Erasmus School of Economics

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The effect of the CEO-to-worker pay gap on company productivity.

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Abstract

In this study, I test the effect of the CEO-to-worker pay gap on company productivity. This study investigates potential reasons for an increasing pay gap and thereby contributes to the existing literature by reevaluating two mechanisms that previous literature uses to explain a positive effect of the CEO-to-worker pay gap on company performance. Using data on 193 industrial US companies (n=1,262) between 2012 and 2021, I find no positive effect of CEO pay on company productivity. Additionally, the findings are not in line with the Tournament theory effect and the Agency theory as potential explanations for previously found positive effects of CEO-to-worker pay gap on company productivity. I do not find evidence for the Tournament theory in this sample, measured in two different ways. First, I find that the estimated effect of CEO-to-worker pay gap on company productivity is not significantly higher companies with characteristics that make promotion more likely. Also, the effect of the CEO-to-worker pay gap on company productivity is not significantly higher for companies with a promoted CEO, compared to companies with an outside hired CEO. For the Agency theory, I find that stock awards and stock options as a component of the CEO compensation do not have a significant positive effect on company productivity. The results of this paper imply that future research on this topic is necessary to be able to explain rising CEO-to-worker pay gaps.

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1. Introduction

The CEO-to-worker pay gap is an extensively discussed topic, both in scientific and political discussions. In a report describing the history and the current state of executive compensation, Murphy (2013) describes how high levels of executive compensation have been a topic of scrutinizing and regulation for nearly a century. According to Tonti (2022), a large majority (87%) of US citizens regard this increase as a problem. However, recent reports provide evidence that the gap is increasing rather than decreasing. For example, contrary to what can be expected based on public criticism, Rushe (2022) finds that the CEO-to-worker pay ratio for large US firms increased between 2020 and 2022.

An explanation of the contrary finding most probably lies within the relationship between company performance and relative CEO pay, which several studies find to be positive (Faleye, Reis & Venkateswaran, 2013; Sigler & Haley, 1995; Main et al., 1993). In this study, I particularly focus on company productivity to measure company performance. Particularly, I aim to find out which underlying theories can explain the effect of the CEO-to-worker gap on company productivity, by answering the research question.

What are the determinants of the effect of the CEO-to-worker pay gap on company productivity?

To answer this question, I test the Tournament theory and the Agency theory. The Tournament theory states that, with a rising CEO-to-worker pay gap, employees within a company are more motivated to perform the work that is required to achieve higher positions within firms (Elsayed & Elbardan, 2018). I test this theory by investigating whether the effect of pay gap on company productivity is more positive for companies where promotion is more likely to take place, which are typically large companies with high-skilled employees (DeVaro & Brookshire, 2007; Hollister, 2004). Further, I test it by investigating if the effect of pay gap is more positive for companies where the CEO is promoted from within the company, rather than being an outside hire.

The Agency theory regards the relationship between the owner and the CEO as a principal-agent relationship, in which the agents (CEOs) are expected to seek high returns while performing minimum effort. According to this theory, the agents should be incentivized to achieve strong company performance (Elsayed & Elbardan, 2018). To test this theory, I analyze whether incentive-based compensation has a positive effect on company productivity.

The sample for this study consists of 193 industrial US companies (n=1,262) between 2012 and 2021. For each of the hypotheses tests, I run an OLS model and two Fixed Effects models. The main regressions testing the effect of CEO-to-worker pay gap on productivity all find negative effects, significant at 5%. The

robustness tests in which I use untransformed values for pay gap and productivity, instead of logged values, also suggest a negative effect. The findings indicate that the effect of CEO-to-worker pay gap on productivity is negative. This means that it is not in line with the findings of several other studies (Elsayed & Elbardan, 2018; Faleye et al., 2013). These authors find that a high pay gap has a positive effect on productivity.

Further, I investigate the underlying theories that other studies use to explain potential reasons why the CEO-to-worker pay gap could have a positive effect on productivity. I find no evidence of the Tournament theory in the sample. I find that the effect of pay gap on productivity does not appear significantly larger for large companies with highly skilled employees and I find similar outcomes for firms where the CEO is promoted from another executive position.

I start by describing the main topics of this study by discussing relevant studies related to company productivity and CEO compensation in section 2. This section also describes the relationship between the CEO-to-worker pay gap and company productivity, including a description of the two mechanisms through which scholars aim to describe this relationship. In sections 3 and 4, I discuss the data and the methodology that I use in this study. Section 5 shows and analyses the results of the models and section 6 concludes with describing the main findings and the limitations of this study as well as providing future research recommendations.

2. Literature review

Firms constantly try to improve their productivity to be able to compete. Studies have done plenty of research on this topic, aiming to find the drivers of company productivity. For example, Patterson et al. (2004) highlight the importance of the organizational climate, stating the importance of employee welfare and employee satisfaction. Other studies focus on company training and the role of HR departments as drivers of company productivity. In this study, I investigate how the CEO-to-worker pay gap drives company productivity, building upon a wide range of literature studies (Elsayed & Elbardan, 2018; Faleye et al., 2013; Sigler & Haley, 1995).

2.1 The Relation between Pay Gap & Productivity

Many authors investigate the CEO-to-worker pay gap as a potential driver of company productivity. Among

them are Sigler and Haley (1995), who study the effects of executive pay and find evidence of a positive connection between the pay of CEOs and company performance. In more recent studies, Elsayed and Elbardan (2018) find similar outcomes.

Specifically for the CEO-to-worker pay gap, Faleye et al. (2013) and Przychodzen and Gómez-Bezares (2021) find that there are situations in which benefits can be achieved through increasing the CEO-to-worker pay gap. Contrarily, Pan et al. (2022) show how high pay ratios can negatively affect a firm. Their results suggest that investors have inequality aversion, by showing that firms that disclose high pay ratios experience a negative market response.

In the study by Przychodzen and Gómez-Bezares (2011), the authors primarily focus on productivity, and they find that in certain situations, productivity increases with the CEO-to-worker pay gap. Similar to the latter authors, I focus on the effect of the pay gap on company productivity, whereby the aforementioned findings lead to Hypothesis 1.

Hypothesis 1: The CEO-to-worker pay gap has a positive effect on company productivity.

The literature provides two mechanisms through which the CEO-to-worker pay gap can affect company productivity. One of the explanations that can be regarded as an explanation for a positive effect of the CEO-to-worker pay gap is the Tournament theory. This theory states that employees get their salaries in accordance with their rank in a company to stimulate employees who have put in enough effort to reaching high positions (Faleye et al., 2013). A second explanation that can explain a positive effect of the CEO-to-worker pay gap is the Agency theory. Agency-based contracts should only lead to high rewards when executives reach certain performance targets (Elsayed & Elbardan, 2018). The following two sections describe the two theories and their role in this study.

2.1.1 Tournament Theory

According to the Tournament theory, offering high compensation to the CEO would stimulate employees to (try to) reach the highest positions within a company. Przychodzen and Gómez-Bezares (2021) find an outcome that supports the Tournament theory. They find that a large pay gap particularly has a positive effect on company productivity for large firms with high-skilled employees, whereas a large pay gap has a negative effect on company productivity for small companies with low average salaries. Tournament-like efficiency incentives are particularly strong for large companies with high average salaries, for several

reasons.

