

The Relationship between Environmental, Social and Governance (ESG) Scores and Financial Performance after the 2008 Financial Crisis

by

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Abstract

This study examines the relationship between environmental, social and governance (ESG) scores and financial performance improvement after the 2008 financial crisis. The result implies that high ESG companies have better financial performance (measured by net income) after the year 2008. However, ESG scores have a weak and negative correlation with long-term financial performance (measured by the Tobin Q ratio) after the year 2008. Compared with the firm characteristics, ESG scores have a less significant correlation with both net income and the Tobin Q ratio.

Table of Contents

1. Introduction.....	1
2. Literature Review.....	5
3. Data.....	11
4. Methodology.....	14
5. Results.....	18
6. Conclusion.....	21
7. Appendix.....	23
8. Reference.....	48

1. Introduction

The 2008 financial crisis causes unforeseen commercial challenges for the majority of companies in the US, and their financial performance dramatically declined. As a result, a new corporate strategy is required to deal with the difficulties brought on by the financial crisis. The environmental, social, and governance (ESG) score, as one of the most comprehensive measurements of corporate sustainability practices, has been one of the new strategies for companies to boost their financial performance, maintain their reputation among stakeholders, adhere to local laws and regulations, and to be consistent with their established core values (Nirino et al., 2021). ESG score comprises three pillars: environmental, social and governance performance. Corporate sustainability aims to maximize the utilities of current generations without compromising the resources of future generations by combining these three pillars, which improve social welfare, sustainable growth, and stakeholders' value (Isaksson & Steimle, 2009).

In the light of corporate sustainability, the traditional shareholder-oriented viewpoint, which primarily focuses on maximizing the financial return to shareholders, has evolved into the stakeholder theory (Tse, 2011). With the stakeholder theory, companies begin to realize that taking sustainable practices, which include a variety of dimensions related to the environment and human beings, will help them to maximize their value and achieve a future landscape. From one perspective, companies are dealing with pressure from stakeholders and society as a whole to restructure their operations more ethically and sustainably to keep up with the changes that our society is undergoing (Nirino et al., 2021). From another perspective, environmental pressure, such as pollution and global warming, is another reason why companies take sustainable

practices. Companies must provide green alternatives in both their production processes and their products themselves to comply with this pressure (Petitjean, 2019).

The 2008 financial crisis reveals the fraudulent actions of some companies, which might harm the trust of the stakeholders and harm the financial performance. Although it seems logical for companies to take sustainable practices to rebuild trust and boost financial performance under the challenges of the financial crisis, the agency problem might arise due to insufficient stakeholder monitoring (Hill & Jones, 1992). Companies' managers frequently pursue personal salary and reputation, rather than long-term development of sustainable returns for shareholders and other stakeholders, including investors, customers, employees and communities (Doyle, 1994). It might expose companies to some hazards. For example, some companies are eager to take symbolic sustainable practices to inflate ESG scores, particularly when they are suffering a profit loss (Michelon et al., 2021; Friede et al., 2015). In this situation, the ESG score disclosure is not beneficial to the company's trust and financial performance.

Most studies explore the impact of ESG scores on financial performance in general and after the COVID-19 pandemic. The results of the relationship between ESG score and financial performance are mixed. Most scholars find a positive relationship between ESG scores and financial performance. For example, Hwang et al. (2021) examine the effectiveness of a company's ESG activities affects its financial performance before and after the business crisis caused by the COVID-19 pandemic. They find that companies with ESG investment are likely to maintain management effectiveness throughout the financial crisis by building trust and support among the stakeholders. Taliento et al. (2019) find a significant positive relationship between economic performance and sustainability indicators (ESG) by analyzing leading European companies "based on a PLS (Partial least squares)/SEM (Structural equation modelling)

methodology together with the unprecedented consideration of ESG measures (Environmental, Social and Governance), either absolute (scores) or relative (extra-performance over industry sector)". Carmudi et al. (2016) examine the effect of ESG practises on economic performance in Malaysia and Singapore and offer evidence that social responsibility practises positively influence economic performance. López-Toro et al. (2021) discovers that effective ESG practices improve economic performance using data from 30 listed pharmaceutical companies. However, some studies find a negative relationship between ESG practice and financial performance due to direct expenditure for sustainable practices. The value of a company will be reduced if ESG practices are motivated by self-interested goals, such as boosting managers' reputations (Al-Hiyari et al., 2022). In this situation, ESG might be economically unfavourable because it is considered a cost rather than an investment. Thus, it becomes challenging for companies to respond to an unanticipated business crisis as a result of ESG activities that decrease available resources (Hwang et al., 2021).

Moreover, there are few researches comparing the relationships between ESG scores and financial performance before and after the 2008 financial crisis, especially when I focus on both long-term and short-term financial performance. On the one hand, companies with improved ESG performance ought to be advantaged from better financial performance during the financial crisis if the claim of an enhanced benefit of ESG scores is true (Hwang et al., 2021). Given that these companies have a high level of social capital and reputation, stakeholders are more inclined to trust them in a financial crisis (Sen & Cowley, 2012). Lins et al. (2017) restrict the analysis period to the financial crisis period from 2008-2009 and find companies with substantial sustainable activities demonstrated higher financial performance, particularly ROA, throughout the financial crisis. On the other hand, as I mentioned before, stakeholders might regard

ESG practices as a waste of money in a financial crisis when companies should pay attention to their recurring financial health (Hwang et al., 2021). As a result, the company loses the trust and reputation of the stakeholders. Therefore, investigating the changes in ESG score's impact on a company's financial performance after the 2008 financial crisis is crucial for understanding the moderating effect of sustainable practices.

I obtain data on companies' ESG performance from the MSCI ESG KLD STATS Database, which includes environmental, social, and governance pillar scores of both inactive and active publicly traded corporations in the US. I created a panel dataset with 7973 observations that exclude financial companies between the fiscal years 2005 and 2010. To visualize whether the ESG scores are significantly correlated with financial performance in both the short and long term (e.g., net income and Tobin Q ratio), I create difference-in-difference graphs for them over a variety of periods using balanced and unbalanced panel data. Furthermore, instead of incorporating a single independent variable in the multiple linear regressions, such as size or ROA (e.g., Brogi & Lagasio, 2018), I use a wide range of firm characteristics, including leverage ratio, size, liquidity, investment, and financial crisis dummy variables to qualify the correlation of ESG scores and financial performance after the 2008 financial crisis. According to Petitjean (2019), to examine how firm valuations changed to CSR activity during the recession, sustainable practices standard is constant in the short term since the financial crisis is “sudden enough to constitute a natural experiment”. Therefore, I assume the ESG score criterion is stable and unchangeable in this study.

