	0.146	1.178*	0.0885
					(0.0349)	(0.129)	(0.638)	(0.145)
R&D ratio					-5.465***	48.04***	46.45***	52.25***
					(1.625)	(11.73)	(16.07)	(10.87)
CEO tenure					-0.000546	0.000371	-0.000226	-0.000802
					(0.00202)	(0.00266)	(0.00260)	(0.00245)
Constant	1.411***	1.624***	1.462***	1.449***	1.650***	0.569	1.077	0.167
	(0.176)	(0.165)	(0.0934)	(0.123)	(0.277)	(0.572)	(3.113)	(0.695)
Observations	522	522	522	522	522	522	522	522
R-squared	0.059	0.803	0.846	0.818	0.846	0.873	0.882	0.875
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO

Table B.17: Regressions on return on assets with pay ratio (salary), year differences

This table presents regressions on return on assets. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is return on assets and this is measured as operating income after depreciation divided by book value of total assets in percentages. Year dummy variables and interaction terms between years and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Return on Assets (RoA)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	0.000804	-0.000487	0.000474	0.000148	1.68e-05	-0.000341	0.000118	-3.74e-05
	(0.000524)	(0.000601)	(0.000479)	(0.000433)	(0.000298)	(0.000366)	(0.000292)	(0.000282)
Year = 2010	0.0308***	0.0306***	0.0315***	0.0313***	0.0381***	0.0347***	0.0348***	0.0343***
	(0.00764)	(0.00811)	(0.00822)	(0.00806)	(0.0116)	(0.00972)	(0.00936)	(0.00953)
Year = 2011	0.0262**	0.0255**	0.0262**	0.0261**	0.0135	0.0180	0.0196	0.0176
	(0.0113)	(0.0124)	(0.0127)	(0.0124)	(0.0140)	(0.0128)	(0.0135)	(0.0130)
Year = 2012	0.0332***	0.0301***	0.0291***	0.0293***	0.0167**	0.0183**	0.0193***	0.0171**
	(0.00858)	(0.00828)	(0.00821)	(0.00809)	(0.00719)	(0.00704)	(0.00713)	(0.00696)
Year = 2013	0.0387***	0.0380***	0.0319***	0.0342***	0.0159*	0.0192**	0.0197**	0.0169**
	(0.0111)	(0.00826)	(0.00820)	(0.00806)	(0.00850)	(0.00733)	(0.00765)	(0.00705)
Year = 2014	0.0339**	0.0345***	0.0306**	0.0319**	0.00932	0.0129	0.0157*	0.0117
	(0.0127)	(0.0122)	(0.0120)	(0.0120)	(0.0110)	(0.00823)	(0.00896)	(0.00834)
Year = 2015	0.0521***	0.0531***	0.0490***	0.0498***	0.0284**	0.0305**	0.0329**	0.0284**
	(0.0179)	(0.0176)	(0.0176)	(0.0173)	(0.0138)	(0.0121)	(0.0138)	(0.0124)
Year = 2016	0.0412***	0.0408***	0.0379***	0.0386***	0.00867	0.0184**	0.0235***	0.0170**
	(0.0135)	(0.0123)	(0.0129)	(0.0125)	(0.00781)	(0.00802)	(0.00876)	(0.00773)
Year = 2017	0.0378***	0.0372***	0.0356***	0.0357***	0.0124	0.0170*	0.0213**	0.0155*
	(0.0118)	(0.0112)	(0.0114)	(0.0111)	(0.0123)	(0.00869)	(0.00970)	(0.00870)
2010* Pay ratio (salary)$_{t-1}$	-0.000183	-0.000211	-0.000229	-0.000229	-5.51e-05	-0.000124	-0.000162	-0.000137
	(0.000170)	(0.000203)	(0.000185)	(0.000187)	(0.000303)	(0.000218)	(0.000199)	(0.000210)
2011* Pay ratio (salary)$_{t-1}$	-4.38e-05	-1.21e-05	-4.04e-05	-3.75e-05	0.000201	6.71e-05	3.26e-05	6.07e-05
	(0.000244)	(0.000305)	(0.000290)	(0.000290)	(0.000362)	(0.000300)	(0.000294)	(0.000296)