First, in small firms promotions may occur less frequently due to the limited number of positions and opportunities available. With fewer employees, there may be less hierarchical structure, and fewer positions to move up to. In contrast, large firms may have more hierarchical structures and a greater number of positions. This could lead to more opportunities for employees to be promoted. Also, at large firms there are more people competing for a position, leading to more competition and therefore a more positive effect of the CEO-to-worker pay gap on company productivity. This is in line with the findings of Hollister (2004), who finds that internal promotion, among other aspects of internal labor markets, is strongly correlated with firm size.

For highly skilled employees, the likelihood of them attaining executive positions within a company is higher. This in turn raises the CEO's compensation as an incentive for them to strive for promotions. DeVaro and Brookshire (2007) show results that are in line with this. They find that the likelihood of promotions within a firm increases with the fraction of high-skilled employees. These aforementioned findings suggest that the results of Przychodzen and Gómez-Bezares (2021) are in line with the Tournament theory and support Hypothesis 2.

> *Hypothesis 2: The effect of the CEO-to-worker pay gap on company productivity is higher for large companies with high-skilled workers, compared to small companies with low-skilled workers.*

Rather than looking at companies where promotion is more likely, I also look at companies where promotion actually takes place to test the Tournament theory. As alternative method to test the Tournament theory, I compare the effect of CEO-to-worker pay gap on company productivity where the company CEO was a non-CEO executive in the same company with the effect on companies where the CEO is an outside hire. If the Tournament theory for the CEO-to-worker pay gap holds, then it is reasonable to expect that for companies where there is evidence of promotions, the effect of the CEO-to-worker pay gap on company performance is particularly evident.

Faleye et al. (2013) describe that the magnitude of the CEO represents the potential prize of the tournament, stating that the motivation to win promotion increases with the increase of the potential prize, which is the CEO compensation. Further, the authors state that this effect is stronger when lower-level employees are aware of the magnitude of the CEO compensation. Additionally, it is also important for lower-level employees to know that promotion is possible. I incorporate this by testing if the effect of

CEO-to-worker is more prominent for companies that have a CEO who also worked on a lower level in the company. Cichello, Fee, Hadlock and Sonti (2009) find that promotions are positively related to performance, measured in return on assets. Additional to their study, I also look at the interaction effect of the CEO-to-worker pay gap with promotion and I measure company performance in productivity, rather than in return on assets. Preferably, I would have access to data on promotions at all levels of the firm, but the dataset limits me to only use promotions of non-CEO executives to the position of CEO.

Hypothesis 3: The effect of the CEO-to-worker pay gap on company productivity is higher for companies where the CEO was a non-CEO executive in the same company, compared to companies where the CEO is an outside hire.

2.1.2 Agency Theory

In line with the Agency theory, companies use several ways of compensation to align the interests of the company and the CEO. The studies by Sigler and Haley (1995), Tosi & Gomez-Mejia (1989) and O'Reilly and Main (2010) find that the interest of the CEO can be aligned with the interest of the shareholders through CEO pay, which improves company performance. As a measure of interest-aligning compensation, I use stock awards and stock options as a share of the total compensation. These measures of incentive-based compensation are preferred over CEO bonuses because bonuses are often provided regardless of company performance (McClure, 2021). Based on the Agency theory, I expect that the interests of the company can be aligned with the interests of the CEO, meaning firms can use stock awards and stock options to stimulate CEOs to drive company productivity (Jensen, 1990). These findings lead to Hypothesis 4 and Hypothesis 5.

Hypothesis 4: The stock award component of the CEO pay has a positive effect on company productivity.

Hypothesis 5: The stock option component of the CEO pay has a positive effect on company productivity.

3. Data

For this study, I combine two different datasets and I focus on the years 2012-2021. The dataset, Compustat - Fundamentals Annual, contains data of US public companies. This dataset includes the

observations using the standard classifications of Compustat, leaving financial companies out. Further, it excludes double observations for companies within a fiscal year.

I combine this dataset on company characteristics with a dataset on executive compensation. This dataset, Compustat Executive Compensation - Annual Compensation, contains data on executive compensation of US-based public companies (Compustat, 2022). I use this dataset, hereinafter referred to as compensation dataset, to retrieve information on CEO characteristics and compensation data. Matching this dataset with the Compustat – Fundamentals Annual dataset, hereinafter referred to as company dataset, allows me to combine firm characteristics with CEO characteristics and to econometrically analyze the relationship between different aspects of CEO compensation on company productivity.

3.1 Variables Description

The dependent variable in this study is company productivity, expressed by output per worker and measured by the annual revenue of a company divided by the number of employees of the respective company. This is a common way of measuring company productivity in the literature (Datta et al., 2005; Chowdhury et al., 2014; Przychodzen & Gómez-Bezares, 2021). I calculate the main variable *Productivity* by the formula displayed in (1).

$$Productivity_{it} = \frac{Revenue_{it}}{Number\ of\ Employees_{it}} \quad (1)$$

The main independent variable in this study is the CEO-to-worker pay gap. Further, I obtain and construct several independent variables from the company dataset, such as the total personnel costs and the number of employees to calculate the average personnel costs per employee. I use this information, together with the total compensation of the CEO, to calculate the CEO-to-worker pay gap as shown in (2). In this equation, I measure personnel costs per employee by total personnel costs of a company divided by the number of employees of the respective company.

$$Pay\ Gap_{it} = \frac{Total\ CEO\ Compensation_{it}}{Personnel\ Costs\ per\ Employee_{it}} \quad (2)$$

The dependent variables that I retrieve from the compensation dataset are the total compensation and base salary of the CEO, the fair value of stock rewards and the fair value of stock options of the CEO and several control variables such as *CEO Age, CEO Tenure* and *CEO Gender*. Also, I use this dataset to create the *CEO Director*, which is a dummy variable indicating whether the CEO is on the board of directors. I use the stock rewards and stock options of the CEOs to construct the *CEO Relative Stock Pay* and the *CEO Relative Option Pay.* I construct these variables as displayed in (3) and (4).

$$CEO\ Relative\ Stock\ Pay_{it} = \frac{CEO\ Stock\ Rewards\ Pay_{it}}{Total\ CEO\ Compensation_{it}} \tag{3}$$

$$CEO\ Relative\ Option\ Pay_{it} = \frac{CEO\ Stock\ Options\ Pay_{it}}{Total\ CEO\ Compensation_{it}} \tag{4}$$

Further, the variable *Promoted CEO* indicates whether the CEO of a respective year previously worked as a non-CEO executive at the firm. To construct this variable, I match the CEO unique identifier at year t with non-executive unique identifiers between 2000 and $t-1$. As a control variable, I construct the debt-to-equity ratio, which is the total debt divided by shareholders' equity. Also, I use the variables *ROA,* total assets growth and the market value as control variables, as well as information on the industry in order to be able to include industry fixed effects. For the industry fixed effects, I use the classification as shown in Table 2. Region dummies are defined by the states of the United States. To construct the variables that divide the companies into large companies and small companies, I make the dummy variable *High Market Value*, which has value 1 if the market value of the firm exceeds the median market value of the sample and zero otherwise. The dummy variable *High Average Salary* is constructed in a similar way. This variable has value 1 for observations where the personnel costs per employee exceed the sample median and zero otherwise.

3.1.1 Control Variables

In order to accurately assess the relationship between the CEO-to-worker pay gap and company productivity, I include various control variables in the analysis. These control variables help to isolate the effect of the pay gap on productivity by accounting for other factors that might influence the relationship.

