Income inequality in S&P 500 companies

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ABSTRACT

Income inequality in the United States has grown significantly in the last decades and has been drawing a lot of attention from the media, public, and academia. One important argument on this epidemic is that executive compensation and financial-sector pay have driven the income inequality. In this paper, I create a simple metric to calculate the CEO-to-worker compensation ratio, called the "Pay Ratio", and examine its relation to the firm performance and pay-performance sensitivities (PPS). I also evaluate the impact of CEO ability on such associations, which is frequently used as a justification for high pay ratios. The findings suggest that the Pay Ratio and firm performance are positively associated, however only when you pay more to a high-ability CEO. In addition, PPS and Pay Ratio is also positively associated, again only with a high-ability CEO. Interestingly, I find that PPS weakens when a low-ability CEO is paid more. Also, the positive association between Pay Ratio and firm performance weakens with a chair-CEO, proving the value deteriorating impact of expropriation. Findings promise to shed light to the ability-entrenchment question in the executive compensation literature. Overall, I suggest that how much more CEOs are paid compared to the workers actually matters and CEO ability plays a key role on how the ratio affects the firm.

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1. Introduction

Income inequality in the United States has grown significantly in the last decades and has been drawing a lot of attention from the media, public, and academia. Former U.S. President Barack Obama referred to the widening income gap as the "defining challenge of our time" (PBS NewsHour, 2013). Robert J. Shiller, the Nobel prize winner for economics in 2013, believes that rising economic inequality in the United States and other countries is "the most important problem that we are facing now" (The Huffington Post, 2013). One of the arguments on this epidemic is that executive compensation and financial-sector pay have driven the income inequality (Mishel and Sabadish, 2012). In his controversial movie, Michael Moore suggests that "The richest 1 percent have more financial wealth than the bottom 95 percent combined" (PolitiFact, 2009) and adds "400 wealthiest Americans have more wealth than half of all Americans combined" (PolitiFact, 2011). The growth of inequality provoked the political protest movement called Occupy Wall Street, with the main slogan "We are the 99%", referring the dissatisfaction with the concentration of income in the top 1% (Wikipedia, 2014; Mishel & Bivens, 2011).

Considering the fact that executive compensation and financial sector are viewed as one of the reasons of the income inequality problem, it is crucial to examine the income inequality within the corporations. The evaluation of the income dispersion among executives and workers may reveal the severity of the issue, allow us to detect the sources leading to it, and more importantly shed light to possible ways of overcoming the income inequality problem. In fact, the significant income growth at the very top of the income distribution over the last few decades was largely driven by households headed by someone who was either an executive or was employed in the financial sector (Mishel and Sabahdish, 2013). The financial industry's 2014 bonuses were double the combined earnings of all Americans who work full-time at the federal minimum wage (Institute for Policy Studies, 2015). In addition, the reaction from the media was notable when the former Chief Executive Officer (CEO) J.C. Penney Co., Ron Johnson, got a compensation package worth 1795 times the average wage and benefits of a U.S. department store worker when he was hired in November 2011 (Bloomberg, 2013).

The skyrocketed CEO-to-worker compensation ratios generate strong reactions from the public and validate the necessity of a possible CEO pay-ratio cap once suggested by Peter Drucker (Drucker, 1982), following the notion that if a CEO wants to get more pay, he needs to do it by raising the average salary of the workers. The U.S. Securities and Exchange Commission (SEC) recently adopted a final rule requiring companies to reveal the pay gap between the chief executive officer and their typical worker (SEC, 2017). According to this new rule, mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act, a public company would have to disclose the ratio of the compensation of its chief executive officer (CEO) to the median compensation of its employees, beginning in January 2017. This suggests that the financial markets and the regulators are well aware of the income inequality problem within the corporations, and they are trying to overcome the issue. This matter was recognized in the last couple years by the public and the media, especially after many studies published by the Economic Policy Institute, one of which had reported that CEOs earned about 30 times their employees' compensation in 1978, and the pay ratio had jumped to more than 300 as of 2014 (Mishel & Davis, 2015).

In this paper, I create a simple metric to report the income inequality in corporations, similar to the one in the new SEC rule that mandates companies to disclose income ratios. Economic Policy Institute created a "CEO-to-worker compensation ratio" (Mishel & Sabadish, 2013) and it has been generating strong reactions from the financial sector ever since. In the study, it was reported that

across the Standard & Poor's 500 Index of companies, the average multiple of CEO compensation to that of rank-and-file workers is 204, up 20 percent since 2009". Following their methodology, I create a similar metric, called "The Pay Ratio", which compares the CEO Compensation to the average workers' compensation using S&P 500 companies is the U.S. equity markets. The recent literature on corporate pay inequality examines its relation to firm performance and finds conflicting results. While Faleye, Reis, and Venkateswaran, (2013) and Mueller, Ouimet, and Simintzi, (2017) find a positive relation between pay inequality and firm performance, Cronqvist, Heyman, Nilsson, Svaleryd, and Vlachos, (2009), find that the relation between wage gap and firm performance is not significant. In this paper, I intend to shed light to this rising question and examine the association between the Pay Ratio and corporate governance, namely firm performance and pay-performance sensitivities.

One significant contribution of this paper is that it examines the possible impact of CEO ability on the CEO Compensation, and therefore on the Pay Ratio. It is widely accepted that there is positive relation between CEO ability and Firm Performance (Bertrand and Schoar (2003); Pérez-González (2006); Falato, Li, and Milbourn, (2015) suggesting that more talented CEOs provide better firm performance. Plus, Faleye et al. (2013) and Mueller et al. (2017) attribute the positive relation between pay inequality and firm performance to higher managerial skills. This paper aims to extend this strand of the literature. In addition, the association between CEO ability and compensation contracts has also been well-documented in the literature. However, the direction of such relation is not agreed upon. On the one hand, literature suggests that CEO pay should be increased in order to attract and retain talented CEOs (Baker, Jensen, and Murphy, (1988); Rose and Shepard (1997); Rosen (1982)). On the other hand, high CEO pay is often associated with agency issues and Rent Seeking CEOs (Bebchuk, Fried, and Walker, (2002); Bebchuk and Fried (2004)). In order to further provide evidence towards this matter, I include the assessment of the possible CEO ability impact on the Pay Ratio. I create an "Ability Index" that evaluates the relative ability of the CEOs in the sample. The index combines widely used ability proxies in the literatures and calculates an index score, similar to the Opacity Index in Anderson, Duru, and Reeb, (2009).

I find that the Pay Ratio and firm performance are positively associated, implying that paying CEOs relatively more may help improve firm performance. Interestingly, high ratios belong to firms with High-Ability CEOs, which points out the need to shed light to the impact of CEO Ability. Further evaluation reveals that the positive association between The Pay Ratio and firm performance exists only when CEO ability is high. In fact, the positive link disappears when the firm has a low-ability CEO. Therefore, it suggests that paying more helps only when CEO talent is high.

When a firm pays relatively more to its CEO, it not only expects to have a better firm performance, but also stronger pay-performance sensitivities (PPS) to assure better future performance. Therefore, I extend my analysis to the relation between the Pay Ratio and PPS. I find that PPS is positively associated to The Pay Ratio, which implies that paying a CEO relatively more may improve the pay-performance sensitivities. Supporting earlier findings, further evaluation reveals that PPS improves only when you pay more to a high-ability CEO. More importantly, PPS decreases when a Low-Ability CEO gets higher pay. Overall, my findings suggest that CEO Ability plays a key role on the relation between the Pay Ratio and PPS.

