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ARTICLE

THE IMPACT OF EXECUTIVE COMPENSATION INCENTIVES ON THE QUALITY OF CORPORATE ENVIRONMENTAL INFORMATION DISCLOSURE

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ABSTRACT

With the continuous development of the concept of green development, the disclosure of corporate environmental information has become one of the most important indicators for judging whether a company fulfils its social responsibility and low carbon development. This paper takes S&P 500 index companies from 2015 to 2019 as a sample for empirical analysis to test the impact of executive compensation incentives on the quality of corporate environmental information disclosure, as well as the moderating effect of industry competition on both. The conclusions show that the enhancement of executive compensation can improve the quality of corporate environmental information disclosure, while more shares held by executives will reduce the quality of corporate environmental information disclosure. The moderating effect of industry competition is significant in the effect of equity incentives on the quality of corporate environmental disclosure, while the moderating effect of industry competition is only significant in non-heavily polluted industries compared to heavily polluted industries.

KEYWORDS

Corporate Governance; Corporate Social Responsibility; Executive Compensation Incentives; Corporate Environmental Disclosure Quality; Industry Competition

1. INTRODUCTION

Over the past few decades, the rapid growth of the global economy has results in escalating environmental degradation. As public awareness of environmental issues has increased, corporate stakeholders find themselves increasingly in need of corporate comprehensive environmental information to make informed decisions. In order to better cater to the market, companies have to disclose more environment-related information [1-2] to justify their position in the current environmental issues [3]. Consequently, companies are compelled to disclose more environment-related information [1-2] in order to demonstrate their commitment to addressing current environmental concerns [3]. Moreover, it has been proven that good environmental management can give companies more competitive advantages in the face of mounting industry competition [4]. This advantage extends to improvements in the company's reputation [5], overall performance [6], and enhanced relationships with stakeholders [7]. Therefore, how to disclose good information management to stakeholders is crucial to the sustainable development of modern enterprises. Moreover, as the implementers of corporate decision-making, how to motivate them to better improve the quality of corporate environmental information disclosure is an issue that enterprises are eager to think about.

On the other hand, the separation of ownership and control in modern corporations has led to more significant conflicts of interest between shareholders and executives. In 'Modern Corporations and Private Property ', point out that, in general, when there is a conflict of interest between the owners and operators of a firm, the operators tend to give priority to their own interests and ignore the interests of the owners to maximise profits. This situation is commonly referred to as an agency problem. As a result, the management, whose compensation is often tied to corporate performance, may reject certain corporate social responsibility (CSR) initiatives that do not yield immediate performance improvements and may maliciously reduce the disclosure of corporate environmental information. To address this issue, it becomes crucial to guide executives to disclose true and complete corporate environmental information. Compensation incentives, as a part of corporate governance, are widely believed to align managers' behaviour and choices with those of the firm's stakeholders [8]. Both principal-agent theory and information asymmetry theory suggest that compensation incentives can effectively motivate corporate executives to run and manage the firm better, leading to disclose more corporate accounting information and improve the quality of corporate disclosure, which can effectively mitigate information asymmetry. This is significant for better corporate environmental disclosure, but the differences in the impact of different types of compensation incentives on the quality of corporate environmental disclosure is still an issue that needs to be explored.

Existing scholars' studies on the influencing factors of corporate environmental information disclosure can be broadly categorised into internal and external factors. Internal factors mainly include corporate structure, corporate governance, and executive characteristics [9, 10, 44], while external factors mainly include government regulation, competitive pressures, and media control [10-12]. As part of corporate governance and as a powerful tool to mitigate corporate agency problems, few scholars have directly studied the influence of executive compensation incentives on corporate environmental disclosure. The most common executive compensation incentives are excess compensation and equity incentives, and there are no clear empirical results on the impact of these two different incentives on the quality of corporate environmental disclosure. Moreover, the continuous development of the economy has made t industry competition is an essential consideration for every enterprise. The different degree of competition in the industry may lead to the relationship between the executive compensation incentives and the disclosure of environmental information of the enterprise to be different, because it may lead to the willingness of the executives to work for the interests of the enterprise's stakeholders to be affected. Additionally, industry competition is seen as an unavoidable factor is also considered as a factor that may affect the fulfilment of corporate social responsibility. Therefore, the intensity of industry competition can be considered an external factor affecting firms may have an impact on the relationship between executive compensation incentives and corporate environmental disclosure.

In light of these findings, this paper aims to address the following research questions:

(1) Does the implementation of compensation incentives for executives have a positive impact on corporate environmental information disclosure?

(2) Does the type of compensation incentive affect the effectiveness of executive compensation incentives?

(3) Does the intensity of industry competition affect the relationship between executive compensation incentives and corporate environmental information disclosure?

To explore the relationship between executive compensation incentives and the quality of corporate environmental disclosure, I mainly explain it through the institutional and agency problems frequently discussed in economics. I argue that, in the context of green development, higher executive compensation is positively related to the quality of corporate environmental disclosure. However, since there are fewer empirical studies on the impact of equity incentives on corporate environmental disclosure, and the results of the positive and negative correlations are not consistent, I assume that the impact of equity incentives on the quality of corporate environmental disclosure is relevant. In addition, I also propose that the intensity of industry competition can consolidate the relationship between executive compensation incentives and corporate environmental disclosure, so industry competition can be considered as a moderating effect between the relationship of two. To verify my conjecture, I conduct an empirical analysis by using data from 403 listed companies of S&P 500 index within the period of January 2015 to December 2019.

The content of this paper is distributed as follows: background analysis in the first part, literature review in the second part, a detailed explanation of the three hypotheses in the third part, preparation of the empirical analysis in the fourth part (including data source and regression model establishment), analysis of the empirical results in the fifth part (including descriptive statistics, correlation analysis, regression analysis, heterogeneity analysis and robustness analysis), and a summary of the empirical findings and constructive comments in the final section.