To account for company size on the effect of pay gap I include market value as control variable, as Baker and Hall (2004) find that CEO productivity is affected by firm size. Another important control variable to consider is the change in total corporate assets, as Ntim et al. (2015) suggest. Companies with higher growth opportunities tend to be more attractive to both executives and investors, leading to the offering of share-based compensation packages. By controlling for the change in total corporate assets, we can account for differences in growth opportunities among firms (Elsayed & Elbardan, 2018). However, it is important not to include total corporate assets as a control variable, as this is strongly correlated with the market value of a company and may introduce multicollinearity. Another relevant control variable that I add is Debt-to-Equity, as Elsayed & Elbardan (2018) proposed. Based on the findings of Cichello et al (2009), I include the return on assets as a control variable.

Additionally, CEO gender, CEO age, as recommended by Przychodzen and Gómez-Bezares (2021), should be included as control variables, as CEO gender and CEO age may capture demographic differences that could affect productivity. Przychodzen & Gómez-Bezares (2021) and Faleye et al. (2013) argue that a CEO also serving on the board of directors can have an effect on company productivity. This can be explained by the findings of the Council of Foundations (2010) as CEOs with a board position have a greater responsibility, which can affect their effort to increase company productivity.

Company location is another important control variable to consider in the analysis. Differences in cost of living and the availability of skilled labor across regions may influence both pay and productivity (Groshen, 1991). By controlling for company location, I can better account for regional variations in pay and productivity that may confound the relationship between the CEO-to-worker pay gap and company productivity. For that reason, I include region fixed effects, with the states of the United States representing the regions.

I do not include company profitability and stock return as control variables, as this may introduce collider bias, potentially leading to inaccurate conclusions about the relationship between the pay gap and productivity. Both productivity and pay gap can affect company profitability and therefore, indirectly, stock return (Przychodzen and Gómez-Bezares, 2021). By excluding these control variables from the analysis, we can obtain a more accurate estimate of the relationship between the CEO-to-worker pay gap and company productivity, resulting in more accurate outcomes.

3.2 Sample Description

In this study, I merge two datasets, one consisting of information on companies and one with executive compensation data. The initial datasets contain a substantial number of observations. However, due to data limitations and quality control measures, the final dataset contains 193 companies with a total of 1,262 observations. The reduction in the dataset is mainly attributed to three factors.

First, a significant number of observations had incomplete information on CEO compensation, which make these data points unusable for the analysis. As a result, I exclude these observations from the dataset. Also, there is missing data on personnel expenses. In order to conduct this analysis, it is essential to have complete data on total personnel expenses for each company, which is the reason why I drop many observations. Last, I drop the observations where the CEO is hired before the year 2000, because I do not have the information to assign a variable for CEO promotion to these observations.

To account for large outliers, I make some additional transformations to the data. Some observations in the dataset had exceedingly high values for CEO-to-worker pay gap, exceeding 20,000. These values are deemed unrealistic and can significantly impact the overall results of the analysis. To prevent potential distortions in the results, I apply winsorization at 1% in each tail for the variables *Pay Gap*, *Productivity*, *Market Value* and *Debt-to-Equity*. Also, for the main analysis, I use log values of pay gap and productivity to limit the effect of outliers. The final dataset includes 193 companies and 1,242 observations.

3.2.1 Descriptive Statistics

Table 1 displays the summary statistics of the sample data. I measure productivity as revenue per employee, meaning that the average revenue per employee of the sample firms equals $676,060. Table 1 shows some variables with high levels of standard deviation, such as *Productivity*, *Pay Gap* and *Average Salary*. This can result in results that are strongly affected by outliers. In the main analysis, I solve this by using log values for productivity and pay gap and by using a dummy variable to indicate a high average salary. For that reason, Table 1 also reports the logged values of these variables. Further, variables are measured as described in the note of Table 1.

The CEO-to-worker pay gap is 115, which is higher than the CEO-to-worker pay gap as Przychodzen and Gómez-Bezares (2021) find. However, this ratio is lower than the pay ratio that Pan et al. (2022) and Lifshey (2018) find. Using data from 2018, these authors find pay ratios of 145 and 144 respectively. These authors use data that is disclosed by companies according to the US pay ratio disclosure rule, requiring companies to disclose the CEO-to-worker pay gap (Lifshey, 2018). The variance in pay gap between this sample and

the sample that Lifshey (2018) and Pan et al. (2022) use can be attributed to several differences in terms of data availability and definitions used.

First, I use data from 2012 to 2021, which could lead to a different pay gap mean than using only 2018 data. However, Figure 1 shows that the average pay ratio in 2018 is approximately 110. Second, the lower pay ratio in my sample can be caused by a difference in the definition of the CEO-to-worker pay gap. Pan et al. (2022) use the ratio between the median annual total compensation of all employees and the annual total compensation of the CEO, as disclosed according to the pay ratio disclosure rule. In this study, I use the definition as shown in (1), meaning that I use the average personnel costs per employee as the numerator, rather than the median salary of employees.

Last, the difference can be caused by selection bias in my sample. CEO can decide what to disclose for labor expenses. Therefore this leads to selection bias, as CEOs with high salaries, which leads to large pay gaps, might rather not disclose it. Still, using the disclosed CEO-to-worker pay gap as done by Pan et al. (2022) and Lifshey (2018) does not fully prevent bias caused by disclosing choices. As described by Lifshey (2018), the variability in permitted methodologies of measuring the pay gap leads to invalid peer comparisons.

Table 1

Summary Statistics of the Main Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm Characteristics					
Productivity	1242	676.06	1428.689	1.398	10922.012
ln Productivity	1242	5.745	1.185	.335	9.299
Pay Gap	1242	115.152	148.919	2.319	812.586
ln Pay Gap	1242	4.078	1.24	.841	6.7
ln Market Value	1242	8.028	1.762	2.718	11.437
ROA	1242	.043	.105	-1.278	1.159
Δ Total Assets	1242	.124	.45	-.87	10.048
Average Salary	1242	163.774	670.597	4.984	12956.667
Debt-to-Equity	1242	.934	3.773	-12.534	16.615
CEO Characteristics					
CEO Age	1242	56.517	6.635	35	75
CEO Tenure	1242	5.64	4.472	0	21
CEO Male	1242	.93	.255	0	1
CEO Director	1242	.962	.191	0	1
Promoted CEO	1242	.353	.478	0	1
CEO Relative Stock Pay	1236	.407	.245	0	1
CEO Relative Option Pay	1236	.079	.143	0	.822

Note. All variables providing monetary values display the value in US dollar. Productivity is measured as revenue per employee. Productivity and Average Salary are measured in thousands.

Table 2 shows the distribution of the sample companies over industries, based on their Standard Industrial Classification codes. The table shows the division of industries for both the sample data and the Compustat data. I use the classification of industries to include industry fixed effects in the analysis. Table 2 shows that the majority of companies in the sample data are active in the Finance, Insurance and Real Estate sector. The total displays the number of companies, as companies are only measured once in this table. In the Compustat dataset, the majority of observations are also in the Finance, Insurance and Real Estate Sector. Further, a relatively large share of the sample companies are active in the Services and Transportation sectors and a relatively small share is active in the Manufacturing sector, compared to the companies in the Compustat dataset. This is a limitation in terms of the representativeness of the sample.

Table 2

Overview of Company Industries

Industry	SIC-codes	Sample data		Compustat data	
		Freq.	Percent	Freq.	Percent
Agriculture, Forestry, Fishing	0-999	0	0	37	0.24
Mining	1000-1499	2	1.04	657	4.25
Construction	1500-1799	3	1.55	85	0.55
Manufacturing	2000-3999	17	8.81	3900	25.23
Transportation	4000-4999	40	20.73	878	5.68
Wholesale Trade	5000-5199	5	2.59	232	1.50
Retail Trade	5200-5999	25	12.95	456	2.95
Finance, Insurance and Real Estate	6000-6799	64	33.16	6218	40.23
Services	7000-8999	37	19.17	1894	12.25
Public Administration	9100-9729	0	0	0	0
Nonclassifiable	-	0	0	1100	7.12
Total		193	100.00	15457	100.00

Note. This table measures only one observation per company.