Finally, further analysis on corporate governance, using CEO duality, reveals that the positive association between Pay Ratio and firm performance weakens with a chair-CEO, proving the value deteriorating impact of expropriation. It also invites future research on the association between governance quality and pay performance sensitivities. As robustness test, I consider the possibility

that my findings could be driven by firm complexity, rather than CEO ability. Rosen (1982) and Rose and Shepard (1997) argue that high-ability CEOs are matched with more complex firms. Therefore, any finding that supports my arguments may be driven by firm complexity, rather than CEO ability. As an attempt to overcome this concern, I create a propensity score matched sample, in which I have firms with high- and low-ability CEOs matched on their predicted propensities to be a complex firm. Supporting my earlier results, I find that the positive relation between the Pay Ratio and firm performance exists only when CEO ability is high. In addition, PPS results are also supporting the main results. More pay to a high-ability CEO improves PPS, while such link disappears for a low-ability CEO.

This study makes two potential contributions to literature. First and foremost, by examining the CEO-worker pay ratio, it extends the growing literature of corporate pay ratio, which constantly attracts more attention from regulators, media, and public. My analysis highlights the possibility that CEO-worker pay ratio is a significant factor for firm performance and more importantly pay performance sensitivities. Secondly, my analysis brings to light the notion that CEO ability is an important factor when it comes to the relation between the CEO-worker pay ratio and corporate governance issues.

The remainder of the paper is organized as follows: Section 2 explains the Pay Ratio in detail, while Section 3 introduces the idea that CEO ability is crucial for the association between The Pay Ratio and corporate governance. Section 4 describes the data, variables of interest, and control variables. Section 5 provides univariate and multivariate analysis results for the impact on firm performance. Pay performance sensitivity analysis results are presented in Section 6. Section 7 examines the impact of corporate governance quality on the pay inequality and pay performance sensitivities, while Section 8 presents the results of the complexity-matched sample evaluation as a robustness check, and Section 9 concludes the paper.

2. The Pay Ratio

Income dispersion within corporations could be measured using a simple CEO-to-worker compensation ratio, in a similar manner how the Gini Coefficient[1] is used to measure the dispersion of income distribution of a nation's residents. Such a metric will not only report the income inequality figures, but also could be used as an indicator for other crucial issues, such as corporate governance problems, firm performance glitches, financial transparency concerns, and earnings management acts.

Following the methodology of the Economic Policy Institute study in which they introduce the "CEO-to-worker compensation ratio" (Mishel & Sabadish, 2013), I create a similar metric that compares the CEO Compensation to the average workers' compensation, called the "*Pay Ratio*". In this paper, I expand the use of the metric for wider purposes, such as to summarize the inequality in the whole corporation, to examine the association between the pay ratio and corporate governance, namely firm performance and pay-performance sensitivities.

2.1. Details about the calculation of the Pay Ratio

The Pay Ratio is a simple relative measure of the CEO compensation to the average workers' compensation. While CEO compensation belongs to the individual CEOs for each company,

workers' compensation is the average of the industry. The intent of the ratio is to report how much more a CEO is making compared to the average worker compensation for each company.

$$PayRatio = \frac{\left[\begin{array}{c} CEO \\ Compensation \end{array}\right]}{\left[\begin{array}{c} AverageWorkers' \\ Compensation \end{array}\right]}$$

For each company, CEO compensation is calculated as the total compensation, using the value of option grants. Average workers' compensation was calculated using the average hourly worker compensation for each industry. For more detailed explanation of the measure and the industry definitions, please see the Economic Policy Institute paper (Mishel & Sabadish, 2013). To overcome possible econometric issues, and as robustness check, an alternative measure of Pay Ratio is also created using "Average CEO Compensation" and "Average Worker Compensation" per industry. More discussion is included in Section 5.3.

For the S&P 500 companies between 1998–2016, the average multiple of CEO compensation to that of workers is 244. This implies that, on average, CEOs were making 244 times more than their workers. Fig. 1 displays the average Pay Ratio between 1998 and 2016. The highest yearly average Pay Ratio was 371 in 2001, and the lowest yearly average Pay Ratio was 185 in 2010. Fig. 1 also displays the average firm performance along with the Pay Ratio. The relatively synchronized movement of the Pay Ratio and the firm performance encourages further analysis on the association among the two, which is basically the main research question of the paper. Fig. 2 presents the breakdown of the CEO compensation and workers' compensation between 1998 and 2016, in which the left axis belongs to the CEO compensation, while the right axis belongs to the workers' compensation.

3. CEO Ability and compensation contracts

CEO ability, also referred to in the literature as CEO talent, CEO skill, and decision-making ability, is commonly associated with corporate governance issues, such as investing and financing decisions (Bertrand & Schoar, 2003), earnings quality (Francis, Huang, Rajgopal, & Zang, 2008; Malmendier & Tate, 2008), and firm performance (Pérez-González (2006), Falato et al. (2015)). The empirical link between CEO ability and firm performance suggests that CEOs with greater ability levels provide better firm performance for their shareholders (Bertrand and Schoar (2003); Pérez-González (2006); Falato et al. (2015). Such an implication brings out the question if those CEOs with high ability deserve to be paid more, and emphasizes the importance of the association between CEO ability and compensation contracts, which is among the main interests of the paper.

Under contracting view, CEO pay is examined through the principal agent models and it is used to reduce the agency problem that arises because of the separation of ownership and control, i.e. CEOs often own very little of the firms they control (1986, Bertrand & Mullainathan, 2001; Murphy, 1985). The current literature examines if CEOs are paid excessively and offer two major strands of explanations. On one hand, there is the "managerial entrenchment" argument, which reflects pure agency issues. It suggests that CEO pay contracts are set by the rent-extracting executives with the power to influence their own pay (Bebchuk & Fried, 2003, 2004; Bebchuk et al., 2002; Bertrand & Mullainathan, 2001; Blanchard, Lopez-de-Silanes, & Shleifer, 1994; Yermack, 1997). The leading alternative explanation, the "ability" argument, suggests that compensation contracts are in fact associated to CEO ability. It is suggested that the compensation for top level management is determined based on their talent and the compensation packages