2. LITERATURE REVIEW

2.1 Corporate Environmental Disclosure

Corporate disclosure started as a disclosure of the company's financial statements and some additional financial information as necessary. With the progress of socio-economic development, corporate disclosure is now widely recognised as an external strategic tool. This transformation demands comprehensive coverage of all aspects of a company's operations for the review of the business's stakeholders, which include not only the owners or shareholders of the business, but also the business's customers, employees and the society as a whole [13]. Among these stakeholders, the disclosure of corporate environmental information is increasingly taking an important place. A considerable amount of literature has examined the motivations that influence corporate environmental disclosure, with the two dominant theories being the legitimacy disclosure theory as well as the voluntary disclosure theory. The legitimacy disclosure theory was proposed by Hogner in 1982 [14], who argued that the original motivation for corporate disclosure of environmental information is to legitimise corporate activities. Specifically, on the one hand, due to the worsening of environmental degradation, the public has awakened to environmental awareness and has become more concerned about whether the economic activities of enterprises affect the environment, and they are increasingly of the opinion that enterprises should not aim at obtaining economic benefits as the primary purpose and should take the initiative to assume social responsibility as far as possible to minimise the pollution of the environment. Moreover, enterprises with poor environmental effects are also likely to be captured by the media and criticised by media reports, which may lead to rapidly lower market favorability. In other words, people feel more favorably about firms that are proactive in their environmental as well as social responsibilities, which means that firms driven by environmental pressures may want to win more goodwill from the market public by increasing the quality of their corporate environmental information. On the other hand, because regulatory mechanisms manage organisations and screen market players by setting and enforcing strict environmental standards, rules and social norms, companies that do not fulfil their social responsibilities but only pursue their economic interests will face the risk of being excluded from the market, and then, in the face of political and social pressures, companies often choose to disclose the relevant information in order to prove the legitimacy of their economic activities [15] and, in contrast, developed Western countries have higher environmental standards and stronger enforcement than other markets compared to other countries. Firms that maliciously violate environmental regulations are subject to severe fines, so under the pressure of the fines, shareholders and investors can only pay more attention to the environmental effects of the firm and urge executives to carry out environmental management for the sake of the long-term interests of the firm. Under this theory, the disclosure of corporate environmental information can be seen as a response to the public's expectations and the government's claims, and scholars supporting this theory have used a large amount of data to prove that corporations use the disclosure of environmental information as a legitimising tool [16], i.e., they hope to reverse the views of corporate stakeholders on the corporation and satisfy their needs through the attitude of positive disclosure. The voluntary disclosure theory, in contrast, focuses on firms with good environmental performance, which are more keen to voluntarily disclose more information about their good environmental performance in order to enhance market favorability and bolster their market value while differentiating themselves from competitors in the same industry, due to the fact that they are proactive in fulfilling their social responsibilities during their daily business activities [17-18]. By communicating good environmental messages, these firms can gain more market favorability, increase their competitive advantage and gain a favorable strategic position. There are previous empirical studies indicating that firms can reduce the cost of capital [19], improve firm performance, and enhance stock liquidity [20] by voluntarily disclosing environmental information.

The management team of a company has always occupied an important position in corporate governance, thereby making the realization of corporate social responsibility contingent upon the collaboration of corporate executives. It has been shown that in corporate environmental issues, without the support of executives, the results of actual internal environmental performance fall short of the desired vision. This is because executives need to actively implement the environmental strategy, which involves not only many interests but also a lot of effort. Therefore, the willingness of executives to take the initiative to implement the corporate social responsibility is largely due to the incentives given by the company, which shows the importance of executive compensation incentives. Similar to the interrelationship between executive compensation incentives and corporate financial performance, executive compensation is affected by the environmental performance of the firm at the same time.

For firms, information disclosure is also a mechanism to ameliorate the conflict of interest between managers and shareholders. Enache and Hussainey [21] argued that under conditions of complete information, the effectiveness of firms' accountability systems diminishes, as investors can safeguard their interests through market prices, However, due to the limitations of contracts as well as finite rationality, firms' disclosures acquire dual significance – they both compel executives to uphold commitments and hold them accountable. Therefore, enhancing the quality of corporate environmental information can effectively mitigate the issue of corporate information asymmetry and curtail the potential for executives to prioritize personal gains in an obscured environment. Moreover, through the support of corporate governance such as executive compensation incentives, it can also reduce the opportunistic behavior of executives and force them to disclose more information under pressure.

2.2 Executive Compensation Incentives

Existing literature suggests that disclosure of corporate information, such as annual report disclosure, is often viewed as the result of intentional and targeted impression management actions [22]. As a result, executives may be averse to the fulfilment of corporate social responsibility that does not bring tangible benefits to the firm. This inclination may lead to the selective withholding of pertinent environmental information or, in more extreme cases, the intentional manipulation of information that directly affects their interests. Such actions can diminish the overall quality of corporate environmental disclosure [23]. Therefore, the challenge of encouraging executives to divulge accurate environmental information is of paramount importance. Executive compensation, as one of the corporate governance mechanisms, has a guiding role in shaping executives' decision-making [24]. Some studies have shown that firms adopting executive compensation incentives tend to exhibit enhanced performance, driven by executives who are motivated by increased personal gains. Once an executive is incentivised in terms of compensation, he or she will be more likely to exert greater effort to validate his or her excessive compensation rewards to the firm's stakeholders and expect them to give him higher ratings as a way to obtain higher compensation incentives. This can lead to executives placing more emphasis on information relevant to the firm's stakeholders, including environmental information [25]. On the other hand, the equity incentives given to executives by enterprises aim at aligning the interests of executives with those of shareholders in order to alleviate the agency problem in the enterprise. By changing the identity of executives from employees to shareholders, equity incentives can enhance the sense of responsibility and sense of belonging to the enterprise. This shift often results in executives are more likely to make decisions that are in line with the interests of shareholders [26]. If the fulfilment of corporate social responsibility contributes to the value of the firm, it will inevitably amplify the incentives for executives who benefiting from equity incentives to engage in corporate social activities.