The essay is organized as follows. The second section demonstrates the works of literature including the background of ESG score and the 2008 financial crisis, former theories, empirical findings and the hypothesis development. The third section presents the selections of the dataset,

variables and their correlation analysis. The fourth section explains the methodology including difference-in-difference graphs and multiple linear regressions. The fifth section discusses the findings. The last section provides the conclusion of the study.

2. Literature Review

2.1 Development of the ESG Practices

As societal requirements have formed and markets have grown, many companies have been paying attention to forms of sustainable management that take environmental, and social concerns, as well as corporate governance (ESG practices), into account and increasingly incorporate ESG strategies as policies (Deegan & Gordon, 1996; Kolk, 2007; Muñoz-Torres et al., 2018). From a company's point of view, sustainability disclosure entails providing the annual report with details on specific operations, activities, and initiatives that are believed to have an impact on the general and other stakeholders (Adams, 2004). The acronyms CSR (corporate social responsibility) and ESG (economic, governance, social, ethical, and environmental) sustainability are used synonymously in the academic world (Holt & Whelan, 2021). They are used to describe corporate sustainability management strategies that benefit both society and businesses (Alsayegh et al., 2020). Decisions and actions that are consistent with socially beneficial values and objectives are known as CSR (Tencati et al., 2004). Companies can use CSR strategies to apply a variety of practices to satisfy the demands of various stakeholders, including the environment, society, and shareholders. The key pillars of CSR are social issues and ethical requirements and interactions with various stakeholders (Maignan et al., 2005). Additionally, compared to CSR, ESG encompasses a wider range of nonfinancial variables. It consists of three aspects, including environmental responsibility (E), social responsibility (S), and governance (G), each of which comprises various nonfinancial activities. ESG stresses

balancing the three aspects without favouring one over the others, in comparison to CSR, which places a greater emphasis on the social aspect (Hwang et al., 2021). Therefore, ESG, which covers a larger spectrum of social values than CSR, is stressed more strongly than CSR from the perspective of modern corporate sustainability management (Tiron-Tudor et al., 2019).

2.2 Influence of the 2008 Financial Crisis

The 2008 financial crisis has an extraordinary effect on the whole world economy, and it brings a change in corporate management strategy. According to earlier research, a company's ESG activities might affect its financial performance after the financial crisis due to the collapse of the trust and expenditure of the ESG score investment. First, the 2008 financial crisis exposed some firms' problems, including downsizing and corporate fraud, unethical business practices societal issues, and environmental depredation (Alsayegh et al., 2020). Serious consequences may harm a company's brand and reputation if stakeholders have a poor impression of the company (Collier & Esteban, 2007). Therefore, after the financial crisis, a company might experience a financial performance deterioration as a result of the responses of its stakeholders (Fred Garcia, 2006). Customers might stop purchasing the company's goods, suppliers would stop supplying them, governments might levy fines and penalties, and investors might sell their shares as a result of the lack of trust (Nirino et al., 2021). To mitigate the crisis's negative consequences and recover their damaged reputation, companies are required to take proactive sustainable actions from the pressure of the stakeholders (Hoshmand & Chung, 2021). However, some companies may only involve in symbolic sustainable activities. As proposed by Kim et al. (2012) and Friede et al., (2015), it only temporarily creates a good perception for their stakeholders. In the other words, these irresponsible behaviours don't have a positive effect on financial performance. Companies that do not contribute actual resources to meet the stakeholder maximization objectives may lose

trust and reputation from the market (Nirino et al., 2021). Second, although ESG initiatives may directly or indirectly increase corporate value over the long term (Diallo et al., 2020), they may also incur expenses and be stressful in the short run. Since companies may be unable to get the resources they need to survive in the situation of a financial crisis. As a result, a company's aggressive ESG investment may become a factor that damages management efficiency (Prior et al., 2008). Based on this view, a company's short-term financial performance declines when the companies attempt to improve ESG scores during the financial crisis.

2.3 Theoretical Background

The relationship between ESG activities and financial performance is mixed based on previous theories. The shareholder value maximization theory and Neo-classical theory believe there is a negative effect of ESG activities on financial performance because it is challenging to achieve direct advantages beyond expenses from ESG activities themselves. Shareholder value maximization is considered the primary company goal by the previous corporate finance literature (Zumente & Bistrova, 2021). With the line of the shareholder value maximization theory, Neo-classical theory asserts that shareholder equity and company earnings might be sacrificed for sustainable activities. The spending in ESG activities reduces the opportunities of exploiting resources to maximize profits. Taking ESG activities involves high costs, which increase the conflicts of the stakeholders' interests and drive down the financial performance (Ahmad et al., 2021). Moreover, some literature considers that ESG activities are motivated by managers' selfish and opportunistic motives. Based on the agency theory, they assert that company managers might take ESG practices to improve their professional image. They deplete a company's finite resources, which are rather used to create shareholder value (Al-Dah et al., 2018).