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[1] **Gini coefficient** is a measure of statistical dispersion intended to represent the income or wealth distribution of a nation's residents, and is the most commonly used measurement of inequality
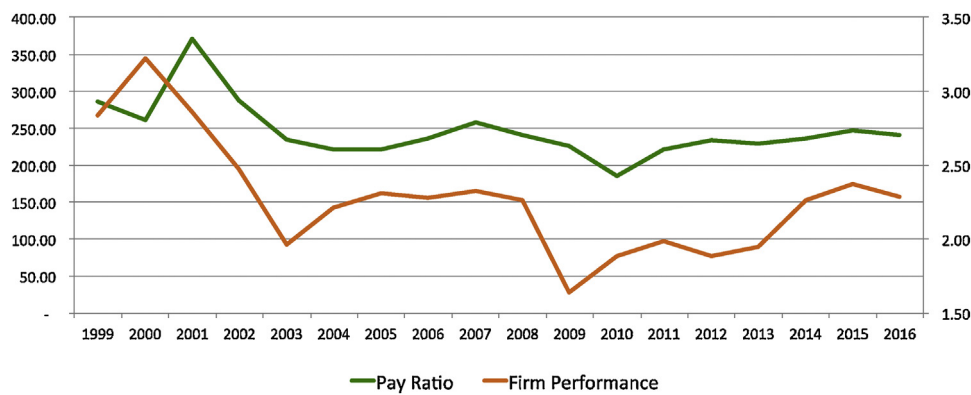
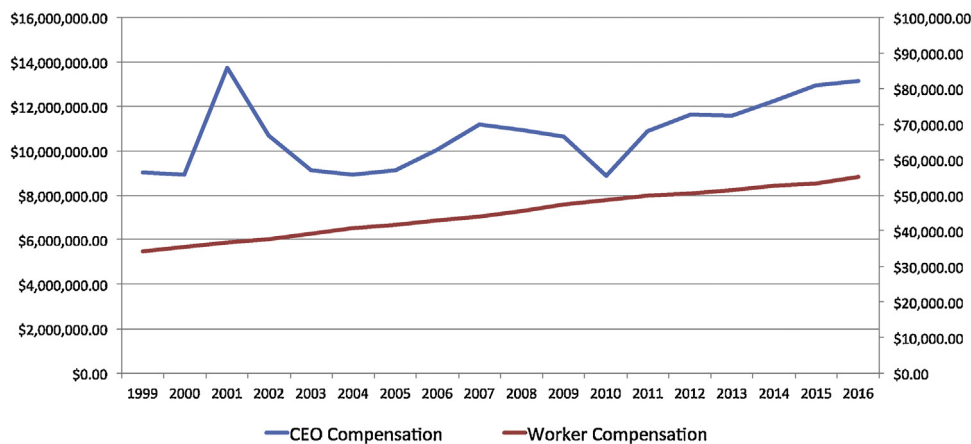**Fig. 1.** Average Pay Ratio between.1998–2016.

Fig. 2. Average CEO and Workers' Compensation between 1998–2016.

are designed to attract and retain appropriate managerial talent (Rose & Shepard, 1997; Rosen, 1982). Yet, the literature lacks agreement on the matter.

With the rise of the "corporate income inequality" topic, CEO ability gains importance again. Whenever there is a discussion about executive compensation, it is nearly impossible to separate the topic of CEO ability, mainly because CEO ability is used to justify the rising CEO pay. Recent literature on corporate income inequality focuses on the centrality of the rising skill premium to the overall growth of earnings inequality. (Autor, 2014). In addition, Faleye et al. (2013) and Mueller et al. (2017) provide evidence that the larger wage gap reflects higher managerial skills. In this paper, I follow the recent literature and suggest that the ability level of the CEO might be an important factor for income inequality in corporations and I examine the impact of CEO ability on the association between the Pay Ratio, firm performance and pay-performance sensitivities. This promises to shed light to the ability-entrenchment question in the executive compensation literature.

3.1. The ability index

It is very difficult to quantify CEO ability and a CEO's true underlying ability is unobservable (Milbourn, 2003). Therefore, the literature offers a variety of ability measures and every measure has its own advantageous and disadvantageous side. For example, an observable CEO characteristic, such as CEO age, might capture CEO ability through accumulating expertise, however it does not reflect an actual CEO action. Thus, in this paper I refrained from using a single CEO ability measure, but I rather create an index, called "*Ability Index*", using the most commonly used ability proxies in the literature.

The Ability Index evaluates the relative ability of the CEOs in the sample and calculates an index score, similar to the Opacity Index in Anderson et al. (2009). The index uses four different CEO ability proxies, namely CEO age (Milbourn, 2003), CEO tenure (Murphy, 1986), CEO education (Bertrand & Schoar, 2003), and CEO Reputation (Banker, Darrough, Huang, & Plehn-Dujowich, 2012; Rajgopal, Shevlin, & Zamora, 2006). In a similar manner to Anderson et al. (2009), Ability Index is a composite index of CEO ability measured by ranking the four individual proxies for ability (age, tenure, education, and reputation) in deciles with the highest ability CEOs taking a value of 10. Because CEO education is a dummy variable, it is converted into 10 if the CEO had an MBA degree from an elite university, 1 otherwise. The index is constructed in such a way that the degree of CEO Ability increases as the index score increases.

4. Data and variables

The recent SEC rule requiring companies to reveal the pay gap between the chief executive officer and their typical worker was effective January 1st, 2017 (SEC, 2017), therefore, my sample goes until 2016. The sample consists of the companies included in the S&P 500 Index between 1998 and 2016. I obtain the company and industry data from COMPUSTAT and CRSP databases. The final sample consists of 376 unique firms and 5981 firm-year observations.

4.1. Data for the relative compensation index

The Pay Ratio is calculated as a simple ratio of CEO compensation to average workers' compensation. For each company, CEO compensation is calculated as the total compensation, using the value of option grants. The data is gathered from EXECUCOMP

Table 1
Descriptive statistics.

Panel A: Descriptive statistics for the entire sample.

Variables	Mean	Median	Std. Dev.	Min	Max
Pay Ratio	243.87	180.22	446.31	0.00	23,107.79
Tobin's q *(t)*	2.25	1.74	1.75	0.46	43.92
Return on Assets *(t)*	0.06	0.06	0.08	−1.09	0.90
Ability Index	0.5121	0.5000	0.1805	0.10	1.00
CEO Age	56.36	57.00	6.53	30.00	83.00
CEO Tenure	6.80	5.00	6.68	0.00	53.00
MBA Dummy	0.33	0	0.47	0.00	1.00
CEO Reputation	0.0076	0.0019	0.0858	−2.2844	0.4803
Total Compensation	10,948.18	8,397.97	15,726.16	0.00	655,488
Total Assets	57,126.40	11,863.34	193,577.23	82.02	2,573,126
R&D Intensity (%)	4.42	2.51	5.68	0.00	67.98
Capital Expenditure (%)	4.56	3.08	5.00	0.00	50.69
Growth (%)	0.0033	0.0004	0.0238	−0.1690	0.9588
Debt ratio (%)	19.20	17.23	14.87	0.00	140.42
Risk (%)	11.63	8.16	16.98	0.36	494.85

Panel B: Correlation Matrix of key variables

	Pay Ratio	Ability Index	Tobin's q	Return on Assets	Total Compensation
Pay Ratio	1.0000				
Ability Index	0.013	1.0000			
	(0.29)				
Tobin's q	0.071	0.129	1.0000		
	(<.001)	(<.001)			
Return on Assets	0.043	0.207	0.405	1.0000	
	(<.001)	(<.001)	(<.001)		
Total Compensation	0.966	0.023	0.034	0.031	1.0000
	(<.001)	(0.07)	(0.008)	(0.017)	

database. Average workers' compensation was calculated using the average hourly worker compensation for each industry. The data was gathered from Bureau of Labor Statistics and Bureau of Economic Analysis. For more detailed explanation of the measure and the industry definitions, please see the Economic Policy Institute paper (Mishel & Sabadish, 2013).

4.2. Data for ability index

Ability index consists of four different ability proxies previously used in the literature, namely age, tenure, education and reputation. The data for *CEO age* and *CEO tenure* was gathered from COMPUSTAT database. *CEO education* is a dummy variable that equals one if CEO has an MBA degree from an elite university,[2] zero otherwise. The CEO education data was hand-collected from proxy statements. *CEO reputation* is the average firm performance for the prior three years. It is measured using Return on Assets and the data comes from COMPSUTAT database.