Beyond the realm of academic endorsement for executive compensation incentives as a valuable tool for corporate governance, condemnations of exorbitant executive compensation incentives and their resultant impact on dysfunctional corporate governance has emerged. Such critiques primarily focus on firms that are in a stage of financial decline or facing imminent failure [13]

. The prevalence of excessive executive compensation incentives may contribute to income imbalances as well as executive privilege. Specifically, a in cases where executives perceive a bleak future for the company, privileged executives holding privileges tend to selfishly choose to defend their own interests by selectively and motivatedly disclosing information about the firm, which in turn leads to a state of dysfunctional corporate governance. Hence, whether executive compensation incentives will have a positive impact on corporate environmental information disclosure remains a question worth exploring.

In addition, the intensity of competition in the firm's industry, as a pertinent influencing factor, can exert an impact on the efficacy of the firm's incentive programs, thus potentially reshaping managerial decision-making. The 'survival of the fittest' dynamic inherent in market competition exerts pressure on companies. Some studies have shown that the more intense competition in the industry increases the likelihood of corporate bankruptcy. Consequently, executives are motivated to maintain the competitiveness of the firm tends to engage in more effective corporate governance activities [40]. Winning the goodwill of customers by improving the quality of corporate environmental disclosure is more conducive to firms to stand out from the crowd in the competitive and incentivised market to occupy a higher market share. However, some studies have also shown that fierce competition in the industry may reduce the profits of enterprises, which directly affects the remuneration interests of executives. This can lead to the loss of confidence in corporate management and reduce the level of effort of executives [26], which has a negative impact on the disclosure of corporate environmental information. Moreover, empirical studies have shown that industry competition not only affects corporate profitability, but also has an impact on the fulfilment of corporate social responsibility[27].

This paper will adopt an executive compensation incentives perspective to explore their impact on corporate environmental information disclosure within the context of environmentally conscious production. Additionally, the study will explore how the level of incentives of industry competition affects the relationship between these two factors. Since there is less literature on the impact of different compensation incentives on corporate environmental information disclosure, the innovations of this paper are: 1. Exploring the impact of executive compensation and equity incentives on the quality of corporate environmental information disclosure separately, which enriches the research on the influencing factors of corporate environmental information disclosure. 2. Taking the screened samples of S&P 500 companies as a sample to verify whether the incentives of executive compensation affect the quality of corporate environmental information disclosure is more persuasive, and the results are more convincing. Because the S&P 500 index is characterised by broad sampling, high representativeness and good continuity, etc. 3. Examination of the moderating role of industry competition intensity in the relationship between executive compensation incentives and corporate environmental information disclosure, which is conducive to the enterprises to flexibly change executive compensation incentive plans according to the market situation, thereby improving the quality of corporate environmental information disclosure.

3. HYPOTHESIS DEVELOPMENT

In terms of legitimacy theory, when companies face social or discursive pressures, they usually pay more attention to the fulfilment of their social responsibilities in the hope that good disclosure of corporate environmental information will increase the goodwill of corporate stakeholders and justify their daily corporate activities. In line with legitimacy theory, studies have shown that executives, incentivised by receiving excess compensation, are more motivated to attempt to justify rewards by actively disclosing corporate environmental information, thus fostering an image of responsible corporate stewardship [28]. In addition, firms often seek to yield the high productivity that comes from executives' more diligent corporate governance by paying them higher compensation. This strategic approach not only promises enhanced economic gains but also more stable growth prospects for the firm. Therefore, it is my contention that firms possess incentives to enhance the caliber of their corporate environmental disclosure by providing executives with surplus compensation.

On the flip side, executives hold a pivotal role in determining the extent of corporate environmental information disclosure, given their authority in executing corporate decisions. Although today's environmental regulatory mechanisms have proposed many provisions for firms to implement social responsibility, there is no mandatory disclosure. As a result, the quality of corporate environmental disclosure inevitably depends on the choice of corporate executives. Berthelot et al [29] argued that the voluntary part of corporate environmental disclosure is entirely up to corporate executives to decide whether to disclose or not. Therefore, it can be concluded that corporate executives have a great deal of autonomy and control over the disclosure of information. Zou et al. [26] argued that good environmental performance is a key signal of managerial endeavor and conscientiousness, whereas the opposite is a managerial failure, and has a significant negative impact on the reputation as well as the career of the manager. Therefore, after executives have been overcompensated, in order to display their stakeholders that they are managing the organisation seriously, they can demonstrate this by actively disclosing the organisation's environmental information.

Based on the comprehensive analysis above, it's evident that executives are both motivated and equipped to divulge environmental information pertinent to their firms and to justify their high compensation, which leads to the first hypothesis:

H1. Firms' implementation of excess compensation incentives for executives is positively associated with the disclosure of firms' environmental information.