In contrast, the stakeholder value maximization theory and the legitimacy theory suggest that ESG activities have a positive effect on financial performance. They can be used to explain the pursuit of ESG practices for the sake of corporate sustainability management (Lokuwaduge & Heenetigala, 2016). According to the stakeholder theory, other entities have an interest in a company besides the shareholders, such as creditors, employees, consumers, investors, and even society and the future generation (Jansson, 2005). Companies should maximize the stakeholders' values when focusing on their financial health. According to the legitimacy theory, investment in sustainable efforts may be expensive in the short term, but it will pay off in the long run when stakeholders view a firm's legitimacy positively (Michelon, 2011). This indicates that to acquire the resources and required support for a firm's survival and development, legitimacy must be established from the views of stakeholders (Michelon, 2011). The collaboration of the stakeholder theory and legitimacy theory may conclude that to treat each entity of stakeholders equally, companies should disclose their sustainable activities voluntarily to meet their expectations (Oyewumi et al., 2018). Besides, the resource-based view assumes that companies with unique and non-substitutable resources accumulate social capital through enhanced sustainable activities to protect the environment, corporate governance and the welfare of human beings. It has a positive impact on developing their brand image and public reputation, increasing stakeholders' trust and subsequently strengthening their competitive advantages and enhancing the financial performance of the companies (Ahmad et al., 2021; Stanaland et al., 2011; Glavič & Lukman, 2007). Environmental and social activities can help a company gain a competitive edge by developing specialized knowledge and abilities (Luthans & Youssef, 2004). Customers who identify with a business's positive reputation exhibit loyalty to it over time, which leads to rising

profitability. (Roberts and Dowling, 2002; Barauskaite & Streimikiene, 2020; González-Ramos et al., 2018).

2.4 Empirical Findings

Friede et al. (2015) state that there are around 2200 independent studies between 1970 and 2015. They also discover a sharp rise in ESG research after 2000. Recent studies investigating the impact of ESG practises on financial performance have uncovered a variety of findings, including either positive, negative, or mixed results (McWilliams et al., 2006). Some works of literature have highlighted the positive impact of a company's sustainable practice on financial performance. According to research by Nikolaou & Matrakoukas (2016), portfolios with higher eco-efficiency scores achieve better investment returns. Using the MSCI dataset, Tang et al. (2012) discover a positive correlation between corporate social practices and financial performance. According to Fauzi et al. (2010), sustainable practices that are effective in satisfying stakeholders generally boost a company's performance. Mason & Simmons (2013) also discover that a company with solid corporate governance meets stakeholder interests through CSR practices, which can enhance financial performance. Lin et al. (2017) view CSR practises as a stand-in for social capital and exam the impact of CSR practices on a company's financial performance during the 2008–2009 financial crisis. They discover that during the financial crisis, when the public's confidence in financial activities has unexpectedly collapsed, companies that have developed stakeholder trust and collaboration through social capital can earn excess profits. Surroca et al. (2010) identified evidence of a positive relationship between CSR and financial performance through the mediating effect of intangible assets using data from 599 samples from 28 countries. These findings suggest that when a company engages in sustainable practices, intangible assets are created. These intangible

assets help the companies improve financial performance. Hwang et al. (2021) also examine whether ESG activities' impact on a company's performance is influenced by the company's financial characteristics. The finding indicates a positive influence of the company's ESG activities on the company's performance, but that influence is driven by the company's financial characteristics.

However, according to some studies, ESG practices are merely a cost of companies, not a true benefit, which harm financial performance. The study by Hou (2018) demonstrates that investments in sustainable practices must reach a particular threshold before CSR positively affects financial performance. In their study of the relationship between ESG practises and financial success in UK enterprises, Brammer et al. (2006) discovered that companies with high ESG scores often experience lower returns. These company activities reduce the shareholder's wealth. According to Chung et al. (2012), ESG disclosure diminishes firm value while at the same time highlighting companies' strengths and mitigating the negative effects of their weaknesses.

To test the stakeholder theory stating that ESG scores are positively correlated with financial performance after the 2008 financial crisis, the following hypothesis is proposed:

HP.1: High ESG companies have better financial performance (e.g., net income and Tobin Q ratio) after the 2008 financial crisis.

Last but not the least, the results of these ESG practices may not be reflected in financial performance. ESG score may not accurately reflect how much capital companies invest in ESG practices and how effectively those practices took either. Further, the evaluation outcomes vary slightly based on the agencies that assess ESG practices (Gregory, 2022). The relationship

between a firm's ESG management performance and its financial performance during the financial crisis may not be found correctly if social capital has not yet been built to the point where the performance of ESG activities is visible, or if the ESG scores itself is an improper measurement (Hwang et al. 2021). Yoo & Managi (2022) mention that ESG scores criteria become conservative after financial recessions holding the company's financial characteristics constant. They also demonstrate the ratings are more exaggerated during financial expansions because the investors are more inclined to trust the companies. The ESG score criterion is set to be stable and unchanged in this study.

3. Data

3.1 Independent Variables

I gather annual ESG data on 2064 non-financial corporations in the US from the MSCI ESG KLD STATS on Wharton Research Data Services (WRDS) for the years 2005 to 2010. MSCI ESG KLD STATS is a database that evaluates the positive and negative environmental, social, and governance performance of companies around the world. Each pillar score's good and poor performances are viewed as concerns and strengths, respectively. Every raw MSCI ESG strength and concern observation has a range of 0 to 10. If a company discloses its sustainable practices, it rises. The raw ESG pillar ratings and the total number of observations for each pillar are summarized in **Table 1**. It is possible to collect observations with identical ESG strengths and concerns but different financial performance metrics. For instance, some observations with all raw ESG scores of 0 have different values for the selected financial performance indicators. In this case, using raw ESG scores to illustrate the relationship between ESG and financial performance might be ineffective (Hwang et al., 2021). Therefore, the ESG quantile values of each pillar's strength and concern are created following the technique outlined in Hwang et al.

(2021)'s study. The new pillar's scores are generated by averaging the quantile values of the strengths and concerns. By averaging the three new pillar scores, the overall ESG score is determined. **Table 2** provides the quantile values for corresponding raw pillar strengths and concerns. **Table 3** outlines the categories, types, measurements and formulas of variables. **Table 4** provides details to calculate ESG pillar scores.

3.2 Control Variables

On WRDS, financial statement information is gathered from Compustat-Capital IQ. It is a complete dataset of annual companies' characteristics including size, leverage, liquidity, and investment, of 2064 non-financial companies specified in **Section 3.1**. Size is included in control variables because "bigger companies, most likely, could have higher ESG practices and financial performance" (Nirino et al., 2021). It is measured by the company's market value (in millions of USD). I also use leverage to control the company's financial risk which could influence the relationship I evaluate. Leverage is measured by debt to equity ratio (in %). Also, I control for liquidity and investment level, which could affect the management decisions on ESG practices. Liquidity is measured by the interest coverage ratio (in %). Investment is measured by the return on invested capital (in %). The natural logarithm is applied to all data to make measurements on a comparable scale. dm_t is a dummy variable set to 1 in or after the year 2008. The control variables' measurements and formulas are listed in **Table 3**. Because financial companies have various financial statement regulations, which have different implications for included control variables, I omit companies in the financial industry. Observations with missing total liabilities, shareholders' equity, earnings before interest and taxes, interest expenditure, market value, income tax, and invested capital have been eliminated as a result of the variable creation procedure. Additionally, observations with negative control variable values are removed.