4.3. Data for pay performance sensitivities

Following Jensen and Murphy (1990), pay performance sensitivity (PPS) values were measured by the correlation coefficient between the change in market value and change in the value of stocks and options. The change in market value is the industry-adjusted change and the data was gathered from COMPUSTAT. The change in the value of stocks and options data was collected from EXECUCOMP database.

4.4. Data for control variables

I use Tobin's q as the measure of firm performance. Tobin's q is calculated as the ratio of the market value of the firm to its book value. Natural log of Tobin's Q is used in the multivariate analysis, following the literature (Chung & Jo, 1996; Gomplers, Ishii, & Metrick, 2008). Relevant data values are gathered from COMPUSTAT database.

I control for the factors included in the literature that potentially affect executive compensation and firm value. *Firm size* is measured by the natural log of book value of total assets. *Research and Development (R&D) Intensity* is calculated as the R&D expenses, scaled by total assets. *Capital expenditure* is the ratio of capital expenses to total assets. Sales growth over total assets is used to control for growth opportunities, and included as the *Growth* variable. *Debt Ratio* is measured by scaling long-term debt by total assets. Standard deviation of monthly stock returns for the prior 3 fiscal years is included as the *Risk* variable. *Prior performance* is the return on assets (ROA) from the previous year, calculated as the ratio of net income over the book value of total assets from the prior year. Lastly, I include dummy variables for each 2-digit SIC code and for each year in my sample.

5. Firm performance and the pay ratio

One of the main interests of this paper is to examine the relation between Pay Ratio and firm performance. The details of the univariate and multivariate analysis are described below.

5.1. Univariate analysis

Panel A in Table 1 displays the descriptive statistics for the variables of the entire sample, such as mean, median, standard deviation. Panel B displays correlation matrix of the key variables. The average multiple of CEO compensation to that of workers is 244.

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[2] US News Elite School Rankings: http://colleges.usnews.rankingsandreviews. com/best-colleges/rankings/national-universities?int=9ff208

Table 2
Descriptive Statistics: Mean Difference Tests.

Panel A: Mean Difference Test Results for the entire sample.

Variables	Mean Value		Difference	t value	
	High Pay Ratio	Low Pay Ratio			
Tobin's q	2.31	2.17	0.15	2.60	***
Return on Assets	0.07	0.06	0.01	3.99	***
Ability Index	0.5297	0.5005	0.0290	4.23	***
CEO Age	56.79	55.78	1.01	4.82	***
CEO Tenure	7.22	6.77	0.45	1.95	*
MBA Dummy	0.38	0.34	0.04	2.82	***
CEO Reputation	0.0055	0.0058	0.0003	0.12	
Total Compensation	17,324	4,822	125021	29.05	***
Total Assets	89,974	25,406	64,567	10.49	***
R&D Intensity (%)	4.41	4.33	0.80	0.32	
Capital Expenditure (%)	4.36	4.67	−0.32	−2.06	**
Growth (%)	0.0002	0.0005	−0.0003	−3.25	***
Debt ratio (%)	19.10	19.45	−0.35	−0.74	
Risk (%)	12.54	10.71	1.82	3.11	***
Number of Observations	1,993	1,993			

Panel B: Mean Difference Test Results for the Firms with High- and Low- Ability CEOs.

Variables	Mean Value				Firms with Low-Ability CEOs			
	Firms with High-Ability CEOs							
	High Relative Comp. Ratio	Low Relative Comp. Ratio	t value		High Relative Comp. Ratio	Low Relative Comp. Ratio	t value	
Tobin's q	2.59	2.38	2.53	**	2.02	1.97	0.68	
Return on Assets	0.09	0.08	2.59	***	0.05	0.04	2.04	*
Total Compensation	18,544	19,502	26.61	***	16,005	4,406	16.51	***
Total Assets	80,910	21,586	7.53	***	98,497	29,771	7.26	***
R&D Intensity (%)	4.45	3.99	1.58	4.32	4.73	−1.10		
Capital Expenditure (%)	4.68	4.46	1.08	4.07	4.84	−3.32		***
Growth (%)	0.0002	0.0004	−2.29	***	0.0002	0.0006	2.24	**
Debt ratio (%)	18.00	17.29	1.13	20.58	21.23	−0.93		
Risk (%)	13.73	12.76	0.95	11.08	8.89	3.88		***
Number of Observations	997	997		997	997			

This implies that, on average, CEOs were making 244 times more than their workers. The average age of the CEO in the sample is about 56, while they stay in office for about 7 years, on average. 33% of the CEOs have an MBA degree from an elite university. The average total compensation is about $11 million.

In addition, the sample consists of 5981 observations, with a mean total assets size of $57.13 billion and less than 1% growth rate, scaled by firm size. These firms have R&D expenses of 4.42% of their firm size and capital expenses of close to 4.56% of their firm size, on average. In terms of leverage, the firms in the sample finance 19% of their assets by long-term debt. These firms have an average of 11.6% standard deviation in their stock returns. Correlation coefficients are displayed in Panel B and the findings are consistent with the previous literature, in the notion that CEO ability, firm performance and total compensation variables are positively related with the pay ratio. Specifically, relative pay increases with CEO ability, market and book-value measures of firm performance, and total CEO compensation.

I continue my univariate analysis with mean difference tests to examine the impact of Pay Ratio on the variables of interest. Panel A in Table 2 presents a comparison of the mean values of firms with high Pay Ratios and firms with low Pay Ratio. The distinction in the Pay Ratio levels are set by ranking the firm based on their Pay Ratios and comparing the top and bottom thirds of the sample. The final column in the table gives the t-statistics for the mean difference tests. Firms with high Pay Ratios have significantly higher performance figures, compared to those with low Pay Ratios, measured both with market value measure (Tobin's q, 2.31 > 2.17) and book value measure (ROA, 0.07 > 0.06). This result suggests that there exists a positive association between the Pay Ratio and firm performance. In other words, paying relatively more to CEOs may

help improve firm performance. Interestingly, high Pay Ratios seem to belong to firms with high-ability CEOs (0.5297 > 0.5005), which implies that further evaluation of the impact of CEO Ability may be needed.

In order to further assess the relation between Pay Ratios and firm performance, and more importantly examine the possible impact of CEO ability, I continue with additional mean difference tests. Panel B in Table 2 displays the results. I split the sample into two subsamples based on the CEOs' ability index score, and repeat the mean difference test within each subsample. For firms with high-ability CEOs, the results are similar to the prior full sample results. When the CEO ability level is high, Pay Ratio and firm performance is positively associated. Specifically, higher pay ratios make average performance figure (measured with Tobin's q) increase from 2.38 to 2.59, when there is a talented CEO. However, this positive link disappears when the firm has a low-ability CEO (becomes very weak when measured by ROA). These findings suggest that paying more to a CEO might provide better firm performance, only when CEO ability level is high. This is a very intriguing finding, since it opens doors to discussions about CEO compensation and corporate income inequality at a new level, by introducing the impact of CEO ability. Recognizing the need for further assessment, I continue with multivariate analysis.