2012* Pay ratio (salary)$_{t-1}$	-0.000408	-0.000224	-0.000202	-0.000201	-3.13e-05	-5.47e-05	-6.07e-05	-3.17e-05
	(0.000276)	(0.000241)	(0.000199)	(0.000205)	(0.000216)	(0.000163)	(0.000164)	(0.000169)
2013* Pay ratio (salary)$_{t-1}$	-0.000554	-0.000601**	-0.000216	-0.000358	-5.38e-06	-0.000177	-2.35e-05	-3.61e-05
	(0.000520)	(0.000251)	(0.000245)	(0.000235)	(0.000243)	(0.000202)	(0.000192)	(0.000187)
2014* Pay ratio (salary)$_{t-1}$	-0.000422	-0.000503	-0.000263	-0.000345	0.000104	-3.93e-05	2.73e-05	5.46e-05
	(0.000447)	(0.000360)	(0.000320)	(0.000330)	(0.000316)	(0.000216)	(0.000230)	(0.000228)
2015* Pay ratio (salary)$_{t-1}$	-0.00109*	-0.00116**	-0.000939*	-0.000989*	-0.000537	-0.000590*	-0.000482	-0.000449
	(0.000592)	(0.000529)	(0.000498)	(0.000494)	(0.000385)	(0.000344)	(0.000382)	(0.000357)
2016* Pay ratio (salary)$_{t-1}$	-0.000528	-0.000631	-0.000383	-0.000452	0.000330	2.28e-05	0.000105	0.000177
	(0.000591)	(0.000415)	(0.000448)	(0.000421)	(0.000241)	(0.000210)	(0.000301)	(0.000230)
2017* Pay ratio (salary)$_{t-1}$	-0.000283	-0.000321	-0.000181	-0.000210	8.86e-05	5.56e-05	0.000205	0.000221
	(0.000413)	(0.000313)	(0.000310)	(0.000297)	(0.000458)	(0.000313)	(0.000339)	(0.000322)

RoA_{t-1}					0.682***	0.365***	0.239**	0.318***
					(0.0462)	(0.0673)	(0.0939)	(0.0821)
Firm size (assets)					0.00184	-0.000253	-0.00914	0.00272
					(0.00334)	(0.00873)	(0.0257)	(0.00975)
Tobin's Q					0.0161***	0.0173	0.00905	0.0136
					(0.00396)	(0.0116)	(0.0133)	(0.0120)
CAPEX/assets					0.105**	0.344***	0.461***	0.384***
					(0.0509)	(0.118)	(0.159)	(0.118)
Leverage					0.00463	-0.0490**	-0.0722**	-0.0713***
					(0.0118)	(0.0195)	(0.0291)	(0.0194)
R&D missing					-0.00875	-0.0557***	-0.111	-0.0469***
					(0.00738)	(0.0131)	(0.0754)	(0.0164)
R&D ratio					-0.474*	-6.459***	-5.064**	-5.391***
					(0.275)	(1.354)	(2.124)	(1.457)
CEO tenure					-0.000475*	-0.000238	-0.000409	-0.000390
					(0.000274)	(0.000309)	(0.000347)	(0.000330)
Constant	0.0437***	0.0696***	0.0583***	0.0522***	-0.0286	0.0767	0.230	0.0438
	(0.0132)	(0.0154)	(0.0103)	(0.0119)	(0.0280)	(0.0842)	(0.288)	(0.0859)
Observations	522	522	522	522	522	522	522	522
R-squared	0.050	0.724	0.787	0.747	0.754	0.817	0.839	0.825
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO

Table B.18: Regressions on stock returns with pay ratio (total), year differences

This table presents regressions on stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Year dummy variables and interaction terms between years and the one-year-lagged total CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (total)$_{t-1}$	-0.000503	-0.000512	-0.000509	-0.000508	-0.000399	-0.000508	-0.000532	-0.000517
	(0.000308)	(0.000335)	(0.000329)	(0.000336)	(0.000271)	(0.000349)	(0.000372)	(0.000359)
Year = 2010	-0.267***	-0.268***	-0.268***	-0.268***	-0.273***	-0.230**	-0.214**	-0.224**
	(0.0865)	(0.0902)	(0.0919)	(0.0905)	(0.0899)	(0.0877)	(0.0924)	(0.0871)