3.3 Financial Performance Variables

The companies mentioned above are included in the financial performance metrics obtained from Compustat-Capital IQ on WRDS from 2005 to 2010. I use net income as an indicator of companies' short-term financial performance, following Galant & Cadez (2017). Tobin Q ratio is defined as the ratio between the market value and total equity to examine the company's long-term financial performance (Yoo & Managi, 2022). Observations with missing market value, total assets, and total liabilities are removed due to the generation procedure of the Tobin Q ratio. Observations with negative net income and Tobin Q ratio values are removed. Please refer to **Table 3** for the measurements and formulas of the financial performance variables.

3.4 Descriptive Statistics

The variables' descriptive statistics for the pre-crisis and post-crisis periods are shown in Table 5. Because inactive companies and negative net income values following the 2008 financial crisis are eliminated from the panel data, there are fewer observations of $\log(\text{net income})$ after the year 2008. After the 2008 financial crisis, the mean, median, and standard deviation values of $\log(\text{net income})$ are greater than they were previously. The $\log(\text{Tobin } Q)$ values for mean, median, and standard deviation are higher after the financial crisis of 2008. After the financial crisis of 2008, these financial performance values tend to be normally distributed. The distributions of the $\log(\text{ESG})$ during pre-crisis and after-crisis periods are highly concentrated near the mean and median. After the 2008 financial crisis, $\log(E)$ and $\log(\text{ESG})$ have fewer outliers and more values are near their median. The mean values of $\log(E)$, $\log(G)$, and $\log(\text{ESG})$ are higher. It means that E, G, and ESG have lower values. While the means of other firm characteristics drop, the mean value of $\log(\text{leverage})$ increases. Firm characteristics variables are relatively volatile during both pre-crisis and after-crisis periods based on their standard deviations.

3.5 Correlation Analysis

Table 6 demonstrates that there are weak correlations (below 0.3) between most explanatory variables. Among the ESG score variables, $\log(G)$ has the highest correlation with short-term financial performances in both the pre-and after-crisis periods. After 2008, there is a minor decline in the correlation between the log values of the ESG score categories and $\log(\text{net income})$, a measure of short-term financial performance. Among the log values of the ESG score categories in both the pre-crisis and post-crisis periods, $\log(S)$ has the highest correlation with the long-term financial performance measure, $\log(\text{Tobin } Q)$. The correlation of $\log(\text{Tobin } Q)$ with $\log(E)$, and $\log(\text{Tobin } Q)$ with $\log(S)$ are stronger after the year 2008. $\log(\text{investment})$ is strongly correlated with both $\log(\text{net income})$ and $\log(\text{Tobin } Q)$. $\log(\text{net income})$ and $\log(\text{Tobin } Q)$ have weak correlations with $\log(\text{leverage})$ and $\log(\text{liquidity})$.

4. Methodology

4.1 Difference-in-Difference (DID) Graphs

DID graphs are used to compare changes over time between the control group and the treatment group to determine the impact of a given intervention. In this essay, I use DID graphs to test the hypothesis that higher ESG scores did not lead to a greater financial performance improvement after the year 2008. I create two groups of companies: companies with high ESG scores (treatment group) and companies with low ESG scores (control group). Companies with high ESG scores and low ESG scores are companies whose average ESG scores between the years 2002 and 2013 fall within the top 25% and bottom 25% of the average ESG scores, respectively. Intervention is set to be the 2008 financial crisis. I use unbalanced panel data to create DID graphs to show the financial performance trends of high and low ESG scores companies in the

same graph and compare the high and low points of trends throughout the pre-crisis (2002–2007) and post-crisis (2008–2013) periods. Additionally, I add additional two years to the preliminary period (2006-2009) each time to establish multiple periods. I use the same method to produce DID graphs using balanced panel data for chosen periods. In the DID graphs, the change in financial performance improvement of high ESG scores companies is measured by the difference in financial performance between high ESG companies and low ESG companies over the period 2002-2013.

Table 9 and **Table 10** provide the number of observations and companies over multiple periods using 2002-2013 unbalanced and balanced panel data. **Graph 1** displays net income trends of high and low ESG companies from 2002 to 2013 using unbalanced panel data in **Table 9**. I observe that from 2002 to 2007, there is a negative difference between the net incomes of high and low-ESG companies. The net income of high ESG companies, however, starts to exceed that of low ESG companies in 2008 and reaches a peak in 2013. It reveals that high ESG has a positive correlation with financial performance improvement after the year 2008. **Graphs 3-7** use balanced panel data to display the net income trends for high and low ESG companies over multiple periods listed in **Table 10**. All graphs show the net earnings of high and low ESG companies exhibit a negative difference in the beginning, and it turns out to be positive following the financial crisis of 2008. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 2 provides the trends in the Tobin Q ratio between high and low ESG companies from 2002 to 2013 using unbalanced panel data in **Table 9**. While ignoring the outliers, it is difficult to analyze the differences in the change of Tobin Q ratios for high ESG companies and low ESG companies over 2002–2013 from the graph. **Graphs 8-12** use balanced panel data to display

Tobin Q ratio trends for high and low ESG companies over multiple periods listed in **Table 2**. According to **Graphs 8-10**, great long-term financial performance and high ESG scores are positively correlated. However, when I add more companies and widen the period, there is a negative correlation between high ESG scores and great long-term financial performance in **Graphs 11-12**.

To summarize, **Graph 1** and **Graphs 3-7** display that high ESG scores companies have high net income after the 2008 financial crisis. **Graph 2** and **Graphs 11-12** show that high ESG scores companies do not have a high Tobin Q ratio after the 2008 financial crisis. To test my findings from DID graphs and quantify the relationship between ESG scores and financial performance (e.g., net income and the Tobin Q ratio), I estimate the multiple linear regression model in **Section 4.2**.