5.2. Multivariate tests

The first hypothesis this paper examines is about the relation between CEO Pay Ratio and firm performance, and CEO ability's impact on such relation. I estimate the following model to test this hypothesis:

Table 3
Regression Results – Impact of CEO Ability on the relation between Pay Ratio and firm performance.

Variables	Dependent Variable = Firm Performance							
	Full Sample				High-Ability CEOs		Low-Ability CEOs	
	(1)		(2)		(3)		(4)	
Pay Ratio	0.00008	***	−0.00003		0.00009	***	0.00003	**
	(6.72)		(−1.44)		(6.38)		(2.01)	
Ability Index	0.3202	***	0.3182	***				
	(11.46)		(11.41)					
(Pay Ratio) x (Ability Index)			0.00024	***				
			(4.83)					
Ln(Total Assets)	−0.1166	***	−0.1178	***	−0.1279	***	−0.1056	***
	(−29.14)		(−29.46)		(−21.82)		(−19.45)	
R&D Intensity	2.4575	***	2.4374	***	3.3485	***	2.1761	***
	(19.65)		(19.51)		(16.66)		(13.58)	
Capital Expenditure	0.2669	**	0.2669	**	0.0805		0.3835	**
	(2.02)		(2.02)		(0.39)		(2.26)	
Growth	177.15	***	176.97	***	307.44	***	166.99	***
	(8.11)		(8.12)		(7.02)		(6.80)	
Debt Ratio	−0.3578	***	−0.3624	***	−0.3805	***	−0.3460	***
	(−9.76)		(−9.90)		(−6.95)		(−7.21)	
Risk	0.0039	***	0.0040	***	0.0030	***	0.0068	***
	(13.41)		(13.51)		(8.42)		(12.69)	
Performance$_{(t-1)}$	0.8870	***	0.8827	***	0.6715	***	1.2982	***
	(18.94)		(18.88)		(11.44)		(16.31)	
Intercept, Industry andYear Dummies	yes		yes		yes		yes	
Adj. R2	0.4967		0.4986		0.5070		0.4899	
Sample Size	5981		5981		2,991		2,990	

$$Performance = \alpha_0 + \alpha_1 (PayRatio) + \alpha_2 (AbilityIndex) + \alpha_3 (PayRatio)$$
$$(AbilityIndex) + \alpha_4 (FirmSize) + \alpha_5 (R\&D) + \alpha_6 (Growth)$$
$$+ \alpha_7 (CAPX) + \alpha_8 (DebtRatio) + \alpha_9 (Risk) + \alpha_{10} (Performance_{t-1})$$
$$+ \sum \alpha_i (IndustryDummy) + \sum \alpha_j (YearDummy) + \varepsilon$$

Performance is measured by Tobin's q, while *Pay Ratio* is the ratio of CEO compensation to average workers' compensation. *Ability Index* measures CEO ability, developed using CEO age, CEO tenure, CEO education, and CEO reputation n as ability proxies. The first control variable is the natural log of total assets, as firm size. Others include R&D expense, capital expenditure, sales growth, long-term debt (all adjusted by total assets), stock return volatility, firm risk and prior performance. Regressions also include industry and year fixed effects.

Table 3 presents the regression results for the model above. Column 1 and 2 displays the full sample results, whereas Column 3 and Column 4 presents the results for the subsample of firms managed with high-ability CEOs and those with low-ability CEOs, respectively. When the regression model includes only the standalone variables for Pay Ratio and CEO ability, there exists a significant and positive association between Pay Ratio and firm performance. The coefficients imply that an increase of one standard deviation in each of Pay Ratio and CEO Ability Index is associated with increases of 42.91% and 5.95% in firm performance, respectively.[3] However, when the interaction variable between Pay Ratio and CEO ability is included to the model, stand alone Pay Ratio loses significance and even changes sign. The most important

finding here is that the interaction variable has a significant and positive coefficient. This means that when CEO ability is low (Ability Dummy = 0), the Pay Ratio is associated to firm performance negatively (coefficient = -0.00003). However, when CEO ability is high (Ability Dummy = 1), then the total value of the coefficient is 0.00021 (= 0.00024-0.00003).

Regression results support the prior findings, suggesting that paying relatively more to CEOs may significantly improve firm performance. The findings are also successful in replicating the positive and significance association between CEO ability and firm performance, as widely cited in the literature. The impact of Pay Ratio on firm performance is sensitive to the CEO ability level, as suggested by the interaction variable. In fact, the findings imply that such positive association exists only when CEO ability level is high. This points out the need to further examine the impact of CEO ability.

The results of high- and low-ability CEO subsamples are presented in Column 3 and 4. High-and low- ability subsamples consist of firms managed by CEOs with Ability Index scores above and below the median value, respectively. The strong positive and significant association between Pay Ratio and firm performance still exists for high-ability CEOs, however such relation weakens, in fact to its third (from 0.00009 to 0.00003), for low-ability CEOs. This finding reinforces the interaction variable result in the full sample findings and suggests that only high-ability CEOs may provide better firm performance if paid relatively more. This promises to shed light to the ability-entrenchment question in the executive compensation literature. The arguments such as "CEOs with high pay in fact deserves it", "It is there to attract talent" may be correct, when the CEO ability level is high. It makes the actual intention realized, which is simply "pay more to high-ability CEOs, so they will provide better performance". However, when low-ability CEOs raise their pay, it may be argued that there is expropriation and there may be some damage to the shareholder value.

5.3. The pay ratio at the industry level

Corporate pay inequality literature typically uses data from non-U.S. countries, due to the lack of U.S data on the company-level

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[3] For dependent variables in natural logs, interpretation of regression
$$\%\Delta \text{ in Y} = 100 \times [\exp(b_1 \times \Delta x_1)-1]$$
$$\%\Delta \text{ in}(Firm\,performance) = 100 \times [\exp(b_{PayRatio} \times [1Std_{PayRatio}] - 1)]$$
coefficients: $= 100 \times [\exp(0.0008 \times 446.31) - 1] = 42.91$
$$\%\Delta \text{ in}(Firm\,performance) = 100 \times [\exp(b_{AbilityIndex} \times [1Std_{AbilityIndex}]) - 1)]$$
$$= 100 \times [\exp(0.3202 \times 0.1805 - 1] = 5.95$$

Table 4
The Pay Ratio at the Industry Level.

Panel A: Descriptive statistics, using The Pay Ratio at the Industry Level

Variables	Mean	Median	Std. Dev.	Min	Max
Pay Ratio	224.94	215.14	148.99	42.40	1,400.98
Tobin's q (t)	2.15	1.94	0.93	1.14	8.05
Return on Assets (t)	0.06	0.06	0.04	−0.14	0.12
Ability Index	0.5174	0.5077	0.0697	0.4050	0.7250
CEO Age	56.33	56.25	1.69	51.17	63.00
CEO Tenure	7.62	7.44	1.95	3.40	17.00
MBA Dummy	0.29	0.26	0.13	0.00	0.67
CEO Reputation	0.0069	0.0001	0.0195	−0.0306	0.1135
Total Compensation	9,859.01	9,568.15	5,267.65	1,586.06	648,019
Total Assets	40,124.6	16,908.8	65,933.3	2,025.84	355,935
R&D Intensity (%)	2.30	0.81	2.95	0.00	11.31
Capital Expenditure (%)	5.53	4.01	4.61	0.47	19.57
Growth (%)	0.0052	0.0002	0.0008	−0.0005	0.0072
Debt ratio (%)	19.51	20.02	6.35	7.12	34.64
Risk (%)	10.59	9.87	4.25	3.49	25.92