In the perspective of stakeholders, internal shareholding has a positive impact on the fulfilment of corporate social responsibility. Internal shareholders such as executives tend to allocate resources among stakeholders to garner corporate support. As such, executive shareholding establishes management and shareholders a community of destiny, linking the wealth of executives to the performance of the firm. This alignment prompts executives to take into account more factors that are beneficial to the long-term development of the firm in their decision-making, and this is also a manifestation of the mitigation of the agency problem [30]. From this vantage perspective, if the effect of corporate value can be achieved through the disclosure of corporate environmental information, executives will be more inclined to improve the quality of corporate environmental information in their future activities. On the other hand, in western countries, more institutional pressure will be exerted on the social responsibility that firms must fulfil [31]. Entities that do not fulfil their social responsibility or exhibit poor environmental performance often face the risk of fines or even being eliminated from the market. In this context, executives who receive equity incentives in such an environment may be motivated to disclose environmental information in order to think of regulatory mechanisms to prove the legitimacy of their economic activities. The more shares executives hold, the more likely they are to make decisions that are in line with the interests of shareholders of the enterprise in order to maximise shareholders' interests. Therefore, if enhancing the quality of corporate environmental information disclosure can bolster the value of the enterprise, executives will likely invest more in fulfilling corporate environment information. On the contrary, if the cost of improving the quality of corporate environmental information disclosure is too high and does not bring more economic effects to the enterprise, executives tend to think that fulfilling their social responsibility is a kind of waste of resources, and they are not willing to disclose corporate environmental information.

Moreover, studies have shown that in developed countries, negative environmental information has a greater impact on the market value of corporate stocks [32]. This means that executives who obtain a change of status may reduce the completeness and truthfulness of the disclosure of environmental information to ensure the value of the firm in order to ensure that the stock market value of the firm does not fall. In addition, firms with more executive shareholdings are more likely to have less public accountability, due to the fact that the firm involves fewer external interests. A range of other studies have also demonstrated that executive shareholding is negatively related to corporate environmental information disclosure [33-34]. This implies that executives who hold shares are likely to reduce their disclosure of corporate environmental information due to they perceive the benefits of corporate social and environmental investments to be much lower than the costs. Based on the above analysis, the second hypothesis is that a firm's executive shareholding is both an incentive to actively disclose corporate environmental information and a possibility to hide environmental information:

H2. Firms' implementation of equity incentives for executives is associated with the disclosure of firms' environmental information.

Based on previous studies in the literature, it has been found that there is a significant effect between industry competition and corporate social responsibility [35-36]. Some studies have argued that when firms are in a competitive industry, they often want to gain more market share by using good corporate social responsibility performance to gain favourability from stakeholders [37-38]. These firms are often trying to use corporate social responsibility to divert customers' attention in terms of product price competition, product quality competition, and corporate reputation, which results in improved firm performance [39]. On the contrary, there are also studies that are skeptical about the positive correlation between corporate competition and environmental performance. Skepticism arises due to factors like lower profit margins and potential bankruptcy risks in fiercely competitive industries, potentially deterring firms from investing extensively in corporate social responsibility, resulting in firms not wanting to put extra money and effort into corporate social responsibility performance, and thus being forced to reduce their capacity for social investment [27]. Therefore, there is no consensus on the effect of industry competition on the relationship between corporate environmental disclosure.

In an agency relationship, after receiving an incentive, executives seek to prove that they are worthy of this reward through their efforts to enhancing the profitability of the firm. However, in highly competitive environments, the potential for executives to expand their market share is greatly reduced, resulting in an inability to increase the profitability of the firm. In this case, corporate social responsibility is treated by executives as a strategic investment aimed at sustaining market presence, diverting the attention of the firm's stakeholders by actively disclosing the firm's social responsibility and winning the goodwill of customers as a way of regaining economic goals [40]. Additionally, some studies have shown that executives are more likely to engage in corporate social responsibility activities as a way to enhance reputation after acquiring less ownership of the firm [41]. However, other studies have also shown that sustainable green strategic investments by firms often imply more costs, which may exacerbate the difficulty of developing markets as well as increasing profitability in an environment of competitive incentives in the industry. Consequently, in order to maintain the competitiveness of the firm as well as to maximise the profitability of the firm, executives with equity ownership may make the choice to reduce their environmental investments. After executives receive equity incentives, their interests converge with the interests of shareholders of the enterprise, and executives may choose to reduce the cost of corporate environmental responsibility to improve the profitability of the enterprise in a highly competitive environment.

In conclusion, industrial competition significantly influences executives' decisions on corporate environmental management. Aggressive disclosure of corporate environmental information in a competitively incentivised industry environment may result in benefits that outweigh

Table 1: Variable explanation

Variable types	Variable names	Variable symbols	Calculation methods
Independent variables	executive pay	Pay	Ln(1+ Total remuneration of executives)
	equity incentives	Ownership	Executive shareholding/total equity
	industry competition	Competition	MHHI index/1000
Dependent variable	Quality of environmental information disclosure	EDI	Environmental Information Disclosure Quality Index
Control variables	Age of Firm	Age	Ln (Number of years the company was established)
	Total Asset Growth Rate	Asset	(Assets at end of year - assets at beginning of year)/ Assets at beginning of year
	Return on Assets	Roa	Net Income/Total Assets
	Profitability	Roe	Net Income/Total Equity
	Leverage	Lev	Total Liabilities/ Total Assets
	Year variable	Year	Year dummy variable
	Firm variable	Firm	Firm dummy variable

the costs. but it is also possible that executives may choose to reduce the disclosure of corporate environmental information in order to reduce the costs to the firm. Therefore, I tentatively predict that executives who receive compensation incentives will be more inclined to demonstrate that they are worthy of being incentivised by improving the economic efficiency of their firms through the implementation of corporate social responsibility. With this I propose a third hypothesis:

H3a. The more competitive the industry, the more significant the positive relationship between executive compensation and corporate environmental information disclosure.

H3b. The more competitive the industry, the more significant the correlation between equity incentives and disclosure of corporate environmental information.

4. RESEARCH DESIGN AND METHODOLOGY

This study uses quantitative analysis to examine whether executive compensation incentives have an impact on corporate environmental information disclosure. By reviewing the information and referring to the existing common practice, this study takes executive compensation (Pay), equity incentives (Ownership), and industry competition (Competition) as the independent variables and the quality of corporate environmental information disclosure (EDI) as the dependent variable. Meanwhile, based on the relevant existing literature, this study decides to use total asset growth rate (Asset), return on assets (Roa), gearing ratio (Lev), age of the firm (Age), and profitability (Roe) as control variables.