4.2 The Multiple Linear Regressions

The multiple linear regression model is applied to evaluate the relationship between ESG score and financial performance after the 2008 financial crisis. I use financial performance measurements (e.g., net income and Tobin Q ratio) as the dependent variables. ESG variables are the independent variables. Along with the ESG variables, I also include a set of firm characteristics as control variables to account for differences across companies. The natural logarithm is applied to all variables to make measurements on a comparable scale. Unobserved firm-specific variables could have an impact on the firm's average financial performance. For example, some companies might invest more in ESG scores after the 2008 financial crisis or their financial performance might be affected more by the 2008 financial crisis than others. I include the firm fixed effects to deal with this issue. I also include the year-fixed effects to control for unobserved year-specific factors that affect companies' financial performance. Eight

regressions are estimated consisting of four regressions for the short-term financial performance (i.e., $\log(\text{net income})$) and four regressions for the long-term financial performance (i.e., $\log(\text{Tobin } Q)$).

$$\begin{aligned} \text{Log}(\text{net income}_{i,t}) &= \alpha + \beta_1 \log(\text{ESG}_{i,t}) + \beta_2 \log(\text{ESG}_{i,t}) * dm_t + \beta_3 \log(\text{Leverage}_{i,t}) \\ &+ \beta_4 \log(\text{Liquidity}_{i,t}) + \beta_5 \log(\text{Size}_{i,t}) + \beta_6 \log(\text{Investment}_{i,t}) \\ &+ \text{Time Fixed Effctcs} + \text{Firm Fixed Effects} + \varepsilon_t \end{aligned}$$

$$\begin{aligned} \log(\text{Tobin } Q \text{ ratio}_{i,t}) &= \alpha + \beta_1 \log(\text{ESG}_{i,t}) + \beta_2 \log(\text{ESG}_{i,t}) * dm_t + \beta_3 \log(\text{Leverage}_{i,t}) \\ &+ \beta_4 \log(\text{Liquidity}_{i,t}) + \beta_5 \log(\text{Size}_{i,t}) + \beta_6 \log(\text{Investment}_{i,t}) \\ &+ \text{Time Fxied Effects} + \text{Firm Fixed Effects} + \varepsilon_t \end{aligned}$$

The coefficient β of each variable represents each variable's elasticity of financial performance. dm_t denotes the dummy variable of the 2008 financial crisis. It is equal to 1 if the observation is in or after the year 2008. β_2 represents the coefficient of interaction term of ESG score after the year 2008 and dummy variable dm_t . It interprets the percent increase in the financial performance for every 1% increase in ESG score after the 2008 financial crisis. If it is positive, it implies the high ESG scores companies' financial performance improves more after the year 2008 than it does in the years before 2008. It is incorporated as the financial performance (e.g., net income and Tobin Q) improvement of high ESG companies after the year 2008 in **Section 4.1**. β_1 interprets the percent increase in the financial performance for every 1% increase in ESG score before the 2008 financial crisis. The set of control variables includes the debt-to-equity ratio (in %), interest coverage ratio (in %), market value (in millions) and return on invested

capital (in %). $\beta_3, \beta_4, \beta_5,$ and β_6 represent the percent increase in financial performance for every 1% increase in control variables. ε_t is the error term.

Results

5.1 Main Results

Table 7 shows the regression results of ESG scores and net income from 2005 to 2010. I find ESG score, E score and S score have a positive, but not statistically significant correlation with net income before the 2008 financial crisis. G score has a negative, but not statistically significant correlation with net income before the 2008 financial performance. More importantly, the coefficients of the interaction terms $\log(E_{i,t}) * dm_t, \log(S_{i,t}) * dm_t, \log(G_{i,t}) * dm_t,$ and $\log(ESG_{i,t}) * dm_t$ are all positive, but not statistically significant. The coefficients of firm characteristics are all statistically significant at the significance level of 0.01. These findings suggest that, except G score, the ESG scores have a weakly positive correlation with short-term financial performance before the 2008 financial crisis. Moreover, high ESG scores have a weakly positive correlation with companies' short-term financial performance improvement after the 2008 financial crisis. Leverage, liquidity, size and investment are highly correlated with short-term financial performance. According to the results, before 2008, a 1% increase in ESG score is correlated with a 0.087% increase in net income. For every 1% increase in the ESG scores after the 2008 financial crisis, an additional premium of 0.144% in net income is added. It implies that after 2008, every 1% increase in ESG score is correlated with a 0.231% increase in net income. Before 2008, the environment score has the strongest correlation with financial performance. A 0.140% rise in net income is associated with every 1% increase in environmental score. After 2008, social score has the largest added premium to net income growth. A 1% rise in

social score is associated with an extra 0.416% increase in net income. The interaction term coefficients results from **Table 7** are consistent with results from **Graph 1** and **Graphs 3-7**.

Table 8 shows the regression results of ESG scores and Tobin Q ratio during the period of 2005-2010. The coefficient signs of the ESG score are all positive, but not statistically significant. It implies that there is a positive correlation between ESG score and long-term financial performance before the year 2008. The coefficients of the interaction term $\log(E_{i,t}) * dm_t$, the interaction term $\log(G_{i,t}) * dm_t$, and the interaction term $\log(ESG_{i,t}) * dm_t$ are negative, but not statistically significant. The coefficients of the interaction term $\log(S_{i,t}) * dm_t$ are positive, but not statistically significant. The findings suggest that, before the 2008 financial crisis, the ESG scores showed a weakly positive correlation with long-term financial performance. High E score, G score and ESG score do not have a positive correlation with companies' long-term financial performance improvement after the 2008 financial crisis. High S scores have a weakly positive correlation with companies' long-term financial performance improvement after the 2008 financial crisis. The coefficients of firm characteristics, except $\log(\text{leverage})$, are all statistically significant at the significance level of 0.01, which implies that firm characteristics are highly correlated with long-term financial performance. According to the findings, before 2008, a 1% rise in the ESG score corresponded to an increase in the Tobin Q ratio of 0.239%. Every 1% increase in the ESG scores since the 2008 financial crisis is correlated with an additional premium of -0.231% in the Tobin Q ratio. It demonstrates that every 1% rise in the ESG score is correlated with a 0.008% rise in the Tobin Q ratio after 2008. Before 2008, the environment score has the strongest correlation with financial performance. A 0.107% rise in Tobin Q ratio is associated with every 1% increase in environmental score. After 2008, social score has the largest added premium to Tobin Q ratio growth. After 2008, a 1% rise in social

score is associated with an extra 0.007% increase in Tobin Q ratio. A 1% rise in the environmental and governance score is correlated with a fall in the Tobin Q ratio. The interaction term coefficients results from **Table 8** are consistent with results from **Graph 2** and **Graphs 11-12**.

