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Does CEO Pay Ratio Matter?

Introduction

Stagnant middle-class wages combined with steeply increasing incomes for high-earners have led to a debate about income inequality in the United States which has been growing for some years (*1*). A new Economic Policy Institute (EPI) analysis finds that CEO pay, which is on-average 399 times as much as that of a typical worker in 2021, has increased by as much as 1,460% since 1978 (*2*). CEO pay ratio is a social concern of interest to investors, employees, and regulators.

Firms were required to disclose CEO-to-median employee compensation in 2018, a first-time event that allows us to explore the short-term market reaction1 and firms’ performance following said reaction. This came as a result of legislature introduced to address issues such as income inequality. As mandated by the Dodd-Frank Wall Street Reform and Consumer Protection Act, the United States Securities and Exchange Commission (SEC) adopted a rule in 2015, effective the fiscal year beginning on or after January 1st of 2017, which required that companies must begin making annual pay ratio disclosures, describing the in-firm pay dispersion2 using the ratio of annual compensation of the company’s CEO to that of their median employee (*3*). The addition of this rule has made the differences in income between CEOs and typical workers more apparent, and has even resulted in legislature which attempts to address this issue. As an example of such legislature, following SEC’s disclosure rule, San Francisco voters approved the Overpaid Executive Tax on November 3, 2020, which became effective on January 1, 2022 (*4*). Though not all believe that the disclosure of pay ratio data is necessarily very informative, or helpful. According to analyst Michelle Leder, after analyzing the CEO pay ratio data and its effects (or lack thereof) for five years since it was first required to be disclosed, there are some who “think it’s time to call the rule a failed experiment and scrap it” (*5*). Others go so far as to say that there is no statistically significant relation between the ratio of CEO-to-mean employee compensation and performance (*6*).

Objectives

As stated by Pan et al., “Understanding equity markets’3 assessment of income inequality is important because equity markets allocate capital and send valuation signals4 to firms, informing and possibly shaping corporate policies that contribute to or mitigate income inequality” (*1*), furthermore, firms’ historical average stock price is helpful in understanding investors’ perception and the outlook of firms. In this study, we specifically focus on whether firms disclosing higher CEO-to-median-employee pay ratios experience significantly lower abnormal announcement returns5, and the relationship of CEO pay ratio with firms’ performance in the long-term. We will discuss these phenomena and work to develop the following hypotheses:

1. The market reaction is more negative for firms with a higher pay ratio relative to firms with a lower pay ratio, or
2. There is no significant relationship between CEO pay ratio and firms’ performance.

Significance

Understanding the extent of the impact of a CEO pay ratio disclosure is important for jurisdictions which may be considering implementing a CEO tax or other measures in order to combat the issue of income inequality. Policymakers need to understand the tradeoffs in implementing such a policy and the magnitude of the potential positive and negative effects.

Data Sources

The 2017 through 2021 CEO-to-median-employee pay ratio data was obtained for the 2018 S&P 100 companies from the SEC Electronic Data Gathering, Analysis, and Retrieval database (EDGAR), and was recorded into a Microsoft Excel spreadsheet file (.xlsx). The pay ratio data had to be recorded manually, as it came directly from Definition 14A proxy statements which companies had filed with the SEC (10-Ks)6. The stock return, book-to-market7, and market capitalization8 data used for the calculation of CAR were obtained from the Center for Research in Security Prices (CRSP) database and the CompuStat database (with return data being obtained from CRSP, and book-to-market and market capitalization from CompuStat). These datasets were obtained in the form of .csv files.

Due to time constraints for this project and because we had to collect and record the data by hand, we chose S&P 100 firms as our sample. After removing the companies for which we could not find documents with 2018 filing dates, and companies with CEO-to-median-employee pay ratios less than 100, we were left with 72 samples and 72 observations for use in model 1, and 72 samples and 416 observations for use in model 2.

Methodology

We performed cross-sectional regressions relating firms’ cumulative abnormal returns to the announced pay ratios while controlling for equity market capitalization and book-to-market statistics. Below are some equations (*1*) describing the relationships between some variables which were used in the analysis of the financial data (LN Pay Ratio, LN MktCap, CAR, and Avg prc are all described in Appendix I):

We expect to observe an overall negative relationship between CAR and the CEO-to-median-employee pay ratio, as that would corroborate the results of Pan et al.’s 2022 study which examined the same variables (*1*).

After all the data was gathered, it had to be merged and cleaned before it could be visualized. Our analysis of the data was conducted on two different merged datasets. One dataset was created by merging the 2018 pay ratio data (2018\_Pay\_Ratio.xlsx) with the book-to-market and market capitalization data (BMC.csv) and the cumulative abnormal returns data (CAR.csv). The purpose of this merging (Model 1) was to see if we could easily replicate the results found by Pan et al. (*1*) by comparing the pay ratio data to the CAR data. The other dataset (Model 2) was created by merging the full 2017 through 2021 pay ratio data (Full\_Pay\_Ratio.xlsx) with the firms’ stock return data (DailyStockPrice.csv), the firms’ fiscal year data (FiscalYear.csv), and the firms’ book-to-market and market capitalization data (BMC.csv). The purpose of looking at this dataset was to see if there was any strong correlation between CEO pay ratio and book-to-market, market capitalization, and average stock price data over a longer time frame. The “merge” function found in the “Pandas” library for python, alongside some sql queries using the “sqlite3” library, was used to achieve these merges, using the firms’ ticker and fiscal year data to organize a proper merge of the datasets.