Executive Compensation (Pay)

In this study, executive compensation was determined as the total annual compensation of all executives of the firm, including their base salary and bonus, and the total compensation was taken as a natural logarithm by adding 1. The logarithm is taken in order to reduce the scale of the variable so that the data becomes smoother and also to attenuate problems such as covariance of the model, thus improving the accuracy of the model.

Equity Incentives (Ownership)

Equity incentive is defined in this study as the percentage of total equity held by all senior managers of a firm. A higher percentage indicates that the more equity a firm allocates to its executives, the more it tends to utilise equity incentives as a corporate governance tool. A lower percentage indicates that the firm allocates less equity to executives and may be in the early stages of implementing an equity incentive policy.

Industry Competition (Competition)

Competition measures the relative market power of the firm in the industry. Drawing on previous research, this study uses the Herfindahl-Hirschman Index (HHI) as a measure of whether competition in an industry is intense. The HHI is defined as the sum of the squares of the market shares of all firms in any one industry in a stationary market [42]. The higher the value of HHI, the higher the market concentration of the industry, meaning that the competition in the industry is weak; on the contrary, the lower the value of HHI, the lower the market concentration of the industry, implying that the competition in the industry is fierce. The formula for calculating HHI is as follows:

$$HHI = \sum_{i=1}^{N_t} M_{it}^2$$

In the formula, represents the market share of enterprise i in industry t, and represents the total number of enterprises in industry t. And the calculation of market share is borrowed from Liu et al. [43], defined as the ratio of annual sales of firm i to the total sales of industry t. Since the intensity of industry competition is inversely proportional to the HHI index, for the convenience of the study, I construct MHHI (1-HHI) as a proxy for the degree of industry competition, which makes higher MHHI values imply more incentivised industry competition, and conversely, lower MHHI implies higher concentration, and since the HHI is generally a four-digit integer, I reduce the MHHI by also 1000 times the data. In this study I reduce the market to the S&P 500, classify firms into ten industry sectors based on the GICS Global Industry Classification Standard, removed the financial sector to calculate the HHI only for the different industries in this market.

Quality of Corporate Environmental Disclosure (EDI)

The quality of environmental disclosure is measured using the Thomson Reuters database ratings of the quality of environmental disclosure of S&P 500 companies on an annual basis. Higher ratings indicate higher quality of the firm's environmental disclosure, and conversely, lower ratings indicate poorer quality of the firm's environmental disclosure. All variables are defined as follows:

The following regression models will be used in this study to regress the data in stata:

1. Examining the relationship between executive overpay and EID

$$EID = a_0 + a_1 Pay_{i,t-1} + a_2 Ownership_{i,t-1} + a_3 Asset_{i,t-1} + a_4 ROA_{i,t-1} + a_5 Lev_{i,t-1} + a_6 Age_{i,t-1} + a_7 Roe_{i,t-1} + \Sigma Year + \Sigma Firm + \varepsilon_{i,t}$$

2. Examining the moderating effect of industry competition on the relationship between executive overpay and EID

$$EID = a_0 + a_1 Pay_{i,t-1} + a_2 Ownership_{i,t-1} + a_3 Competition_{i,t-1} + a_4\ Pay_{i,t-1} \times Competition_{i,t-1} + a_5\ Ownership_{i,t-1} \times Competition_{i,t-1} + a_6 Asset_{i,t-1} + a_7 ROA_{i,t-1} + a_8 Lev_{i,t-1} + a_9 Age_{i,t-1} + a_{10} Roe_{i,t-1}$$

5. DATA AND SAMPLE

This study collects data from companies in the S&P 500 from 2015 to 2019 and constitutes panel data as a sample to test my proposed hypotheses. Data on the quality of environmental disclosure, data on executive compensation, data on industry competition, and data on control variables for the sample are mainly from the Thomson Reuters database, Compustat-Capital IQ's North American database (the main source of data on financial statement variables), Compustat-Execucomp's annual salary database, and the missing data in the above databases are supplemented by the annual reports of the companies, and the data are validated using various methods. Meanwhile, in order to ensure a more representative sample and to maintain comparability between companies, the observations of companies in the financial sector are excluded from this study, in addition, companies with abnormal financial indicators, imperfect data on relevant variables during the sample period, and sample extremes will be excluded from the sample. After performing the merging and screening of various data sets, the final sample consists of 403 firms as well as 2015 sample year observations for the period from January 2015 to December 2019.

6. EMPIRICAL RESULTS AND ANALYSES

6.1 Descriptive Statistics

Descriptive statistics focuses on the use of tabulation and classification to summarise and characterise data..Table 2 shows the descriptive statistics of this study, as can be seen from the 2015 samples screened from S&P 500 firms from January 2015 to December 2019, the mean value of the quality of environmental information disclosure (EDI) of these firms in different industries is 0.706, which suggests that by 2020 these firms already have a higher level of awareness of environmental information disclosure, and the quality of the disclosures is at a higher level. In addition, the minimum value of corporate environmental information disclosure is 0.000, and the maximum value even reaches 0.958, indicating that the level of environmental information disclosure quality still varies greatly among different enterprises, and some enterprises have a stronger sense of social responsibility and environmental protection, and attach more importance to the disclosure of corporate environmental information, but there are also some enterprises with a weaker sense of social responsibility and environmental protection, and the quality of the disclosure and the level of disclosure are yet to be improved; the standard deviation of the remuneration of the senior executives (Pay) standard deviation of 0.465, the minimum value of 6.217, while the maximum value of 11.031, it can be seen that there are differences in executive compensation in different enterprises, but the difference is not as bad as equity incentives (Ownership), as can be seen in the table, equity incentives, the standard deviation of 4.038, the minimum value of 0.000, and the maximum value of 42.769, indicating that in the Standard & Poor's 500 market, the equity incentives are more important. S&P 500 index this market equity incentives there are great differences, some companies have executives holding most of the shares of the enterprise, while some executives can not even live equity incentives; industry competition (MHHI) of the minimum value of -144.200, the maximum value of -3.248, indicating that the strength of the competition in different industries really varies a lot, and there are industries with high concentration, while there are some industries with fierce competition .