This study finds that high ESG scores companies perform better (e.g., net income and Tobin Q ratio) before the 2008 financial crisis. Most of the studies find a positive relationship between ESG scores and financial performance. They are in line with the stakeholder theory and the legitimacy theory, indicating a positive correlation between the corporation's economic value and company sustainability management. Social capital investments that create bonds of trust between businesses and their stakeholders are rewarded through financial success. Social and environmental performance are strongly positively correlated with economic performance. Disclosure of ESG data to all stakeholders is a critical component of building a significant advantage for improving company sustainability performance (Alsayegh et al., 2020). Kim & Li (2021) discover a positive relationship between ESG scores and corporate profitability, with a stronger correlation for larger companies. ESG disclosure and firm profitability are primarily positively correlated (Benlemihet al., 2018). My findings contribute to the same streams of the above literature by indicating the benefits of ESG scores to financial performance. On the other hand, Nollet et al. (2016) demonstrate that investments in corporate social performance (CSP) must reach a particular threshold before sustainable actions become paid off. Moreover, I find high ESG scores companies have better short-term financial performance (e.g., net income) after the 2008 financial performance. This result is consistent with the finding that ESG performance is negatively correlated the earnings loss in an uncertain environment (Hwang et al., 2021).

However, my findings do not allow me to confirm that high ESG scores companies have better long-term financial performance (e.g., Tobin Q ratio) after the year 2008. In this regard, a few studies find a negative or neutral relationship between ESG scores and returns after turbulent times (e.g., the 2008 financial crisis and the COVID-19 pandemic). Whether or not the analysis is constrained to the 2008 financial crisis, the emission reduction or climate change policies in major US corporations does not appear to be strongly correlated to financial performance (Petitjean, 2019). When industry affiliation, accounting- and market-based determinants of returns are properly controlled for, firms with higher ESG scores do not experience superior returns (i.e., smaller losses) during COVID-19 (Demers et al., 2020). According to Fatemi et al. (2018), ESG disclosure reduces firm value while at the same time minimizing the negative impacts of a firm's hazards and highlighting its strengths. This contrasts with the findings of previous studies which underline that ESG practises can be used as a risk management tool to improve share price resilience, especially during tumultuous times (Li et al., 2022). My finding also seems to go against the study of Henke (2016) which find that high-ESG-rated funds outperformed low-ESG-rated funds during the crisis. He states that ESG actions lower the downside risks that companies face as well as their exposure to such risks. Investors make optimistic predictions on sustainable assets, shifting capital from funds with low sustainability ratings to those with high ratings.

7. Conclusion

This research implements empirical analysis to investigate ESG management performance's correlation with financial performance after the 2008 financial crisis. Companies listed on the US capital market experience a sudden shock from the 2008 financial crisis. It also causes decreases in both financial performance and ESG score performance. My findings suggest that companies

with higher ESG score performance experience greater short-term financial performance (net income) improvement after the 2008 financial crisis. Furthermore, ESG scores have a weak and negative correlation with long-term financial performance (Tobin Q ratio) improvement after the 2008 financial crisis. I also discover that, when compared to company characteristics (e.g., size, investment, and leverage), ESG scores have negligible correlations with both short-term and long-term financial performance.

The limitation of this study is that the results do not show the causation of ESG scores and financial performance. Instead, they show a correlation. Reverse causality is thus a main concern. For example, a company with greater net income improvement after the year 2008 might have higher ESG scores as they have more financial resources to invest in ESG actions.

Appendix

Table 1: ESG variables and number of observations

Observations	Environmental				Social						Governance			
	Environment		Community		Diversity		Employee Relations		Human Rights		Product		Corporate Governance	
MSCI Score	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns
0	6696	6568	7274	7273	5353	4211	6336	4593	7902	7613	7513	6512	6811	4877
1	818	838	486	647	1502	3030	1208	2493	71	307	428	1062	1088	2704
2	257	346	158	49	579	727	306	718		47	31	294	66	332
3	137	141	39	4	294	5	90	153		6	1	87	8	53
4	56	58	16		142		28	16				18		7
5	9	22			70		5							
6					26									
7					7									
8														
9														
10														
Sum	7973	7973	7973	7973	7973	7973	7973	7973	7973	7973	7973	7973	7973	7973

The table shows the raw ESG pillar ratings and the total number of observations for each pillar collected from the ESG KLD STATS database. Each pillar score's good and poor performances are viewed as concerns and strengths, respectively. Every raw MSCI ESG strength and concern observation has a range of 0 to 10. If a company discloses its sustainable practices, the rating will rise.

Table 2: ESG variables and scoring system

Quantile- Based Score	Environmental				Social						Governance			
	Environment		Community		Diversity		Employee Relations		Human Rights		Product		Corporate Governance	
	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns	Strengths	Concerns
0	0.166667	1	0.2	1	0.125	1	0.166667	1	0.5	1	0.25	1	0.25	1
1	0.333333	0.833333	0.4	0.75	0.25	0.75	0.333333	0.8	1	0.75	0.5	0.8	0.5	0.8
2	0.5	0.666667	0.6	0.5	0.375	0.5	0.5	0.6		0.5	0.75	0.6	0.75	0.6
3	0.666667	0.5	0.8	0.25	0.5	0.25	0.666667	0.4		0.25	1	0.4	1	0.4
4	0.833333	0.333333	1		0.625		0.833333	0.2				0.2		0.2
5	1	0.166667			0.75		1							
6					0.875									
7					1									
8														
9														
10														

The table provides the quantile values for corresponding raw pillar strengths and concerns. The ESG quantile values of each pillar's strength and concern are created following the technique outlined in Hwang et al. (2021)'s study: t observation has a new score of 0.833 if it has an MSCI environmental strength score of 4. The observations with the highest MSCI score had a score of 1. The new score for the observation is the highest value for the relevant quantile range, and each MSCI score can be thought of as a group, range, or quantile (e.g., MSCI 4 for environmental strength ranges from 0.667 to 0.833).