Panel B: Firm performance, using the Pay Ratio at the Industry Level

	Low Relative Comp. Ratio	High Relative Comp. Ratio	t-stat
Low Ability CEOs	1.72	2.23	−3.64***
High Ability CEOs	1.96	2.64	−2.67***
t-stat	−1.98**	−1.57	

Panel C: Multivariate Analysis, using the Pay Ratio at the Industry Level

	Dependent Variable = Firm Performance			
Variables	(1)		(2)	
Pay Ratio	0.00156	***	−0.0037	
	(5.48)		(−1.58)	
Ability Index	−0.5573		0.1786	
	(-1.52)		(0.37)	
(Pay Ratio) x (Ability Index)			0.0101	**
			(2.27)	
Intercept, Control Variables, Industry and Year Dummies	yes		yes	
Adj. R2	0.8754		0.8818	
Sample Size	146		146	

workers' wages before the recent SEC ruling (SEC, 2017). For example, Cronqvist et al. (2009) uses data from Sweden, while Mueller et al. (2017) uses data from UK. Faleye et al. (2013) uses U.S. data, however ends up relying on voluntary disclosure of employee compensation data, which creates a range of other sampling concerns. In this paper, in spite of the lack of compensation data of an average worker in a firm, U.S data was utilized. The CEO-to-Worker Pay Ratio was constructed by using CEO data that belonged individual CEOs, however no data existed for the compensation of an average worker in a firm. Following the methodology of Lawrence and Sabadish, (2012), I had to create my own proxy, which was simply average worker data per industry.

Considering industry-level wages implicitly assumes that all wages are equal across firms within a given industry. In addition, this may create issues in my measures, as the analyses are performed using an industry-level variable with a firm-level variable. To find a way around this matter, I performed the analyses all over using the pay ratio at the industry level. In other words, as a robustness check, I created an alternative Pay Ratio using "Average CEO Compensation" and "Average Worker Compensation" per industry. To go along with such a measure, I have aggregated the values of every other variable at the industry level for each year.

The results using a Pay Ratio at the industry level are displayed in Table 4. The findings are similar to those of earlier analyses using a Pay Ratio with firm-level CEO data. Panel A presents the descriptive statistics at the industry level. The average Pay Ratio at the industry level is 225, while the original Pay Ratio was 244.

The findings on the impact of CEO Ability on the association between Pay Ratio and firm performance are also reinforced with the industry level measures. Panel B display the four different sub-samples, based on high-low CEO Ability and high-low Pay Ratio. After cutting the sample into two based on the ability index, I later further cut those into two groups based on Pay Ratio, under each ability category. This creates four subsamples of interest. As 2-by-2 table shows, under each ability level, paying relatively more improves firm performance. And more importantly, the highest firm performance is achieved when high-ability CEOs get paid at a higher Pay Ratio. This corresponds with the main finding of the paper.

Lastly, multivariate analysis is repeated using the industry level Pay Ratio to examine the impact of the Pay Ratio on firm performance and the impact of CEO ability on such association. The results are displayed in Panel C. Once again, the earlier findings are confirmed. Pay Ratio is still positively and significantly associated to firm performance. In addition, such positive association exists only when CEO ability is high, displayed by the significant interaction variable coefficient.

To sum, I recognize the possible drawback of using industry-level worker wage against the firm-level CEO compensation for the foremost measure of Pay Ratio in the paper. The analysis repeated with the alternative Pay Ratio at the industry level reveals that the findings are similar to those of the main analyses. Although it would have been ideal to have access to firm-level worker wage data, it could be argued that what we have right now in our hands also provides acceptable results.

Table 5
Correlation Results – Pay Performance Sensitivities.

Panel A: Correlation Matrix of Pay Performance Sensitivities, for the Full Sample, High and Low Relative Compensation Ratio Subsamples

		Change in Market Value	Change in Stocks and Options	
Full Sample	High Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	0.1592 (<.001)	1.0000
	Low Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	0.0057 (0.75)	1.0000

Panel B: Correlation Matrix for the High and Low Ability CEOs Subsamples

		Change in Market Value	Change inStocks and Options	
High-Ability CEOs	High Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	0.241 (<.001)	1.0000
	Low Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	−0.004 (0.91)	1.0000
Low-Ability CEOs	High Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	0.099 (0.002)	1.0000
	Low Ratio	Change in Market Value	1.0000	
		Change in Stocks and Options	−0.0002 (0.995)	1.0000

6. Pay-performance sensitivities

Jensen and Murphy (1990) define pay–performance sensitivity as the change in CEO wealth associated with a one-dollar change in shareholder wealth. Pay-performance sensitivity measures are often used as indicators of the quality of corporate governance and larger sensitivities are signs of better alignment between the chief executive incentives and the interest of the shareholders. In this paper, I examine if Pay Ratio, i.e. how much more CEOs are paid compared to their workers, has any impact on the pay performance sensitivities.

6.1. Correlation results

Table 5 displays the pay-performance sensitivities (PPS) measured by correlation coefficient between change in market value and change in stocks and options included in CEOs' compensation packages. Panel A examines the full sample and compares PPS values for the high and low Pay Ratio subsamples, where the subsamples are constructed by the median Pay Ratio cutoff. For the firms with high Pay Ratios, there exists a positive and significant PPS for the CEOs, however the PPS value is no longer positive nor significant for the firms with low Pay Ratios. This finding suggests that paying relatively more to a CEO may improve the pay-performance sensitivities. Considering the earlier results regarding the impact of CEO ability, further analysis of the impact of CEO ability on the relation between PPS and Pay Ratio is certainly needed.

Panel B in Table 5 displays the results for the high- and low-ability CEO subsamples. Within each sample, similar tests like above were repeated for high and low Pay Ratios. For firms with high-ability CEOs, PPS value is still positive and significant with high-Pay Ratios, supporting earlier results. However, those strong positive PPS values weaken for firms with low-ability CEOs. Precisely, for low-ability CEOs with high-Pay Ratios, PPS values decrease to below its half (from 0.241 to 0.099), plus lose much of its significance. These findings imply that firms may achieve stronger PPS values only if high-ability CEOs are paid relatively more. These correlation figures provide preliminary evidence that there is a positive relationship between PPS and Pay Ratio, and more importantly that ability plays an important role on such relation.

6.2. Regression results

Following the methodology of Jensen and Murphy (1990), I continue analyzing the relation between PPS and Pay Ratio, and the impact of CEO ability on such relation. I estimate the following model to test this relation:

$$Change in Stock and Options = \alpha_0 + \alpha_1 \left(\frac{Change in}{MarketValue} \right) + \alpha_2 (PayRatio) + \alpha_3 \left(\frac{Change in}{MarketValue} \right) (PayRatio) + \sum \alpha_i (IndustryDummy) + \sum \alpha_j (YearDummy) + \varepsilon$$

Change in Stocks and Options is measured by getting the difference between one year versus the prior year, while Pay Ratio is the ratio of CEO compensation to average workers' compensation. Regressions also include industry and year fixed effects.