6.2 Correlation Analysis

From the correlation analysis between the variables in Table 3, it can be seen that the P-value of executive compensation (Pay) and corporate environmental disclosure quality (EDI) is less than 0.01, i.e., it is significantly positive at the 1% level, thus initially confirming the proposed H1; similarly, the P-value of equity incentives (Ownership) and corporate environmental disclosure quality (EDI) is less than 0.01, but the different correlation coefficient is negative, so the two are significantly negative at the 1% level, which likewise confirms H2; the industry competition index (MHHI) and the quality of corporate environmental disclosure (EDI) are likewise significantly positive at the 1% level, but the effect of industry competition on the relationship between executive compensation incentives and the quality of corporate environmental disclosure also needs to be determined by the coefficient of the coefficients of the interaction term to be determined, so H3 cannot be verified for the time being.

6.3 Analysis of Regression Effects

Table 4 and table 5 shows the results of the regression test. Firstly, the main effect is analysed, as can be seen from the table 4 below, column (3) is the effect of executive compensation (Pay) and equity incentives (Ownership) on corporate environmental information disclosure (EDI) only, and column (4) is the effect of executive compensation (Pay) and equity incentives (Ownership) on corporate environmental information disclosure (EDI) after control variables are added. Without adding control variables, the relationship between the two and EDI is different, the effect of executive compensation on the quality of corporate environmental information is significantly positive, while the effect of equity incentives on the quality of corporate environmental information is significantly negative, and with the addition of control variables executive compensation and equity incentives still pass the test of significance of 0.1%, and respectively, the positive and negative correlation on the quality of corporate environmental information disclosure did not change and both H1 and H2 were verified (Pay, 0.075, $p<0.001$; Ownership, -0.006 $p<0.001$). This is due to the rapid economic growth in the early 21st century led to the global environment is extremely deteriorating, leading to more and more people are concerned about the fulfilment of corporate social responsibility and green development, the S & P 500 index companies as the leading enterprises in various industries, more should actively fulfil their social responsibility to improve environmental awareness, and executive compensation as part of corporate management, its high and low can directly affect the degree of efforts of the executives of the corporate management. The higher compensation given to executives by the enterprise makes the executives fulfil more corporate social responsibility under the compulsion of trying to justify their compensation, actively disclose environmental information, and make continuous efforts for the sustainable development of the enterprise. On the contrary, executives who receive more equity incentives are more likely to reduce the disclosure of corporate environmental information, because for developed countries, the negative information of an enterprise will largely affect the market value of the listed company's stock, so in order to ensure their own interests, corporate executives who become shareholders of the company through equity incentives will selectively disclose or fail to disclose environmental information that is unfavourable to the enterprise, which results in the disclosure of corporate environmental information of a quality decreases. In summary, executive compensation can motivate executives to better fulfil their corporate social responsibility and better disclose their corporate social responsibility, while equity incentives will make executives reduce the disclosure of corporate responsibility.

Secondly, to analyse the moderating effect, the table 5 below shows that columns (1) and (2) demonstrate the regression results of the conditional role of industry competition (MHHI) in the effect of executive compensation as well as equity incentives on corporate environmental disclosure in the two cases of no control variables added and with control variables added, respectively. It can be seen that the regression coefficient of the interaction term between equity incentives and industry competition is significantly positive, while the interaction term between executive compensation and industry competition is not significant and does not change the regression results with the addition of control variables, indicating that the higher the concentration of the industry can contribute to the improvement of equity incentives on the quality of corporate environmental disclosure, and on the contrary, the fiercer the competition of the industry can lead to the lowering of equity incentives to reduce the quality of corporate environmental disclosure, and furthermore, the The intensity of the industry has little effect in the relationship between executive compensation and the quality of corporate environmental disclosure. H3a was not validated and H3b

Table 2: Descriptive Statistics of Variables

Variable	Obs	Mean	Sd.	Min	**Max**
EDI	2,015	0.706	0.276	0.000	0.958
Pay	2,015	8.321	0.465	6.217	11.031
Ownership	2,015	1.578	4.038	0.000	42.769
MHHI	2,015	-0.023	0.122	-14.420	0.000
Age	2,015	4.059	0.746	0.000	5.517
Roe	2,015	0.271	3.937	-40.835	143.588
Roa	2,015	0.0673	0.0766	-1.227	0.399
Lev	2,015	0.633	0.272	0.059	4.350
Asset	2,015	0.124	0.418	-0.729	8.748

Table 3: Correlation Analysis of Variables

Variables	EDI	Pay	Owner	MHHI	Age	Roe	Roa	Lev	Asset
EDI	1								
Pay	0.270***	1							
Owner	-0.093***	-0.098***	1						
MHHI	0.114***	-0.237***	-0.047**	1					
Age	0.300***	0.145***	-0.165***	0.156***	1				
Roe	0.026	0.028	-0.001	0.002	0.047**	1			
Roa	0.024	-0.021	0.007	0.040*	-0.002	0.078***	1		
Lev	0.035	0.101***	-0.085***	0.027	0.071***	0.030	0.079***	1	
Asset	-0.101***	-0.063***	0.022	-0.028	-0.087***	0.001	-0.021	-0.058***	1
*** p<0.01, ** p<0.05, * p<0.1									

was validated. (Pay x MHHI, 0.001, p>0.1; Ownership x MHHI, -0.008, p<0.001). The reason is that executives will pay more attention to the business condition of the firm after receiving more equity incentives, and firms in industries with competitive incentives tend to face a greater likelihood of bankruptcy, so in their own interests, executives tend to take measures to ensure the competitiveness of their firms, which means that executives may beautify the firms by lowering or hiding unfavourable information about the firms' environment, to win the market's goodwill for a short period of time This means that executives may beautify the firm by reducing or hiding unfavourable information about the firm's environment in order to gain favourable market sentiment for a short period of time, thus achieving a higher market share to save the firm on the verge of bankruptcy. While executive compensation is only the basic interest of the executives, the competition in the industry has less