Table 3: Variables, measurements and formulas

Category	Type	Measurement	Formula
Dependent Variables	Financial Performance	Short term profits	net income
		Long-term financial performance	Tobin Q= Market Value/(Total Assets- Total Liabilities)
Independent Variables	ESG	Environmental score	Refer to table 4
		Social score	
		Governance score	
		Total ESG Score	
	Leverage	Debt to Equity	Total Liabilities/Shareholders' Equity
	Liquidity	Interest Coverage Ratio	EBIT/Interest Expense
Size	Market Value	market value	
Investment	Return on Invested Capital	(EBIT-Income Tax)/ Invested capital	

The table lists the measurements and formulas of the dependent variables and independent variables. Financial performance is measured in millions. ESG scores are converted to quantile-based scores using the scoring system in **Table 2**. Firm characteristics variables include the debt-to-equity ratio (in %), interest coverage ratio (in %), market value (in millions) and return on invested capital (in %).

Table 4: Formulas of ESG pillar scores

ESG pillar scores	Variables	Formula
Environmental score	Environmental strengths and concerns	$\Sigma(\text{environmental strengths} + \text{environmental concerns})/2$
Social Score	Social strengths and concerns	$\Sigma(\text{community, human rights, employment, diversity, product strengths}) + (\text{community, human rights, employment, diversity, product concerns})/10$
Governance Score	Corporate Governance strengths and concerns	$\Sigma(\text{corporate governance strengths} + \text{corporate governance concerns})/2$
Total ESG score	Average of environmental, social and governance scores	Average of environmental, social and corporate governance scores

The table provides details to calculate ESG pillar scores. The new pillar's scores are generated by averaging the quantile values of the strengths and concerns. The overall ESG score is determined by averaging the three new pillar scores.

Table 5: Descriptive statistics of ESG score and financial performance sample

2005-2007 (before the 2008 financial crisis)						
Variables	Number of observations	Mean	Median	S.D	Skewness	Kurtosis
log(net income)	3331	4.408613	4.248767	1.66216	0.3134238	3.538146
log(Tobin Q)	3774	0.982048	0.9060503	0.6959198	1.375276	9.254128
Log(E)	3867	-0.5646521	-0.5389936	0.1271447	-3.353658	23.86258
Log(S)	3867	-0.4974486	-0.5039051	0.0557716	-0.0241696	5.840704
Log(G)	3867	-0.5210829	-0.4700036	0.1357267	-0.5137805	4.808035
Log(ESG)	3867	-0.5235823	-0.5159303	0.0652423	-0.8217644	7.78222
log(leverage)	3772	0.0548578	0.0643437	0.9934203	0.4767688	6.120409
log(liquidity)	3564	2.363482	2.086413	1.754674	1.00359	5.184196
log(size)	3867	7.196144	7.023246	1.484066	0.5923737	2.234644
log(investment)	3540	-2.293814	-2.250624	0.7289111	-1.050049	8.728926

The table displays the total number of observations, mean, median, standard deviation, skewness, and kurtosis of each variable's natural log value before the year 2008.

Table 5: Descriptive statistics of ESG score and financial performance sample (continued)

2008-2010 (after the 2008 financial crisis)						
Variables	Number of observations	Mean	Median	S.D	Skewness	Kurtosis
log(net income)	3098	4.357301	4.274149	1.817325	0.1777497	3.386085
log(Tobin Q)	3952	0.653966	0.5893314	0.6231545	0.7809746	6.893494
log(E)	4106	-0.5396432	-0.5389936	0.1308741	-1.7184	16.65747
log(S)	4106	-0.5053936	-0.5122154	0.0616724	0.283084	5.739001
log(G)	4106	-0.5185017	-0.4700036	0.1333426	-0.9067815	6.242905
log(ESG)	4106	0.5173237	-0.5177933	0.0692329	-0.0095791	7.113569
log(leverage)	3944	0.1200116	0.0830705	1.034558	0.07609592	6.224118
log(liquidity)	3614	2.205278	1.970694	1.764295	0.0722476	4.556307
log(size)	4106	7.176018	7.009253	1.603847	0.4418572	3.030935
log(investment)	3618	-2.359171	-2.276177	0.887014	-1.17085	10.13356

The table displays the total number of observations, mean, median, standard deviation, skewness, and kurtosis of each variable's natural log values in and after the year 2008.

Table 6: Correlation analysis of ESG and financial performance

2005-2007 (before the 2008 financial crisis)									
	log(net income)	log(Tobin Q)	log (E)	log(S)	log(G)	log(ESG)	log(leverage)	log(liquidity)	log(size)
log(net income)	1								
log(Tobin Q)	0.1884	1							
log (E)	-0.2531	0.0811	1						
log(S)	0.0337	0.1273	0.2779	1					
log(G)	-0.248	-0.0399	0.0284	0.0779	1				
log(ESG)	-0.2783	0.0624	0.6958	0.497	0.6764	1			
log(leverage)	0.1708	0.2466	-0.1641	-0.0706	-0.0455	-0.1514	1		
log(liquidity)	0.0517	0.2479	0.1239	0.1294	0.009	0.1218	-0.6372	1	
log(size)	0.872	-0.0394	-0.2996	-0.0146	-0.2381	-0.3157	0.3678	-0.2631	1
log(investment)	0.4027	0.5438	-0.0402	0.0832	-0.0573	-0.0322	0.0844	0.3774	0.0795

The table displays the correlation matrix for dependent and independent variables' natural log values before the year 2008.