Table 3 shows that the observations are quite evenly distributed over the years, with each year representing between 9% and 11% of the observations. This shows that the sample is representative for each of the 10 years of the sample. As there are 193 companies in the dataset, spread over 1242 observations, we find that sample companies have a presence of 6.4 years in the dataset, on average.

Table 3

Number of Observations per Fiscal Year

	Freq.	Percent	Cum.
2012	113	9.10	9.10
2013	113	9.10	18.20
2014	125	10.06	28.26
2015	136	10.95	39.21
2016	132	10.63	49.84
2017	130	10.47	60.31
2018	127	10.23	70.53
2019	128	10.31	80.84
2020	113	9.10	89.94
2021	125	10.06	100.00
Total	1242	100.00	

Note. The average number of years per company is 6.4.

Table A1 displays a table of correlations between the main variables of interest. The most prominent correlation is between ln Market Value and ln Pay Gap. This coefficient shows that, on average, companies with a larger market value have a larger CEO-to-worker pay gap. Further, no correlation coefficients larger than 0.45 are present in the table, indicating that multicollinearity is not an issue in this study.

3.2.2 Annual Trends

Figure 1 shows the development of the average CEO-to-worker pay gap of the sample companies. This development touches upon a widely discussed topic. For example, in his report on the history and the current state of executive compensation, Murphy (2013) describes how high levels of executive compensation have been a topic of scrutinizing and regulation for nearly a century. Tonti (2022) finds that many regard large CEO-to-worker pay gaps as a problem. Still, Rushe (2022) finds that the CEO-to-worker pay ratio for large US firms increased between 2020 and 2022. Looking at Figure 1, we also see that the pay gap has been slightly increasing since 2012. Similar to what is done for the CEO-to-worker pay gap in Figure 1, Figure 2 shows the annual development of the average productivity of the sample companies. Although Figure 2 does not show a smooth development of average productivity over time, it shows an overall increasing number. Due to the limited sample, outliers in the dataset can have a substantial impact on the average productivity per year. This is an alternative reason for the unstable productivity over time. This shows the importance of including year fixed effects in the analysis. Comparing Figure 1 and Figure 2, the average productivity and the average pay gap seem to be weakly correlated over time, meaning that no conclusions can be drawn from this.

Figure 1

Average Pay Gap per Fiscal Year

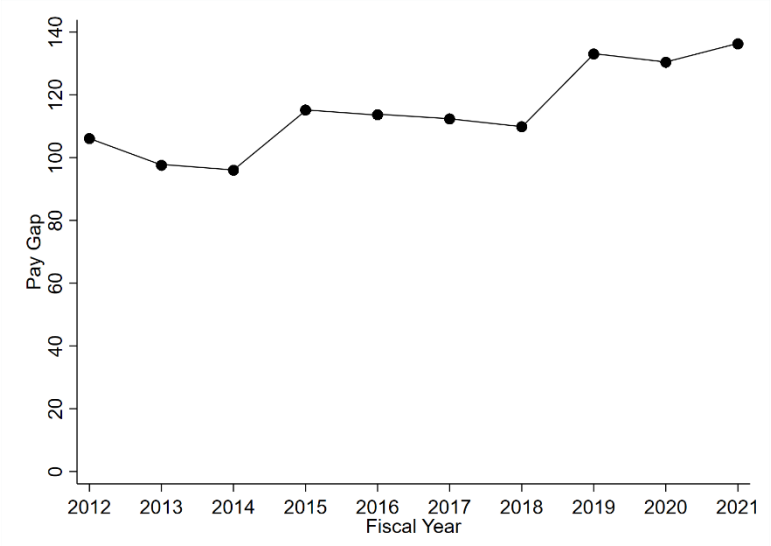
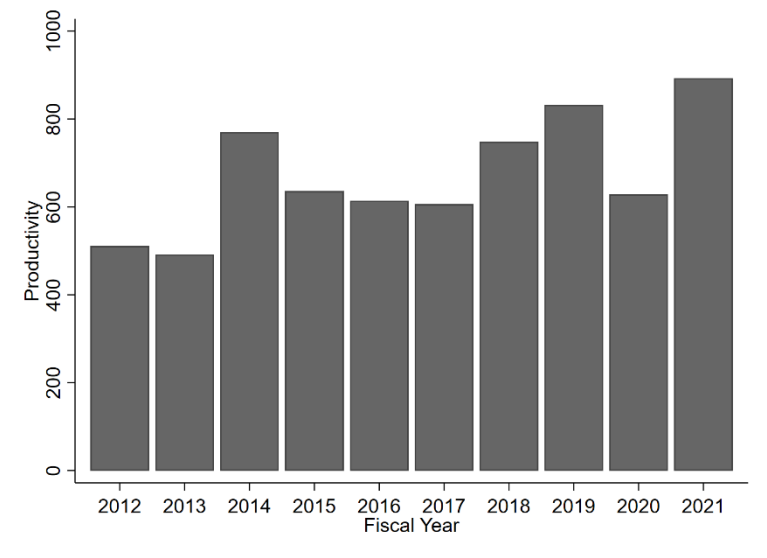


Figure 2

Average Productivity per Fiscal Year



4. Methodology

In each regression, the logged value of company productivity is the dependent variable. Instead, I could have used other measures for company performance, such as stock returns or company profitability. Stock return is highly sensitive to market trends, which would limit the predictive power of the models. I decide not to use firm profitability as the dependent variable due to reversed causality issues. Especially incentive-based compensation is likely to be affected by company profitability because these are often dependent on company profitability (McClure, 2021). This would mean that a potential positive relation between performance measured in profitability and CEO compensation can arise because profitability positively affects the CEO compensation, instead of the other way around. Although using productivity as the output measure does not fully prevent this, I expect it to make this issue substantially less prominent.

For each of the hypothesis tests, I use three models to estimate the effects. Model 1 is a model with the dependent variable, the variables of interest and control variables, which include CEO age, CEO tenure, CEO gender, company size measured by the natural logarithm of Company Market value, return on assets, total assets growth, the debt-to-equity ratio and a dummy that has the value 1 if the CEO is also in the board of directors. Also, this model includes dummy variables for region and year. Model 2 and Model 3 are similar to the first model, but they include industry fixed effect and company fixed effects respectively.

Also, Model 3 does not include region fixed effects because these effects are already captured by the company fixed effects.

Model 1 is an OLS model, including several dummy variables. This model is able to explain the most variation, but it might not be appropriate because it does not control for firm-specific or industry-specific effects. By including several firm-specific control variables, I partly solve this. However, as there are many unobserved characteristics of companies and industries, I also used Model 2 and Model 3. Model 2 and Model 3 are Fixed Effects models. Model 2 includes Fixed Effects for industries, to control for industry characteristics. Still, this model does not control for all firm-specific characteristics. Therefore, I also include Model 3. This model includes company Fixed Effects, decreasing the issue of unobserved heterogeneity. Model 1 and Model 3 include robust standard errors that are clustered at the company level, whereas the standard errors of Model 2 are also robust but clustered at the industry level.