Table 6 presents the PPS regression results. Column 1 and 2 display the results fro the full sample, while Columns 3 through 6 display the results for the high- and low-ability subsamples, respectively. The coefficient of the *Change in Market* Value variable represents the PPS value, while the interaction variable in the regression model is included to examine if the PPS value changes significantly with the Pay Ratio. I find that the coefficient is significant and positive for the interaction variable, suggesting the PPS in fact improve when Pay Ratio increases. This implies that stronger PPS values may be achieved by paying the CEOs relatively more. Higher pay ratios simply reinforce PPSs. Further evaluation reveals more interesting results with the examination of the CEO ability. The results are similar for the subsample of firms with high-ability CEOs, that is a positive and significant coefficient estimate for the interaction variable. Interestingly, the coefficient estimate is loses significance for those firms with low-ability CEOs. These findings suggest that stronger PPS is achieved only when a High-Ability CEO is paid relatively more. In other words, PPS may not be improved when a Low-Ability CEO gets higher pay. Overall, the results imply that CEO Ability plays a key role on the relation between The Ratio and PPS.

Table 6
Regression Results – Impact of CEO Ability on the relation between Pay Ratio and Pay Performance Sensitivities.

| | Dependent Variable = Change in Stocks and Options | | | | | |
| | Full Sample | | High-Ability CEOs | | Low-Ability CEOs | |
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Change in Market Value	0.0658 *** (8.81)	0.0059 (0.47)	0.0747 *** (7.12)	−0.00764 (−0.45)	0.0496 *** (4.61)	0.0356 * (1.88)
Pay Ratio	−1,285.7 *** (−5.57)	−1,324.9 *** (5.75)	−1,565.5 *** (−4.21)	−1,654.5 *** (−4.48)	−997.70 *** (−3.60)	−1,000.9 *** (−3.61)
(Change in Market Value) x (Pay Ratio)		0.0938 *** (5.99)		0.1328 *** (6.14)		0.0209 (0.90)
Intercept, Industry and Year Dummies	yes	yes	yes	yes	yes	yes
Adj. R2	0.0515	0.0571	0.0555	0.0671	0.0429	0.0429
Sample Size	5981	5981	2,991	2,991	2,990	2,990

7. Pay inequality, pay performance sensitivity and corporate governance quality

Previous literature suggests that the most interesting lines of research might be the impact of pay inequality on pay performance sensitivity and the relation between pay inequality, agency issues and governance matters. Cronqvist et al. (2009) work with an agency model in which managers have a taste for both profits and highly paid employees, which implies that corporate governance can be of importance for labor market outcomes such as workers' pay. Faleye et al. (2013) suggest that CEO–employee pay ratios depend on the balance of power between the CEO relative to the board, which is basically the core of corporate governance.

CEO duality, i.e. CEOs serving as board chair, is a widely used measure of corporate governance, in the notion that it measured CEOs' power over the board. Faleye, Hoitash, and Hoitash, (2011) and Core, Holthausen, and Larcker, (1999) suggest that CEOs who serve as board chairs have better bargaining powers because they are either more entrenched, more experienced, or more talented. Moreover, it is suggested that board monitoring decreases, and arguably expropriation increases, with CEO duality (Uygur, 2017; Goyal & Park, 2002). Bertrand and Mullainathan (2000, 2001) report evidence of a "skimming model" in which CEOs working for poorly governed firms are able to pay themselves higher wages. The possible impact of CEO duality on the Pay Ratio, and therefore on the pay-performance sensitivities is very intriguing. In this section, I examine such association, while using a measure of CEO duality equals one when the CEO also serves as board chair, zero otherwise.

Earlier findings of the paper provide evidence that Pay Ratio and firm performance is positively associated, suggesting paying highly to a CEO may improve firm performance. Remembering that fact that executive compensation contacts are designed to align CEOs' incentives with those of the shareholders, such positive association might be greater under strong corporate governance. For example, high pay ratios given to non-chair CEOs (stronger governance) might provide better performance figures, while high pay ratios given to chair-CEOs (weaker governance) might provide only lower performance figures. This could be explained by the lower board monitoring, possible expropriation that may come with weaker governance, and their deteriorating impact on the shareholder value. When CEO is also the chair, she might be too powerful to set her own pay, and that will not be the kind of "high pay" that will motivate her and improve firm performance.

Panel A in Table 7 displays the regression results on this matter. CEO duality *(CEO = CHAIR)* is included as an additional explanatory variable to the model. After controlling for duality, Pay Ratio is still positively and significantly associated, confirming earlier findings.

Interestingly, the interaction variable ([*Pay Ratio]x[CEO = CHAIR*]) is negative and significant. This suggests that when there is a chair-CEO, the positive association between Pay Ratio and firm performance weakens. Columns 3 and 4 further splits the sample for chair-CEOs and nonchair-CEOs. The coefficient for Pay Ratio is twice higher for nonchair-CEOs, compared to chair-CEOs (0.00006 < 0.00012), once again suggesting that the association is much stronger under good governance. These findings imply that increased corporate governance, i.e. less power of CEO over the board, is an important factor for setting the Pay Ratio and understanding its impact on shareholders' value.

CEO duality might affect not only the association between the Pay Ratio and firm performance, but also that with pay performance sensitivities. Under weaker governance, i.e. with a chair-CEO, high pay ratios may not provide stronger performance sensitivities, again due to the possible expropriation. Panel B in Table 7 displays the regression results for this analysis, where the coefficient of the *Change in Market* Value variable represents the PPS value, similar to previous sections. Interestingly however, the findings suggest the opposite. For chair-CEOs, I find positive and significant PPS values, while nonchair-CEOs have non-significant, even negative, figures.

These findings, although contradicting each other, are proofs that further research is necessary, and really thought-provoking, about the association between pay inequality, pay performance sensitivity and governance matters.

8. Robustness tests: matched sample

Rosen (1982) and Rose and Shepard (1997) suggest that high-ability CEOs are typically matched with more complex firms. Therefore, my findings could be driven by firm complexity, rather than CEO ability. Although I control for a variety of firm-specific characteristics, I further control for such potential endogeneity by comparing firms as similar as possible, in the hope of providing a more meaningful evaluation of the effects of CEO ability.

In an attempt to overcome such problem, I create a propensity score matched sample, in which I have firms with high- and low-ability CEOs matched on their propensity scores, the predicted propensities to be a complex firm (Villalonga, 2004). I follow Coles et al. (2008) and use firm size, leverage, and number of segments as determinants of firm complexity, and include R&D intensity, sales growth and industry as additional determinants. 10% propensity score matching has been used in my matched sample. I have 3134 firm-year observations in my matched sample, 1567 of which belong to firms with high-ability CEOs and the other 1567 observations belong to their matches with low-ability CEOs.

Table 7
Corporate Governance and Pay Ratios.