Year = 2011	-0.566***	-0.564***	-0.563***	-0.564***	-0.568***	-0.527***	-0.509***	-0.522***
	(0.0938)	(0.0974)	(0.0993)	(0.0977)	(0.0911)	(0.0888)	(0.0933)	(0.0889)
Year = 2012	-0.182*	-0.177	-0.178	-0.177	-0.181*	-0.140	-0.121	-0.136
	(0.104)	(0.106)	(0.109)	(0.107)	(0.102)	(0.0956)	(0.0961)	(0.0951)
Year = 2013	-0.130	-0.123	-0.124	-0.123	-0.142	-0.0857	-0.0630	-0.0815
	(0.103)	(0.106)	(0.108)	(0.106)	(0.103)	(0.100)	(0.106)	(0.101)
Year = 2014	-0.327**	-0.316**	-0.313**	-0.317**	-0.343***	-0.280**	-0.245**	-0.276**
	(0.123)	(0.130)	(0.134)	(0.130)	(0.109)	(0.110)	(0.108)	(0.109)
Year = 2015	-0.365***	-0.355**	-0.354**	-0.355**	-0.369***	-0.306**	-0.267**	-0.300**
	(0.134)	(0.141)	(0.145)	(0.142)	(0.123)	(0.134)	(0.129)	(0.133)
Year = 2016	-0.336***	-0.328***	-0.325***	-0.328***	-0.322***	-0.289***	-0.236**	-0.282***
	(0.0895)	(0.0950)	(0.0978)	(0.0952)	(0.0834)	(0.0849)	(0.0896)	(0.0841)
Year = 2017	-0.273***	-0.265**	-0.262**	-0.265**	-0.270***	-0.224**	-0.172*	-0.218**
	(0.0957)	(0.101)	(0.104)	(0.101)	(0.0940)	(0.0963)	(0.102)	(0.0973)
2010* Pay ratio (total)$_{t-1}$	0.000531*	0.000535*	0.000535*	0.000533*	0.000536*	0.000509*	0.000513*	0.000509*
	(0.000308)	(0.000311)	(0.000310)	(0.000311)	(0.000278)	(0.000302)	(0.000306)	(0.000305)
2011* Pay ratio (total)$_{t-1}$	0.000658**	0.000646**	0.000640*	0.000644**	0.000659**	0.000649**	0.000656*	0.000652**
	(0.000313)	(0.000320)	(0.000322)	(0.000320)	(0.000276)	(0.000319)	(0.000331)	(0.000323)
2012* Pay ratio (total)$_{t-1}$	0.000234	0.000190	0.000205	0.000190	0.000336	0.000199	0.000207	0.000196
	(0.000406)	(0.000401)	(0.000416)	(0.000402)	(0.000417)	(0.000396)	(0.000413)	(0.000397)
2013* Pay ratio (total)$_{t-1}$	0.000521	0.000469	0.000469	0.000468	0.000618*	0.000484	0.000489	0.000487
	(0.000338)	(0.000326)	(0.000332)	(0.000326)	(0.000357)	(0.000330)	(0.000344)	(0.000333)
2014* Pay ratio (total)$_{t-1}$	0.000570	0.000484	0.000457	0.000485	0.000701	0.000563	0.000531	0.000565
	(0.000528)	(0.000564)	(0.000564)	(0.000564)	(0.000540)	(0.000607)	(0.000606)	(0.000607)
2015* Pay ratio (total)$_{t-1}$	0.000195	0.000119	0.000113	0.000120	0.000308	0.000113	0.000117	0.000118
	(0.000529)	(0.000576)	(0.000597)	(0.000577)	(0.000522)	(0.000582)	(0.000589)	(0.000576)
2016* Pay ratio (total)$_{t-1}$	0.000600*	0.000538	0.000513	0.000538	0.000641**	0.000585	0.000566	0.000596
	(0.000322)	(0.000349)	(0.000360)	(0.000349)	(0.000303)	(0.000362)	(0.000408)	(0.000369)
2017* Pay ratio (total)$_{t-1}$	0.000582*	0.000522	0.000497	0.000522	0.000706**	0.000601	0.000618	0.000621
	(0.000327)	(0.000355)	(0.000371)	(0.000356)	(0.000348)	(0.000409)	(0.000478)	(0.000422)
Ret$_{t-1}$					0.0348	-0.0205	-0.0241	-0.0220
					(0.0631)	(0.0850)	(0.0961)	(0.0848)
Firm size (assets)					-0.0737***	-0.0472	-0.284*	-0.0559
					(0.0255)	(0.0484)	(0.163)	(0.0577)
RoA					-0.802	-1.169	-1.461	-1.375
					(0.503)	(1.367)	(1.861)	(1.534)