It is important to note that the R^2 of Model 2 and Model 3 can be lower than that of OLS Model 1 because the R^2 values represent different aspects of the data. Also, for Model 2 and Model 3, within-R^2 is reported, which provides a more accurate measure of the proportion of the variance that is explained by the model. In Model 1, which is an OLS model, R^2 indicates the proportion of the variance in the dependent variable that is explained by the independent variables. However, in Model 2 and Model 3, R^2 measures the proportion of the within variance in the dependent variable that is explained by the model, which is the variation of the dependent variable within each company or industry. This difference in interpretation means that R^2 values between Model 1 and Model 2 and 3 cannot be directly compared.

I use each of the models to interpret the findings. However, it is important to note that variation between companies is particularly important for several hypotheses. For example, Hypothesis 2 and 3 assume that employees make more efforts to perform well when they know that this lead to a larger probability of promotion. This effect is largely captured by company culture, which is often regarded as resilient (Walker, 2017). Therefore, it is more interesting to compare this between companies rather than within companies. For that reason, Model 1 and Model 2 might be more appropriate to test these hypotheses.

4.1 Model Specification

I test Hypothesis 1 with (5), with c denoting a vector of control variables and ε denoting the error term. By doing so, I can estimate the effect of the CEO-to-worker pay gap. Similar to the other equations, I run this equation with the 3 models as described in section 4.

$$ln\ Productivity_{it} = \beta_0 + \beta_1 * ln\ Pay\ Gap_{it} + \gamma' * c_{it} + \varepsilon_{it} \quad (5)$$

Next, I add several interaction effects, to test if the effect is particularly prominent for large firms with highly skilled employees, in line with Hypothesis 2. The size of the firm is measured in market capitalization and the skill of the employees is measured by the average wage of employees, whereby I assume that high-skilled employees generally have a high wage, similar to Przychodzen and Gómez-Bezares (2021). Equation (6) shows how I test Hypothesis 2. The variable *ln Pay Gap* in the interaction effect in this equation is centered.

$$\begin{aligned} ln\ Productivity_{it} \\ &= \beta_0 + \beta_1 * ln\ Pay\ Gap_{it} + \beta_2 * \ High\ Market\ Value_{it} + \beta_3 \\ &* High\ Average\ Salary_{it} + \beta_4 * (ln\ Pay\ Gap_{it} \\ &* High\ Market\ Value_{it}) + \beta_5 * (ln\ Pay\ Gap_{it} \\ &* High\ Average\ Salary_{it}) + \beta_6 * (ln\ Pay\ Gap_{it} \\ &* High\ Market\ Value_{it} * High\ Average\ Salary_{it}) + \gamma' * c_{it} \\ &+ \varepsilon_{it} \end{aligned} \quad (6)$$

Similar to the Hypothesis 2 test, I test Hypothesis 3 with an interaction effect. In order to test if the pay gap effect is more prominent for firms where the CEO is promoted, I include an interaction effect between the dummy variable for a promoted CEO and the pay gap, as shown in (7). Also in this equation, the variable *ln Pay Gap* in the interaction effect in this equation is centered.

$$\begin{aligned} ln\ Productivity_{it} \\ &= \beta_0 + \beta_1 * ln\ Pay\ Gap_{it} + \beta_2 * Promoted\ CEO_{it} + \beta_3 \\ &* (Pay\ Gap_{it} * Promoted\ CEO_{it}) + \gamma' * c_{it} + \varepsilon_{it} \end{aligned} \quad (7)$$

For the fourth hypothesis, the test is somewhat similar to the test for Hypothesis 1. However, as we want to see the effect of the stock rewards in particular, another main variable of interest is used. The variable *CEO Relative Stock Pay* is the value of the stock rewards of the CEO, relative to their total compensation in the same year. Therefore, I use (8) to test Hypothesis 4. For Hypothesis 5, I test the effect of the CEO stock options pay, relative to the total compensation of the CEO in the respective year. This leads to the Equation as displayed in (9).

$$ln\ Productivity_{it} = \beta_0 + \beta_1 * CEO\ Relative\ Stock\ Pay_{it} + \gamma' * c_{it} + \varepsilon_{it} \quad (8)$$

$$ln\ Productivity_{it} = \beta_0 + \beta_1 * CEO\ Relative\ Option\ Pay_{it} + \gamma' * c_{it} + \varepsilon_{it} \quad (9)$$

4.2 Alternative Approach

The sample data is characterized by high variance, as shown by the relatively large standard deviations for *Pay Gap* and *Productivity* in Table 1. To account for these outliers and the violation of the normal distribution, I use the logged values of pay gap and productivity in the main analysis. However, as a robustness test I also test the hypotheses using regular values for *Pay Gap* and *Productivity*. These alternative models, testing Hypothesis 1-5 respectively, are displayed in Table A2-A6. I use both the log models as well as the alternative models to analyze the results, however, the log models are preferred as they are better suited to account for outliers and the violation of the normal distribution.

5. Empirical Analysis

5.1 CEO-to-Worker Pay Gap Models

Table 4 displays the regression models testing Hypothesis 1. As I find in Model 1, an increase of pay gap by 1% is expected to decrease the productivity of the company by approximately 0.56%, ceteris paribus and significant at 1%. The outcomes suggest that the CEO-to-worker pay gap has a negative effect on productivity, measured in revenue per employee. Model 1, Model 2 and Model 3 all find a negative estimated effect, and significant at 5%. Table A2 displays the same regression models, with non-transformed values for company productivity and CEO-to-worker pay gap. In these models, I also find negative coefficients for the effect of pay gap on productivity. However, merely Model 1 finds a significant effect at the 5% level. For Model 1 of Table A2, an increase of pay gap by 1 is expected to decrease the productivity of the company by approximately $1,759, ceteris paribus and significant at 5%.

Based on the models, I find that my results are not in line Hypothesis 1. There is no evidence that the CEO-to-worker pay gap has a positive effect on company productivity, as the findings suggest that there is a negative effect of pay gap on productivity. The findings are not in line with several other findings, such as the ones from Elsayed and Elbardan (2018), Faleye et al. (2013) and Sigler and Haley (1995). This means that large relative CEO compensation packages cannot be explained by their effect on company

productivity.

Table 4

Regression Models of Pay Gap on Productivity

	(1) ln Productivity	(2) ln Productivity	(3) ln Productivity
ln Pay Gap	-.557***	-.368***	-.046**
	(.062)	(.072)	(.019)
CEO Age	.003	.007	.003
	(.01)	(.011)	(.004)
CEO Tenure	-.005	-.007	.001
	(.013)	(.01)	(.004)
CEO Male	.137	.08	-.05
	(.164)	(.104)	(.037)
ln Market Value	.269***	.133***	.097***
	(.046)	(.037)	(.037)
ROA	2.016**	2.217*	1.604*
	(.91)	(.994)	(.914)
CEO Director	-.288	.109	-.01
	(.303)	(.142)	(.049)
Δ Total Assets	-.096	-.096	-.054
	(.112)	(.111)	(.061)
Debt-to-Equity	.001	-.002	.001
	(.011)	(.011)	(.004)
Constant	4.955***	4.956***	4.991***
	(.63)	(.625)	(.418)
Observations	1242	1242	1242
R^2	.524	.422	.256
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.
Robust and clustered standard errors are displayed in parentheses. For Model 2 and Model 3, the R^2 of the within variation is displayed.