Table 4: Regression analysis of main variables

VARIABLES	**(1)** **EDI**	**(2)** **EDI**	**(3)** **EDI**	**(4)** **EDI**
Pay	0.082*** (0.012)		0.080*** (0.012)	0.075*** (0.012)
Ownership		-0.008*** (0.002)	-0.008*** (0.002)	-0.006*** (0.002)
MHHI				
Pay x MHHI				
Ownership x MHHI				
Age				0.098*** (0.016)
Roe				-0.000 (0.001)
Roa				0.253*** (0.051)
Lev				0.003 (0.028)
Asset				-0.016* (0.007)
Constant	0.028 (0.103)	0.719*** (0.013)	0.053 (0.102)	-0.318** (0.117)
Year	Control	Control	Control	Control
Firm	Control	Control	Control	Control
F Value	44.19	21.07	64.31	135.810
R-squared	0.073	0.009	0.064	0.131
Observations	2,015	2,015	2,015	2,015

Standard errors in parentheses: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

influence on the salary and bonus of the executives, plus the executives, as the wage earners of the enterprise, their personal interests are separated from the interests of the enterprise, and the economic effect of the enterprise is not good, and they can even choose to jump ship to seek better personal interests. Therefore, industry competition incentives will reduce the quality of equity incentives on corporate environmental information disclosure, but not promote the quality of executive compensation on corporate environmental information disclosure.

6.4 Heterogeneity Analysis

Since the actual situation varies greatly between industries, coupled with the fact that the demand for environmental information disclosure varies from industry to industry, the impact of executive compensation incentives on the quality of corporate environmental information disclosure as well as the moderating effect of industry competition may vary. Heavily polluting industries have a greater impact on the environment, and in order to comply with the requirements of the environmental regulatory mechanism as well as to give an account to stakeholders, these enterprises need to disclose corporate environmental information no matter what the circumstances are. Therefore, for heavily polluting firms, the moderating role of industry competition in the relationship between executive compensation and equity incentives on corporate environmental disclosure may not be significant. However, for non-heavily polluting firms, they have less influence on the environment and more autonomy and manipulability for corporate environmental information disclosure, so when in the environment of industry competition incentives, it is very likely to affect the strategy of executives for corporate environmental information disclosure. Therefore, this paper examines the differences in the impact of executive compensation incentives on the quality of corporate environmental information disclosure and the differences in the moderating effect of industry competition by dividing industries according to their degree of environmental pollution. As can be seen above, I classify the sample firms into ten industries based on the GICS global industry classification standard. In order to distinguish the industry types, I classify the industry, raw material industry, and energy industry as heavy polluting industries, and the non-essential consumer goods industry, essential

Table 5: Regression analysis of regulatory variables

VARIABLES	(5) EDI	(6) EDI
Pay	0.086*** (0.013)	0.079*** (0.013)
Ownership	-0.009*** (0.002)	-0.008*** (0.002)
MHHI	-0.009* (0.022)	-0.008** (0.022)
Pay x MHHI	0.001 (0.002)	0.001 (0.002)
Ownership x MHHI	-0.009** (0.002)	-0.008*** (0.002)
Age		0.101*** (0.016)
Roe		-0.000 (0.001)
Roa		0.248*** (0.051)
Lev		0.002 (0.027)
Asset		-0.016* (0.007)
Constant	0.004 (0.112)	-0.366** (0.124)
Year	Control	Control
Firm	Control	Control
F Value	79.69	154.220
R-squared	0.061	0.132
Observations	2,015	2,015

Standard errors in parentheses: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 6: Industry Differences Regression Results

VARIABLES	Heavy polluting industries		Non-heavy polluting industries	
	(1)	(2)	(1)	(2)
	EDI	EDI	EDI	EDI
Pay	0.094*** (0.019)	0.092** (0.034)	0.069*** (0.015)	0.074*** (0.017)
Ownership	-0.027*** (0.006)	-0.025* (0.012)	-0.005** (0.002)	-0.007*** (0.002)
MHHI		0.101* (0.314)		-0.007* (0.023)
Pay x MHHI		-0.002 (0.037)		0.001 (0.003)
Ownership x MHHI		0.003 (0.011)		-0.001** (0.000)
Age	0.077** (0.025)	0.076** (0.026)	0.101*** (0.020)	0.106*** (0.020)
Roe	0.003 (0.003)	0.003 (0.003)	-0.000 (0.001)	-0.000 (0.001)
Roa	0.222*** (0.067)	0.195** (0.068)	0.277*** (0.073)	0.268*** (0.073)
Lev	0.069 (0.071)	0.033 (0.073)	-0.008 (0.031)	-0.008 (0.030)
Asset	0.001 (0.015)	0.001 (0.015)	-0.019* (0.008)	-0.019* (0.008)
Constant	-0.384* (0.187)	-0.290 (0.304)	-0.293* (0.146)	-0.349* (0.157)
Year	Control	Control	Control	Control
Firm	Control	Control	Control	Control
F Value	69.88	71.59	85.49	101.27
R-squared	0.219	0.200	0.113	0.112
Observations	585	585	1430	1430