CAPEX/assets					0.0138	-1.187	-1.314	-1.076
					(0.322)	(1.501)	(1.870)	(1.497)
Leverage					-0.195	-0.234	-0.440	-0.290
					(0.141)	(0.237)	(0.413)	(0.276)
R&D missing					-0.0904**	0.0808	-0.0544	0.136
					(0.0349)	(0.200)	(0.622)	(0.201)
R&D ratio					-6.088***	12.00	2.017	11.06
					(1.826)	(21.81)	(22.83)	(21.86)
CEO tenure					0.00347	0.00481	0.00507	0.00475
					(0.00341)	(0.00376)	(0.00407)	(0.00377)
Constant	0.472***	0.486***	0.575***	0.485***	1.399***	1.029*	3.418*	1.090*
	(0.0862)	(0.0845)	(0.0858)	(0.0847)	(0.350)	(0.602)	(1.804)	(0.630)
Observations	522	522	522	522	522	522	522	522
R-squared	0.150	0.233	0.244	0.234	0.187	0.255	0.272	0.258
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO

Table B.19: Regressions on stock returns with pay ratio (salary), year differences

This table presents regressions on stock returns. Columns 1 to 4 show regressions without control variables. Columns 5 to 8 show regressions with controls based on Bebchuk et al. (2011). Columns 1 and 5 show OLS regressions. Columns 2 and 6 illustrate industry FE regressions, Columns 3 and 7 show firm FE regressions and Columns 4 and 8 show industry and country FE regressions. The fixed effects are not shown in the table, but a row is added with YES when they are included in the model. All regressions have *t*–statistics based on robust standard errors clustered at the firm-level. The standard errors are reported between parentheses. The dependent variable for all regressions is stock returns and this is measured as the price at the end of the year minus the initial price plus dividend per share, all divided by the initial stock price. Year dummy variables and interaction terms between years and the one-year-lagged salary CEO-to-worker pay ratio are included. See Table 1 for further variable explanations. *, **, and *** indicate significance at 10%, 5% and 1% level, respectively.

Variable	Stock returns (Ret)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pay ratio (salary)$_{t-1}$	-0.00335*	-0.00131	-0.000897	-0.00118	-0.00193	-0.00264	-0.000690	-0.00150
	(0.00194)	(0.00280)	(0.00315)	(0.00300)	(0.00208)	(0.00318)	(0.00345)	(0.00320)
Year = 2010	-0.271***	-0.264**	-0.262**	-0.263**	-0.276**	-0.217**	-0.194*	-0.207**
	(0.101)	(0.104)	(0.106)	(0.104)	(0.105)	(0.0984)	(0.102)	(0.0975)
Year = 2011	-0.583***	-0.571***	-0.568***	-0.570***	-0.579***	-0.528***	-0.505***	-0.521***
	(0.0975)	(0.102)	(0.104)	(0.102)	(0.0954)	(0.0950)	(0.0990)	(0.0947)
Year = 2012	-0.193*	-0.182	-0.181	-0.182	-0.179*	-0.137	-0.115	-0.133
	(0.111)	(0.114)	(0.116)	(0.114)	(0.106)	(0.101)	(0.0984)	(0.0995)
Year = 2013	-0.0951	-0.0854	-0.0836	-0.0854	-0.0978	-0.0233	-0.00214	-0.0224
	(0.118)	(0.120)	(0.122)	(0.120)	(0.118)	(0.110)	(0.113)	(0.110)
Year = 2014	-0.226	-0.213	-0.211	-0.213	-0.224*	-0.145	-0.110	-0.142
	(0.150)	(0.159)	(0.163)	(0.159)	(0.134)	(0.138)	(0.135)	(0.135)