5.2 Tournament Theory Models

Table 5 displays the regression models testing Hypothesis 2. As these regressions test Hypothesis 2, the main coefficient of interest is the coefficient for the interaction of *Pay Gap, High Market Value* and *High Average Salary*. As the coefficient for this coefficient is negative across Model 1 and Model 2, there is an indication that the effect of pay gap on productivity is more negative for large firms with highly skilled employees. However, these models do not find a significant (at 5%) effect for this interaction. In line with the hypothesis, Model 3 finds a positive effect for the interaction between the three variables, however, this coefficient is also insignificant. Further, looking at the interaction between pay gap and market value specifically, I find that the effect of pay gap is particularly negative for firms with a high market value.

Based on these results, I conclude that the findings are not in line with Hypothesis 2.

From the alternative models, as displayed in Table A3, I draw a similar conclusion about Hypothesis 2. The models in Table A3 all display a negative coefficient for the pay gap, market value and average salary coefficient. Therefore, these findings are also not in line with Hypothesis 2.

Table 5

Regression Models of Pay Gap, High Market Value and High Average Salary, Including Interaction Effects, on Productivity

	(1) ln Productivity	(2) ln Productivity	(3) ln Productivity
ln Pay Gap	-.164	-.053*	.011
	(.104)	(.024)	(.038)
High Market Value	1.309***	.802**	.166
	(.395)	(.242)	(.152)
High Average Salary	.315	.702*	-.215
	(.506)	(.357)	(.195)
ln Pay Gap * High Market Value	-.207**	-.168**	-.065**
	(.089)	(.051)	(.026)
ln Pay Gap * High Average Salary	.248	-.011	.042
	(.154)	(.067)	(.049)
ln Pay Gap * High Market Value * High Average Salary	-.111	-.01	.025
	(.098)	(.054)	(.03)
CEO Age	.004	.006	.003
	(.009)	(.011)	(.004)
CEO Tenure	-.011	-.008	.001
	(.013)	(.009)	(.004)
CEO Male	.324**	.204	-.045
	(.157)	(.141)	(.034)
ROA	2.552***	2.465**	1.737*
	(.768)	(.927)	(.962)
CEO Director	-.055	.279*	.004
	(.318)	(.137)	(.051)
Δ Total Assets	-.071	-.084	-.045
	(.103)	(.104)	(.06)
Debt-to-Equity	.01	.003	.001
	(.01)	(.013)	(.005)
Constant	4.421***	4.359***	5.531***
	(.709)	(.471)	(.258)
Observations	1242	1242	1242
R^2	.548	.458	.247
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.
Robust and clustered standard errors are displayed in parentheses. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table 6 displays the regression models testing Hypothesis 3, which I also use to test the Tournament theory. Similar to the findings in Table 5, Model 1 and Model 2 show a negative insignificant coefficient and Model 3 shows a positive insignificant coefficient for the main independent variable of interest, which is the interaction between *ln Pay Gap* and *Promoted CEO*. Remarkably, the alternative tests in Table A4 show opposite signs for Model 1, 2, and 3. However, these coefficients are also insignificant. As the sign of the coefficients of the interaction effect of Pay Gap and Promoted CEO differ between the models, and neither of the coefficients is significant, my results are not in line with Hypothesis 3 based on these findings.

The results in Table 5 and Table 6 fail to provide evidence for the Tournament theory. Therefore, the findings of this analysis are not in line findings of several other studies that suggest that offering high compensation to the CEO stimulates employees to reach the highest positions within a company, which results in more motivated and productive employees (Faleye et al., 2013; Przychodzen & Gómez-Bezares, 2021).

Table 6

Regression Models of Pay Gap and Promoted CEO, Including Interaction Effects, on Productivity

	(1) ln Productivity	(2) ln Productivity	(3) ln Productivity
ln Pay Gap	-.528***	-.362***	-.053***
	(.07)	(.071)	(.019)
Promoted CEO	.342	.126	-.159
	(.344)	(.156)	(.109)
ln Pay Gap * Promoted CEO	-.084	-.021	.018
	(.076)	(.04)	(.022)
CEO Age	.004	.007	.001
	(.01)	(.011)	(.003)
CEO Tenure	-.006	-.006	-.003
	(.015)	(.009)	(.004)
CEO Male	.153	.087	-.049
	(.166)	(.106)	(.039)
ln Market Value	.27***	.134***	.096**
	(.046)	(.037)	(.037)
ROA	1.947**	2.199*	1.623*
	(.914)	(.981)	(.917)
CEO Director	-.265	.117	-.02
	(.298)	(.147)	(.051)
Δ Total Assets	-.095	-.094	-.053
	(.11)	(.108)	(.06)
Debt-to-Equity	.001	-.001	.001
	(.01)	(.011)	(.004)
Constant	4.743***	4.876***	5.139***
	(.662)	(.658)	(.402)
Observations	1242	1242	1242
R^2	.525	.423	.26
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.
Robust and clustered standard errors are displayed in parentheses. For Model 2 and Model 3, the R^2 of the within variation is displayed.

5.3 Agency Theory Models

Table 7 displays the regression models testing Hypothesis 4. Model 1 and Model 2 show that the *Relative Stock Pay* has a positive estimated effect on *Productivity*, which is in line with Hypothesis 4. However, the findings are insignificant at the 5% confidence level and Model 3 shows a negative estimated effect. This means that there is no clear evidence that there is a positive effect of a stock award component for the CEO on company productivity. The interpretation of the alternative models in Table A5 leads to a similar conclusion. These models show a negative and insignificant estimated effect of CEO stock awards on company productivity and therefore there is no clear evidence of an effect of a stock award component for the CEO on company productivity.

Table 7

Regression Models of Relative Stock Pay on Productivity

	(1) ln Productivity	(2) ln Productivity	(3) ln Productivity
CEO Relative Stock Pay	.233	.087	-.007
	(.225)	(.125)	(.044)
CEO Age	.004	.011	.002
	(.011)	(.01)	(.004)
CEO Tenure	-.001	-.008	0.000
	(.017)	(.01)	(.004)
CEO Male	.403	.182	-.054
	(.254)	(.149)	(.036)
ln Market Value	.048	-.051**	.082**
	(.043)	(.02)	(.038)
ROA	2.169***	2.554**	1.614*
	(.726)	(.74)	(.914)
CEO Director	-.506	-.026	-.018
	(.348)	(.223)	(.051)
Δ Total Assets	-.037	-.052	-.055
	(.103)	(.1)	(.061)
Debt-to-Equity	-.005	-.007	.001
	(.015)	(.009)	(.004)
Constant	3.786***	4.544***	4.952***
	(.821)	(.68)	(.408)
Observations	1236	1236	1236
R^2	.344	.32	.256
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.
Robust and clustered standard errors are displayed in parentheses. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table 8 displays the regression models testing Hypothesis 5. As the sign of the coefficient of *Relative Option Pay* is negative in all three models, I find that my results are not in line with Hypothesis 5. Particularly Model 1 suggests an opposite effect than the estimated effect of Hypothesis 5. Significant at 1%, Model 1 estimates that an increase of relative stock option pay by 0.1 leads to a decrease of company productivity by approximately 0.12%. The alternative models in Table A6 show similar results, as all models display a negative coefficient for *CEO Relative Option Pay* and only Model 1 is significant at 5%. Also, these findings are not in line with Hypothesis 5.

The findings in Table 7 and Table 8 do not seem to be according to the Agency theory, stating that the compensation of CEOs should be based on their performance, in order to align their incentives with the interest of the shareholders. With these findings, there is no evidence that findings from the previous century seem to also hold for more recent data (Sigler & Haley, 1995; Tosi & Gomez-Mejia, 1989), both for

stock options and stock rewards.