Results

Because of the limitations in terms of sample size of the data, we could not get a significant regression result for Model 1 (FIG. 1):

**Chart, scatter chart

Description automatically generatedFIG. 1**: The natural logarithm of CEO-to-median-employee pay ratio as compared to CAR[-1,+5]. The r2 value for this regression was 1.71e-4, with a slope of 3.78e-3.

The results of this regression suggest no strong correlation between CEO pay ratio and CAR[-1,+5].

Chart, scatter chart

Description automatically generatedFor Model 2 (FIG. 2-4), the results appeared to be consistent with our expectations: although the market reaction is negatively correlated with higher CEO pay ratio in the short term after the initial disclosure, according to Pan et al. (*1*), it does not appear to have significant influence on or correlation with the firms’ performance in the long-term.

**FIG. 2**: The natural logarithm of CEO-to-median-employee pay ratio as compared to the firms’ average stock price. The r2 value for this regression was 7.31e-4, with a slope of 3.37e-3.

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Description automatically generated **FIG. 3**: The natural logarithm of CEO-to-median-employee pay ratio as compared to the natural logarithm of the firms’ market capitalization. The r2 value for this regression was 1.00e-2, with a slope of 1.01e-1.

**FIG. 4**: The natural logarithm of CEO-to-median-employee pay ratio as compared to the firms’ book-to-market. The r2 value for this regression was 1.86e-2, with a slope of -5.73e-2.

Future Work

If we were to have the opportunity to work on further research in this direction in the future, the first step would be to use a larger sample. Due to the time constraints of this project, we decided to only work with the companies which were recognized as the S&P top 100 in 2018, around the time of the first fiscal year where companies had to disclose their CEO-to-median-employee pay ratios (*2*). In addition to analyzing the data of more U.S. corporations, we could take a look at international data to analyze the relationship between CEO and median employee compensation across the world and whether it displays the same relationship as in the U.S.

As stated in the introduction, in November of 2020 the majority of San Francisco voters voted to instate the Overpaid Executive Tax, which became effective on the 1st of January, 2022 (*5*). This new tax regulation levies additional taxes on gross receipts tax if the pay ratio of the highest-paid managerial position over the median San Francisco-based employees is higher than 100. Future research in this direction could use this event as a shock, and employ a difference-in-difference (DiD) approach to perform further analysis, using a sample of San Francisco-based businesses in 2022-2023. For each firm, we could manually collect its proxy statement DEF 14A information, then define treated and control groups as firms with CEO pay ratio greater than and less than 100. The primary sample would comprise 672 treated firms (IPOs) based in San Francisco. To measure a firm’s change in behavior, we could use compensations of the CEO and workers, the CEO turnover rate, relocation of firms, and middle-wage and low-wage jobs hiring.

Appendix I: Key Terms

1. Market Reaction: measured by cumulative abnormal returns, please refer to the proposed methods.

2. Relationship between In-Firm Pay Dispersion and Income Inequality: personal income includes salary, investment returns, self-employment, etc. One of the factors that could lead to overall income inequality is in-firm pay dispersion.

3. Equity Market: where companies issue stocks to raise capital and where investors trade stocks to invest.

4. Valuation Signals: in the context of this paper, the valuation signal means the equity market will assess firms’ CEO-to-median-employee pay ratio and give feedback through companies’ performance in the equity market. The process of assessment and feedback is the valuation signals, which may in-turn shape the firms’ policies.

5. Abnormal Returns: between event days -1 and +5 as the difference in basis points between a firm’s daily return and the value-weighted CRSP market return, with both returns excluding dividends.

6. Definition 14A Proxy Statements (10-Ks): a 10-K is a comprehensive report filed annually by a publicly-traded company about its financial performance, and is required by the SEC.

7. Book-to-Market Equity Ratio: the ratio of the company’s market capitalization to its book value, which is the amount left in the event that the company liquidates all of its assets and repays all of its liabilities.

8. Market Capitalization: the total value, in U.S. dollars, of a firm’s outstanding stock shares.

9. CAR [-1, +5]: cumulative abnormal return between event days -1 and +5, with an abnormal return representing the difference between a firm’s daily return and the value-weighted CRSP market return, with both returns excluding dividends. Day 0 in event time is identified as the earliest filing date in 2018 of either the preliminary or the definitive proxy statement.

10. LN Pay Ratio: the natural logarithm of the pay ratio, which was obtained by dividing annual CEO compensation by annual median employee compensation and rounding to the nearest whole number.

11. LN MktCap: the natural logarithm of the firm’s market capitalization.

12. Average prc: average annual stock return price.

Appendix II: Individual Contributions & Github URL

Qinghua: 50% manual collection of CEO pay ratio data, data cleaning and merging, data regression and visualization. Wrote introduction, objectives, significance, data sources, methods, results, future work, and appendix.

Zach: 50% manual collection of CEO pay ratio data, organization and uploading of files to Github. Managed report citations, report editing, report formatting, and contributed to writing of the introduction, objectives, data sources, methodology, results, future work, and appendix.

Project Github page URL:

https://github.com/ZachIngram04/MBIO4783\_Project

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