Year = 2015	-0.432***	-0.423**	-0.422**	-0.423**	-0.417***	-0.338**	-0.296*	-0.333**
	(0.154)	(0.161)	(0.165)	(0.162)	(0.147)	(0.167)	(0.164)	(0.162)
Year = 2016	-0.371***	-0.361***	-0.359***	-0.361***	-0.348***	-0.300***	-0.247**	-0.294***
	(0.0936)	(0.0951)	(0.0961)	(0.0951)	(0.0910)	(0.0903)	(0.0954)	(0.0885)
Year = 2017	-0.294***	-0.279***	-0.277**	-0.278***	-0.276***	-0.220**	-0.167	-0.214**
	(0.0962)	(0.103)	(0.105)	(0.103)	(0.0976)	(0.104)	(0.113)	(0.104)
2010* Pay ratio (salary)$_{t-1}$	0.00312	0.00280	0.00272	0.00278	0.00295	0.00237	0.00207	0.00226
	(0.00264)	(0.00276)	(0.00282)	(0.00278)	(0.00269)	(0.00276)	(0.00284)	(0.00275)
2011* Pay ratio (salary)$_{t-1}$	0.00473*	0.00413	0.00402	0.00411	0.00448	0.00398	0.00374	0.00390
	(0.00270)	(0.00301)	(0.00308)	(0.00302)	(0.00277)	(0.00323)	(0.00337)	(0.00320)
2012* Pay ratio (salary)$_{t-1}$	0.00190	0.00130	0.00122	0.00128	0.00174	0.000992	0.000856	0.000968
	(0.00278)	(0.00281)	(0.00284)	(0.00281)	(0.00271)	(0.00267)	(0.00269)	(0.00263)
2013* Pay ratio (salary)$_{t-1}$	0.00103	0.000653	0.000579	0.000661	0.00117	-0.000497	-0.000250	-0.000176
	(0.00328)	(0.00336)	(0.00347)	(0.00337)	(0.00330)	(0.00353)	(0.00369)	(0.00352)
2014* Pay ratio (salary)$_{t-1}$	-0.00207	-0.00262	-0.00273	-0.00262	-0.00220	-0.00370	-0.00382	-0.00351
	(0.00429)	(0.00475)	(0.00492)	(0.00478)	(0.00449)	(0.00524)	(0.00537)	(0.00511)
2015* Pay ratio (salary)$_{t-1}$	0.00418	0.00377	0.00372	0.00378	0.00394	0.00194	0.00184	0.00209
	(0.00432)	(0.00461)	(0.00477)	(0.00465)	(0.00447)	(0.00541)	(0.00553)	(0.00522)
2016* Pay ratio (salary)$_{t-1}$	0.00533**	0.00500**	0.00489*	0.00500**	0.00519**	0.00410	0.00400	0.00432*
	(0.00261)	(0.00247)	(0.00249)	(0.00247)	(0.00237)	(0.00259)	(0.00295)	(0.00250)
2017* Pay ratio (salary)$_{t-1}$	0.00442*	0.00372	0.00366	0.00372	0.00441	0.00340	0.00343	0.00356
	(0.00230)	(0.00270)	(0.00279)	(0.00272)	(0.00286)	(0.00346)	(0.00405)	(0.00346)
Ret$_{t-1}$					0.0328	-0.0271	-0.0318	-0.0288
					(0.0635)	(0.0847)	(0.0964)	(0.0850)
Firm size (assets)					-0.0651**	-0.0430	-0.277*	-0.0605
					(0.0249)	(0.0478)	(0.166)	(0.0558)
RoA					-0.697	-1.173	-1.401	-1.324
					(0.517)	(1.472)	(1.916)	(1.582)
CAPEX/assets					-0.0221	-1.137	-1.339	-1.043
					(0.322)	(1.501)	(1.868)	(1.499)
Leverage					-0.173	-0.258	-0.429	-0.279
					(0.146)	(0.228)	(0.363)	(0.258)
R&D missing					-0.0744*	0.0596	0.00519	0.145
					(0.0404)	(0.193)	(0.570)	(0.196)
R&D ratio					-5.588***	9.790	3.788	10.77
					(1.847)	(21.08)	(21.07)	(20.73)
CEO tenure					0.00415	0.00515	0.00497	0.00488
					(0.00317)	(0.00367)	(0.00391)	(0.00370)
Constant	0.483***	0.452***	0.555***	0.449***	1.274***	1.018*	3.265*	1.097*
	(0.0874)	(0.100)	(0.0994)	(0.106)	(0.319)	(0.568)	(1.794)	(0.581)
Observations	522	522	522	522	522	522	522	522
R-squared	0.153	0.235	0.246	0.235	0.185	0.256	0.273	0.258
Industry FE	NO	YES	NO	YES	NO	YES	NO	YES
Country FE	NO	NO	NO	YES	NO	NO	NO	YES
Firm FE	NO	NO	YES	NO	NO	NO	YES	NO