Table 8

Regression Models of Relative Option Pay on Productivity

	(1) ln Productivity	(2) ln Productivity	(3) ln Productivity
CEO Relative Option Pay	-1.186***	-.391	-.084
	(.392)	(.253)	(.14)
CEO Age	.003	.01	.002
	(.011)	(.011)	(.003)
CEO Tenure	-.001	-.008	0.000
	(.016)	(.01)	(.004)
CEO Male	.394	.183	-.056
	(.253)	(.152)	(.037)
ln Market Value	.086**	-.036**	.081**
	(.042)	(.014)	(.039)
ROA	2.092***	2.533**	1.617*
	(.749)	(.741)	(.912)
CEO Director	-.376	.009	-.014
	(.341)	(.228)	(.046)
Δ Total Assets	-.053	-.058	-.055
	(.106)	(.099)	(.061)
Debt-to-Equity	-.007	-.007	.001
	(.014)	(.009)	(.005)
Constant	3.728***	4.52***	4.961***
	(.813)	(.689)	(.402)
Observations	1236	1236	1236
R^2	.358	.322	.256
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.
Robust and clustered standard errors are displayed in parentheses. For Model 2 and Model 3, the R^2 of the within variation is displayed.

6. Discussion

6.1 Conclusion

This study does not find that the amount of CEO compensation has a significant positive effect on company productivity. Contrarily, the findings suggest that high CEO compensation has a negative effect on company productivity. Additionally, it comes to a different conclusion than other studies that find the Tournament theory effect and the Agency theory to explain the positive effects of CEO-to-worker pay gap on company productivity. I conclude that the Tournament theory is not supported by this analysis, based

on the estimated effect of CEO-to-worker pay gap on company productivity which is not significantly higher for large companies with highly skilled workers compared to smaller companies with lower-skilled workers. Also, the effect of CEO-to-worker pay gap on company productivity is not significantly higher for companies with a promoted CEO, compared to company with an outside-hired CEO. For the Agency theory, I find that stock rewards and stock options as a component of the CEO compensation do not have a significant positive effect on company productivity.

6.2 Contribution

In this section, I describe the theoretical and societal contribution of this study. An important empirical finding of this study is the finding that the CEO-to-worker pay gap does not necessarily lead to higher company productivity. While previous studies (Faleye et al., 2013; Sigler & Haley, 1995) suggest that a larger pay gap between CEOs and workers leads to better performance, our study challenges this assumption. We suggest that the reason for this discrepancy may be the more recent data we use compared to other studies. This study incorporates data that is more recent, and as such, may be more reflective of current trends. Furthermore, the analysis extends beyond testing the effect of the CEO-to-worker pay gap by testing the Tournament theory and the Agency theory. However, my analysis does not find evidence to support these theories, which is not in line with the findings of previous studies (Elsayed & Elbardan, 2018; Faleye et al., 2013; Sigler & Haley, 1995). These results suggest that lower-level employees are not significantly incentivized to put in more effort for promotion with an increase of the relative pay of the CEO. Also, it does not provide evidence that CEOs are motivated by incentivizing compensation components, such as stock rewards and stock options. Alternatively, it could be that stock rewards and stock options are not properly constructed to incentivize CEOs, as argued by Jensen (1990). Furthermore, Hypothesis 3 presents a novel way of testing the Tournament theory, which also does not provide evidence for the Tournament theory.

Moreover, this study has significant implications for the ongoing debate around executive compensation. I find no evidence to support that a larger CEO-to-worker pay gap leads to higher company productivity. This finding adds to the growing body of literature that discusses the effectiveness of high executive compensation in promoting company success. Moreover, our results do not provide clear evidence for the need for companies to pay exorbitant salaries to their CEOs. This is particularly relevant in light of the increasing criticism of high compensation packages, as described by Murphy (2013) and demonstrated by Tonti (2022). This has important implications for both policymakers and business leaders, who may need

to reconsider their approach to executive compensation.

6.3 Limitations & Recommendations

The study has some limitations that should be taken into consideration when interpreting the results. One of the limitations is the possibility of reverse causality in the relationship between productivity and incentive-based CEO compensation. However, productivity is less vulnerable to reverse causality than other company performance measures such as profit and stock price increase, which often drive this type of compensation. Also, there is a risk of self-selection bias if firms with low average salaries choose not to publish their data. More problematic, CEO can decide what to disclose for labor expenses. Therefore this is likely to lead to selection bias, as CEOs with large gaps and high salaries might rather not disclose it. This potentially wrong representation of US firms in the sample is supported by the relatively low pay gap in the sample, compared to the pay gaps that Pan et al. (2022) and Lifshey (2018) find.

Particularly looking at the stock options, the time lag between the grant date, the vesting date and the maturity date is a limitation that makes it difficult to establish a clear causal relationship between stock option pay and company productivity within a timeframe of one year. Typically, stock options have a maturity of 10 years and they must be held for 3 years (Global Shares, 2022; Livermore, 2022). Because of this, there is a substantial time lag between the actions of a CEO and the realization of the benefits. Further, the study finds significant variability between the models, indicating that choosing the appropriate model is critical. Additionally, the dataset only provides information on promotions from non-CEO executives to CEO positions, which limits the analysis of promotions at other levels of the firm.

Overall, the results are influenced by the distribution of the variables and outlier values in the sample data. I make an effort to limit the effect of these outliers by using log values and by applying winsorization. Further, the models fail to provide strongly significant coefficients for the control variables, this might indicate that the lack of significant results might be due to a low number of observations in the sample data. Also, Table 2 shows that the share of companies per industry differs between the Compustat data and the sample data, which is the result of removing many observations. This could also limit the representativeness of the sample. A recommendation for future research is to expand the dataset to include more years and examine promotions of other executives as well. The latter can be done by using the executive ranking variable of the Compustat dataset to determine whether executives make promotions over time. Last, I highlight the importance of the increase of CEO-to-worker pay gap by

recommending future research on exploring alternative reasons for the increase of the pay gap as I have not been able to find an explanation for this highly-criticized phenomenon.

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8. Appendix

Table A1

Table Displaying the Correlation between the Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) ln Productivity	1.000													
(2) ln Pay Gap	-0.410	1.000												
(3) ln Market Value	0.220	0.474	1.000											
(4) ROA	0.196	0.181	0.349	1.000										
(5) Δ Total Assets	0.000	-0.043	0.023	-0.008	1.000									
(6) Average Salary	0.305	-0.275	-0.022	0.186	-0.037	1.000								
(7) Debt-to-Equity	0.035	0.074	0.127	-0.068	-0.007	0.015	1.000							
(8) CEO Age	0.022	0.044	0.080	0.008	-0.125	-0.055	0.027	1.000						
(9) CEO Tenue	-0.003	-0.055	-0.030	-0.020	0.011	-0.070	-0.038	0.282	1.000					
(10) CEO Male	0.106	-0.019	0.106	0.030	0.049	0.034	-0.019	0.033	-0.026	1.000				
(11) CEO Director	-0.126	0.067	0.019	-0.006	0.028	0.001	0.023	-0.060	-0.038	-0.055	1.000			
(12) Promoted CEO	0.017	0.121	0.147	0.065	-0.043	0.047	-0.001	-0.069	-0.357	0.016	0.040	1.000		
(13) CEO Relative Stock	0.018	0.382	0.270	0.030	-0.030	-0.077	0.077	0.021	0.102	-0.003	0.086	0.120	1.000	
(14) CEO Relative Option	-0.024	0.247	0.253	0.046	-0.020	0.002	0.023	-0.014	-0.058	0.021	0.069	-0.060	-0.299	1.000