Standard errors in parentheses: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

consumer goods industry, health care industry, information technology industry, communication service industry, and public utilities as non-heavy polluting industries. As shown in Table 6, the regression results after dividing the industries, it can be seen that for heavy polluting enterprises, both executive compensation and equity incentives have a greater impact on the environmental information disclosure of enterprises, but the moderating effect of industry competition is not obvious (Pay, 0.092, p<0.01; Ownership, -0.025, p<0.05; Pay x MHHI, -0.002, p>0.1; Ownership x MHHI, 0.003, p>0.1). As for non-heavily polluted industries, consistent with the original regression results, industry competition has a certain moderating effect on the impact of equity incentives and corporate environmental information disclosure (Pay, 0.074, p<0.001; Ownership, -0.007, p<0.001; Pay x MHHI, 0.001, p>0.1; Ownership x MHHI, -0.001, p<0.01).

6.5 Robustness Analysis

In this paper, we refer to the previous literature on robustness testing and decide to re-run the same regression test with a randomly selected 1/2 sample.

6.5.1 Robustness Test of Main Effects

The robustness test of main effects is shown in Table 6 below. The results show that executive compensation and equity incentives are positively and negatively related to corporate environmental information disclosure, respectively, regardless of whether control variables are added, which can verify H1 and H2, indicating that the benchmark regression results of this study are relatively stable (Pay, 0.090, p<0.001; Ownership, -0.006, p<0.001).

6.5.2 Robustness Test for Moderating Effects

The robustness test of the main effect is shown in Table 6 below, which shows that the effect of industry competition on the relationship between executive compensation and equity incentives and corporate environmental disclosure is consistent with the results of the previous benchmark regression (Pay x MHHI, 0.003, p>0.1; Ownership x MHHI, -0.001, p<0.05). That is, it has a further strengthening effect on the negative impact of equity incentives on corporate environmental

Table 7: Main effects robustness tests

VARIABLES	(1) EDI	(2) EDI
Pay	0.100*** (0.018)	0.090*** (0.018)
Ownership	-0.008*** (0.002)	-0.006*** (0.002)
Age		0.108*** (0.017)
Roe		-0.000 (0.001)
Roa		0.260*** (0.072)
Lev		-0.020 (0.036)
Asset		-0.020+ (0.012)
Constant	-0.118 (0.152)	-0.478** (0.160)
Year	Control	Control
Ind	Control	Control
F Value	45.32	105.65
R-squared	0.075	0.158
Observations	1008	1008
Number of OrganizationID	393	393

Standard errors in parentheses: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

disclosure, but it does not have a moderating effect on the relationship between executive compensation and corporate environmental disclosure, which can be verified H3. It can be shown that the results of the benchmark regression in this study are more stable.

7. CONCLUSION

This paper is to study the direct effect of executive compensation incentives (executive compensation and equity incentives) on the disclosure quality of corporate environmental information, and to further study the moderating effect of industry competition on the relationship between the two, using a sample of listed firms in the S&P 500 index from 2015 to 2019. The following three conclusions are drawn: 1. the increase in executive compensation helps corporate executives pay more attention to the disclosure of corporate environmental information; 2. the implementation of equity incentives for corporate executives reduces the quality of corporate environmental information disclosure; 3. industry competition, as an external factor that may affect corporate management, has a further strengthening effect on the negative impact of equity incentives on corporate environmental information disclosure, but does not play a role in the direct relationship between executive compensation and environmental information disclosure.

Therefore, the following suggestions are made in response to these findings: 1. Under the environment of green production, as the leading enterprises in each industry, they should take active measures to improve the quality of corporate environmental information disclosure, and conform to the choices of the times and the market. 2. Enterprises should reasonably adjust the executive compensation as well as equity incentives given to the executives according to their own actual situation, in order to maximize their roles, and improve the quality of corporate environmental information disclosure. 3. For the executive compensation and equity incentives, it is important for enterprises to make reasonable adjustments according to their own actual situation. 4. For enterprises in heavily polluting industries, industry competition has little effect on the relationship between executive compensation incentives and corporate environmental disclosure, making it more important for them to take advantage of the effects of executive compensation and equity incentives on corporate environmental disclosure to improve the quality of corporate environmental disclosure. For enterprises in different industries, equity incentive policies should be adjusted according to the strength of industry competition, so that equity incentives can better serve the transparency and completeness of corporate environmental information. The study examines the relationship between executive compensation incentives and the quality of corporate environmental information disclosure, as well as the changes in the relationship between the two under the competition of the industry is related to how the company can make better use of executive compensation incentives to motivate executives to improve the quality of corporate environmental information disclosure, so as to use the disclosure of environmental information to obtain the initiative in the market, and to obtain better economic benefits. This study aims to investigate companies under different conditions and backgrounds, and is an ongoing investigation of corporate environmental information

Table 8: Moderating effects robustness tests

VARIABLES	(1) EDI	(2) EDI
Pay	0.112*** (0.020)	0.097*** (0.020)
Ownership	-0.009*** (0.003)	-0.008** (0.002)
MHHI	-0.031* (0.034)	-0.023* (0.033)
Pay x MHHI	0.004 (0.004)	0.003 (0.004)
Ownership x MHHI	-0.001* (0.001)	-0.001* (0.001)
Age		0.108*** (0.017)
Roe		-0.000 (0.001)
Roa		0.255*** (0.073)
Lev		-0.011 (0.036)
Asset		-0.020+ (0.012)
Constant	-0.212 (0.168)	-0.537** (0.173)
Year	Control	Control
Ind	Control	Control
F Value	48.79	154.220
R-squared	0.085	0.132
Observations	1008	1008
Number of OrganizationID	393	393

Standard errors in parentheses: *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

disclosure, with practical implications for how companies can better disclose information through the use of executive excess compensation incentives.

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