Panel A: Regression Results – Impact of CEO Duality on the relation between Pay Ratio and Firm Performance

	Dependent Variable = Firm Performance							
	Full Sample				*CEO = CHAIR*		*CEO ≠ CHAIR*	
Variables	(1)		(2)		(3)		(4)	
Pay Ratio	0.00007	***	0.00012	***	0.00006	***	0.00012	***
	(6.69)		(3.45)		(5.28)		(3.50)	
CEO = CHAIR	0.0176		0.0169					
	(1.37)		(1.30)					
(Pay Ratio) x (CEO = CHAIR)			−0.00005					
			(−1.41)					
Ability Index	0.3158	***	0.3148	***	0.2991	***	0.3101	***
	(11.23)		(11.19)		(5.28)		(6.91)	
Intercept, Control Variables Industry and Year Dummies	yes		yes		yes		yes	
Adj. R2	0.4967		0.4986		0.4827		0.5546	
Sample Size	5981		5981		3,881		2,163	

Panel B: Regression Results – Impact of CEO Duality on the relation between Pay Ratio and Pay Performance Sensitivities

	Dependent Variable = Change in Stocks and Options			
	CEO = CHAIR		*CEO ≠ CHAIR*	
Variables	(1)		(3)	
Change in Market Value	0.0947	***	−0.0116	
	(10.87)		(-0.81)	
Pay Ratio	−1,262.8	***	−1,323.46	***
	(−4.32)		(−3.49)	
Intercept, Industry andYear Dummies	yes		yes	
Adj. R2	0.0767		0.0429	
Sample Size	3,881		2,163	

Table 8
Matched Sample Results: Descriptive Statistics.

Panel A:

	Mean Value			
Variables	High Pay Ratio	Low Pay Ratio	Difference	t value
Tobin's q	2.26	2.23	0.03	0.58
Return on Assets	0.07	0.06	0.01	3.01

Panel B:

	Mean Value						
	Firms with High-Ability CEOs				Firms with Low-Ability CEOs		
Variables	High Pay Ratio	Low Pay Ratio	t value		High Pay Ratio	Low Pay Ratio	t value
Tobin's q	2.42	2.34	0.82		2.10	2.13	0.35
Return on Assets	0.079	0.071	2.43	**	0.055	0.049	1.50

Panel C: Correlation Matrix for the High and Low Ability CEOs Subsamples

		Change in Market Value	Change inStocks and Options		
High-Ability CEOs	High Ratio	Change in Market Value	1.0000		
		Change in Stocks and Options	0.269	(<.001)	1.000
	Low Ratio	Change in Market Value	1.0000		
		Change in Stocks and Options	−0.012	(0.74)	1.000
Low-Ability CEOs	High Ratio	Change in Market Value	1.0000		
		Change in Stocks and Options	−0.021	(0.56)	1.000
	Low Ratio	Change in Market Value	1.0000		
		Change in Stocks and Options	0.007	(0.83)	1.000

Table 8 presents the descriptive results for the matched sample. The *t*-test results for the differences of performance measures between firms with high-ability CEOs and their matched firms with low-ability CEOs are displayed in Panel A. Supporting the initial results, although less significant with Tobin's q measure, firm performance is higher for the firms with higher Pay Ratios, both measured with market value and book value measures. Panel B presents the results of the analysis of the impact of CEO ability and results suggest that the positive relation between firm performance and Pay Ratio exists only when the firms are managed with a talented CEO. Panel C displays the correlation results for the pay performance sensitivities. Similar to the initial findings, the positive and significant PPS values belong to high ability CEOs who are paid more. However, such relation not only vanishes when the CEO ability level is low, but also turns into a negative relation. These findings imply that stronger PPS could be achieved only when a high-ability CEO is paid more. Overall, the matched samples results replicate the main findings, at the univariate level.

Table 9 shows the multivariate analysis results using the matched sample. Using the same model used in previous sections

Table 9
Matched Sample Results: Multivariate Analysis.

	Dependent Variable = Firm Performance							
	Full Sample				High-Ability CEOs		Low-Ability CEOs	
Variables	(1)		(2)		(3)		(4)	
Pay Ratio	0.00008	***	−0.00006	**	0.00026	***	0.00001	
	(4.56)		(−2.53)		(7.23)		(0.93)	
Ability Index	0.1595	***	0.0161					
	(4.29)		(0.39)					
(Pay Ratio) x (Ability Index)			0.00054	***				
			(7.85)					
Ln(Total Assets)	−0.1052	***	−0.1161	***	−0.1027	***	−0.1038	***
	(−18.60)		(−20.08)		(−12.89)		(−12.68)	
R&D Intensity	2.6135	***	2.4962	***	2.3638	***	2.1978	***
	(14.17)		(13.62)		(9.15)		(8.60)	
Capital Expenditure	0.2395		0.2629		−0.2414		0.6567	**
	(1.37)		(1.52)		(−1.02)		(2.72)	
Growth	381.41	***	375.84	***	624.21	***	268.23	***
	(7.07)		(7.03)		(6.19)		(4.27)	
Debt Ratio	−0.4175	***	−0.4194	***	−0.3220	***	−0.5268	***
	(−7.86)		(−7.97)		(−4.64)		(−6.93)	
Risk	0.0026	***	0.0027	***	0.0017	***	0.0077	***
	(7.02)		(7.41)		(4.53)		(8.04)	
Performance$_{(t-1)}$	2.0592	***	2.0297	***	3.5277	***	1.3245	***
	(22.55)		(22.43)		(23.29)		(11.72)	
Intercept, Industry and Year Dummies	yes		yes		yes		yes	
Adj. R2	0.5421		0.5506		0.6284		0.5055	
Sample Size	3134		3134		1567		1567	

for the full sample, I evaluate the relation between Pay Ratio and firm performance in multivariate setting. Similar to the main findings of the paper, higher Pay Ratios might result in better firm performance. More importantly, this relation exists only when CEO ability level is high. The more detailed assessment of the impact of CEO ability is included in the last two columns. Replicating the main results, the positive association between Pay Ratio and firm performance appears to be valid only for the firms managed by high-ability CEOs, and simply disappears for those with low-ability. These results provide additional support for my earlier findings. Overall, these results support the earlier findings, and act as a robustness check.

9. Conclusion

In this paper, I examine income inequality within corporations, which is one of the most intriguing topics of the recent times. I use a simple metric to calculate the CEO-to-worker compensation ratio, called the "Pay Ratio", and examine its relation to the firm performance and pay-performance sensitivities (PPS). One of the most important contributions of the paper is that, it introduces the possibility of CEO ability being an important factor in the way executive compensation, therefore the Pay Ratio, impacts corporate governance issues. While doing so, a new ability index is offered, as a more comprehensive measure of CEO ability, using a variety of widely accepted proxies.

I find that the Pay Ratio and firm performance are positively associated, suggesting that paying relatively more to CEOs may help improve firm performance. However, I also find that the impact of Pay Ratio on firm performance is sensitive to the CEO ability level. The positive relation between Pay Ratio and firm performance exists only for high-ability CEOs, and such relation disappears for low-ability CEOs. This is a very interesting finding, since it opens doors to discussions about CEO compensation and corporate income inequality at a new level, by introducing the impact of CEO ability. Moreover, it also promises to shed light to the ability-entrenchment question in the executive compensation literature. Similar findings are gathered using a matched sample and also an alternate Pay Ratio at the industry level for robustness tests.

Pay-performance sensitivity, a commonly used indicator of the quality of corporate governance, is also examined in the paper, in the notion that if Pay Ratio has any impact on the pay performance sensitivities. I find that PPS and Pay Ratio are positively associated, only with a high-ability CEO. In fact, PPS weakens when a Low-Ability CEO is paid more. Further analysis on corporate governance, using CEO duality, reveals that the positive association between Pay Ratio and firm performance weakens with a chair-CEO, proving the value deteriorating impact of expropriation. It also opens doors to further research on the association between governance quality and pay performance sensitivities. Overall, I suggest that how much more CEOs are paid compared to the workers actually matters and CEO ability plays a key role on how the ratio affects the firm.

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