Table A2

Regression Models of Pay Gap on Productivity Using Logarithmic Values

	(1) Productivity	(2) Productivity	(3) Productivity
Pay Gap	-1.759***	-.774	-.074
	(.52)	(.577)	(.07)
CEO Age	-1.717	3.329	-5.415*
	(11.926)	(10.102)	(3.027)
CEO Tenure	-17.378	-13.908	.062
	(29.158)	(15.944)	(4.478)
CEO Male	447.337	367.08	-19.097
	(303.139)	(219.752)	(29.152)
ln Market Value	-3.315	-73.976	50.679
	(58.666)	(77.561)	(38.429)
ROA	1966.316*	1764.499	231.2
	(1079.645)	(1106.618)	(388.331)
CEO Director	179.65	534.67	18.639
	(524.746)	(497.829)	(25.384)
Δ Total Assets	27.876	9.346	9.055
	(80.729)	(67.375)	(17.656)
Debt-to-Equity	26.706	22.698	1.145
	(18.547)	(21.027)	(2.782)
Constant	-398.847	-33.726	607.223*
	(867.446)	(580.601)	(326.626)
Observations	1242	1242	1242
R^2	0.224	.195	.045
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.

Robust and clustered standard errors are displayed in parentheses. Productivity is measured in thousands. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table A3

Regression Models of Pay Gap, High Market Value and High Average Salary, Including Interaction Effects, on Productivity Using Logarithmic Values

	(1) Productivity	(2) Productivity	(3) Productivity
Pay Gap	.587	-.387	.484
	(1.135)	(.909)	(.331)
High Market Value	333.717	74.508	74.026
	(276.721)	(152.15)	(57.746)
High Average Salary	898.385**	933.805*	-6.933
	(353.417)	(461.601)	(37.584)
Pay Gap * High Market Value	-1.344	.111	-.537*
	(1.288)	(.712)	(.293)
Pay Gap * High Average Salary	-1.925	-1.388	1.067
	(8.714)	(9.265)	(2.038)
Pay Gap * High Market Value * High Average Salary	-2.152	-2.622	-.977
	(8.05)	(8.086)	(1.904)
CEO Age	-2.937	-1.405	-5.322*
	(12.576)	(11.209)	(2.931)
CEO Tenure	-18.741	-11.955	.44
	(28.506)	(15.129)	(4.619)
CEO Male	501.368*	455.289**	-25.615
	(290.11)	(175.02)	(25.874)
ROA	1897.795*	1598.458*	309.889
	(977.898)	(810.456)	(356.398)
CEO Director	294.587	689.91	20.88
	(554.579)	(452.373)	(28.405)
Δ Total Assets	6.582	-16.82	13.598
	(81.678)	(61.59)	(18.783)
Debt-to-Equity	30.531	29.852	1.64
	(18.859)	(25.854)	(2.572)
_cons	-938.895	-740.439	914.096***
	(896.001)	(534.382)	(185.37)
Observations	1242	1242	1242
r2_w	.261	.233	.04
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.

Robust and clustered standard errors are displayed in parentheses. Productivity is measured in thousands. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table A4

Regression Models of Pay Gap and Promoted CEO, Including Interaction Effects, on Productivity Using Logarithmic Values

	(1) Productivity	(2) Productivity	(3) Productivity
Pay Gap	-2.025***	-1.016	-.014
	(.702)	(.749)	(.097)
Promoted CEO	-294.855	-190.936*	24.274
	(207.297)	(82.582)	(59.484)
Pay Gap * Promoted CEO	.447	.482	-.18
	(.649)	(.473)	(.169)
CEO Age	-2.27	3.209	-5.19**
	(12.136)	(9.936)	(2.593)
CEO Tenure	-27.682	-20.047	.249
	(32.236)	(16.468)	(4.852)
CEO Male	401.52	337.045	-12.615
	(298.03)	(213.827)	(31.451)
ln Market Value	2.945	-71.979	49.868
	(58.74)	(77.778)	(38.54)
ROA	1956.251*	1785.555	225.243
	(1087.726)	(1114.934)	(387.004)
CEO Director	170.847	515.275	24.155
	(513.87)	(480.436)	(22.002)
Δ Total Assets	15.895	3.786	9.337
	(87.244)	(68.277)	(17.671)
Debt-to-Equity	26.312	22.6	1.488
	(18.262)	(20.849)	(2.947)
Constant	-201.786	121.21	582.362**
	(902.793)	(619.876)	(287.983)
Observations	1242	1242	1242
R^2	.228	.197	.046
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.

Robust and clustered standard errors are displayed in parentheses. Productivity is measured in thousands. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table A5

Regression Models of Relative Stock Pay on Productivity Using Logarithmic Values

	(1) Productivity	(2) Productivity	(3) Productivity
CEO Relative Stock Pay	-181.093	-279.174	-23.016
	(364.771)	(342.483)	(94.333)
CEO Age	-2.859	3.056	-5.615*
	(12.399)	(10.477)	(3.055)
CEO Tenure	-10.05	-10.362	.152
	(29.502)	(17.23)	(4.781)
CEO Male	550.532*	373.869	-19.22
	(322.409)	(205.321)	(29.661)
ln Market Value	-49.621	-99.502	50.276
	(55.19)	(80.212)	(36.524)
ROA	1922.48*	1783.243	232.181
	(1076.959)	(1061.292)	(387.989)
CEO Director	146.339	552.492	19.375
	(549.935)	(521.631)	(21.92)
Δ Total Assets	34.672	8.188	8.872
	(82.146)	(61.969)	(17.531)
Debt-to-Equity	25.412	21.961	1.106
	(20.12)	(19.852)	(2.732)
Constant	-208.452	193.112	619.007*
	(919.362)	(653.193)	(320.041)
Observations	1236	1236	1236
R^2	.201	.193	.045
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.

Robust and clustered standard errors are displayed in parentheses. Productivity is measured in thousands. For Model 2 and Model 3, the R^2 of the within variation is displayed.

Table A6

Regression Models of Relative Option Pay on Productivity Using Logarithmic Values

	(1) Productivity	(2) Productivity	(3) Productivity
CEO Relative Option Pay	-936.107**	-374.501	-3.047
	(470.661)	(302.466)	(117.263)
CEO Age	-3.073	3.128	-5.568*
	(12.002)	(10.298)	(2.986)
CEO Tenure	-11.865	-12.164	.059
	(28.477)	(16.259)	(4.358)
CEO Male	557.76*	398.275	-19.866
	(320.447)	(227.929)	(28.98)
ln Market Value	-34.061	-98.422	48.993
	(59.382)	(78.874)	(38.826)
ROA	1918.851*	1822.352	236.769
	(1078.089)	(1118.866)	(387.058)
CEO Director	210.956	546.161	17.21
	(545.377)	(521.338)	(29.654)
Δ Total Assets	31.578	11.935	8.951
	(84.315)	(67.75)	(17.631)
Debt-to-Equity	22.721	21.162	1.157
	(19.109)	(19.627)	(2.697)
Constant	-316.32	108.043	621.895*
	(889.956)	(629.363)	(320.846)
Observations	1236	1236	1236
R^2	.207	.192	.045
Region Fixed Effects	Yes	Yes	No
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	No
Company Fixed Effects	No	No	Yes

Note. *** p<.01, ** p<.05, * p<.1.

Robust and clustered standard errors are displayed in parentheses. Productivity is measured in thousands. For Model 2 and Model 3, the R^2 of the within variation is displayed.