Table 6: Correlation analysis of ESG and financial performance (continued)

2008-2010 (after 2008 the financial crisis)									
	log(net income)	log(Tobin Q)	log (E)	log(S)	log(G)	log(ESG)	log(leverage)	log(liquidity)	log(size)
log(net income)	1								
log(Tobin Q)	0.1918	1							
log (E)	-0.0956	0.0782	1						
log(S)	0.1284	0.1307	0.2415	1					
log(G)	-0.253	-0.0517	0.071	0.0485	1				
log(ESG)	-0.1467	0.0574	0.6931	0.4804	0.6931	1			
log(leverage)	0.2065	0.2312	-0.0972	-0.0275	-0.076	-0.11	1		
log(liquidity)	0.0097	0.238	0.0884	0.0869	0.0391	0.1039	-0.6167	1	
log(size)	0.8572	-0.0265	-0.1323	0.0943	-0.2661	-0.1871	0.3865	-0.2942	1
log(investment)	0.385	0.5011	0.0039	0.0683	-0.0644	-0.0109	0.1191	0.341	0.0589

The table displays the correlation matrix for dependent and independent variables' natural log values in and after the year 2008.

Table 7: Regression analysis of ESG and net income during the period of 2005-2010

Coefficients (t-value)	Model 1 (E Score)	Model 2 (S Score)	Model 3 (G Score)	Model 4 (ESG Score)
Dependent Variable	log(net income)			
log (E)	0.140377 (1.05)			
log (E)*dm	-0.0078581 (-0.05)			
log (S)		0.0402407 (0.09)		
log (S)*dm		0.4156708 (0.91)		
log (G)			-0.0329638 (-0.16)	
log (G)*dm			0.0132074 (0.07)	
log (ESG)				0.0869843 (0.26)
log (ESG)*dm				0.1442286 (0.5)
log(leverage)	-0.1597882*** (-4.85)	-0.1611658*** (-4.93)	-0.1591155*** (-4.65)	-0.1602137*** (-4.82)
log(liquidity)	0.13239113*** (4.57)	0.1329146*** (4.58)	0.0132074*** (4.52)	0.1322319*** (4.59)
log(size)	1.03182*** (17.77)	1.030392*** (17.86)	1.02792*** (17.97)	1.031125*** (17.9)
log(investment)	0.7045092*** (11.18)	0.7025619*** (11.03)	0.7046864*** (10.97)	0.7042526*** (11.18)
Constant	-2.966369** (-3.57)	-3.015916** (-2.99)	-3.030866** (-3.82)	-2.992003*** (-3.91)
Observations	6429	6429	6429	6429
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.9318	0.9289	0.9224	0.9301
RMSE	0.4848	0.5001	0.4891	0.481

The table reports the relationship between ESG and net income from the year 2005 to 2010. E is the environmental score; S is the social score; G is the governance score; ESG is the average of environmental, social and governance score; dm_t is the dummy variable indicating whether the observation is in or after the year 2008. The set of control variables includes the debt-to-equity ratio (in %), interest coverage ratio (in %), market value (in millions) and return on invested capital (in %). The estimated coefficients are the percent increase in net income for every 1% increase in variables. The estimated coefficients of

interaction terms $\log(ESG_{i,t}) * dm_t$, $\log(E_{i,t}) * dm_t$, $\log(S_{i,t}) * dm_t$, and $\log(G_{i,t}) * dm_t$ interprets the percent increase in the financial performance for every 1% increase in ESG score after the 2008 financial crisis. All t-values are based on the standard errors clustered by firms. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests. All models include the year-fixed effects and firm-fixed effects.

Table 8: Regression analysis of ESG and Tobin Q ratio during the period of 2005-2010

Coefficients (t-value)	Model 5 (E Score)	Model 6 (S Score)	Model 7 (G Score)	Model 8 (ESG Score)
Dependent Variable	log(Tobin Q)			
log (E)	0.1065055 (1.46)			
log (E)*dm	-0.069387 (-0.51)			
log (S)		0.006112 (0.03)		
log (S)*dm		0.0071086 (0.04)		
log (G)			0.086477 (1.62)	
log (G)*dm			-0.13805 (-1.71)	
log (ESG)				0.2389532 (1.67)
log (ESG)*dm				-0.2311855 (-1.28)
log(leverage)	0.4151859*** (10.21)	0.415047*** (10.1)	0.4155475*** (10.15)	0.4160042 (10.24)
log(liquidity)	0.0752746*** (7.66)	0.0753763*** (7.58)	0.075951*** (7.53)	0.1987131*** (6.7)
log(size)	-0.3512344*** (-7.12)	-0.352647*** (-7.13)	-0.3519504*** (-7.06)	-0.3511084*** (-7.03)
log(investment)	0.1472073*** (6.78)	0.146724*** (6.68)	0.1454728*** (6.54)	0.1466238*** (6.68)

Constant	3.624924*** (10.11)	3.57977*** (9.4)	3.614291*** (9.86)	3.687201*** (10.54)
Observations	6303	6303	6303	6303
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.8226	0.8271	0.8203	0.8214
RMSE	0.3133	0.3189	0.3124	0.3112

The table reports the relationship between ESG and Tobin Q ratio from the year 2005 to 2010. E is the environmental score; S is the social score; G is the governance score; ESG is the average of environmental, social and governance score; dm_t is the dummy variable indicating whether the observation is in or after the year 2008. The set of control variables includes the debt-to-equity ratio (in %), interest coverage ratio (in %), market value (in millions) and return on invested capital (in %). The estimated coefficients are the percent increase in the Tobin Q ratio for every 1% increase in variables. The estimated coefficients of interaction terms $\log(ESG_{i,t}) * dm_t$, $\log(E_{i,t}) * dm_t$, $\log(S_{i,t}) * dm_t$, and $\log(G_{i,t}) * dm_t$ interprets the percent increase in the Tobin Q ratio for every 1% increase in ESG score after the 2008 financial crisis. All t-values are based on the standard errors clustered by firms. *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively, in two-tailed tests. All models include the year-fixed effects and firm-fixed effects.

Table 9: Number of observations and companies over multiple periods for 2002-2013 unbalanced panel data

Period	Number of Observations	Number of Companies
2006-2009	5230	1751
2005-2010	7973	2064
2004-2011	10797	2428
2003-2012	13533	2681
2002-2013	15267	2856

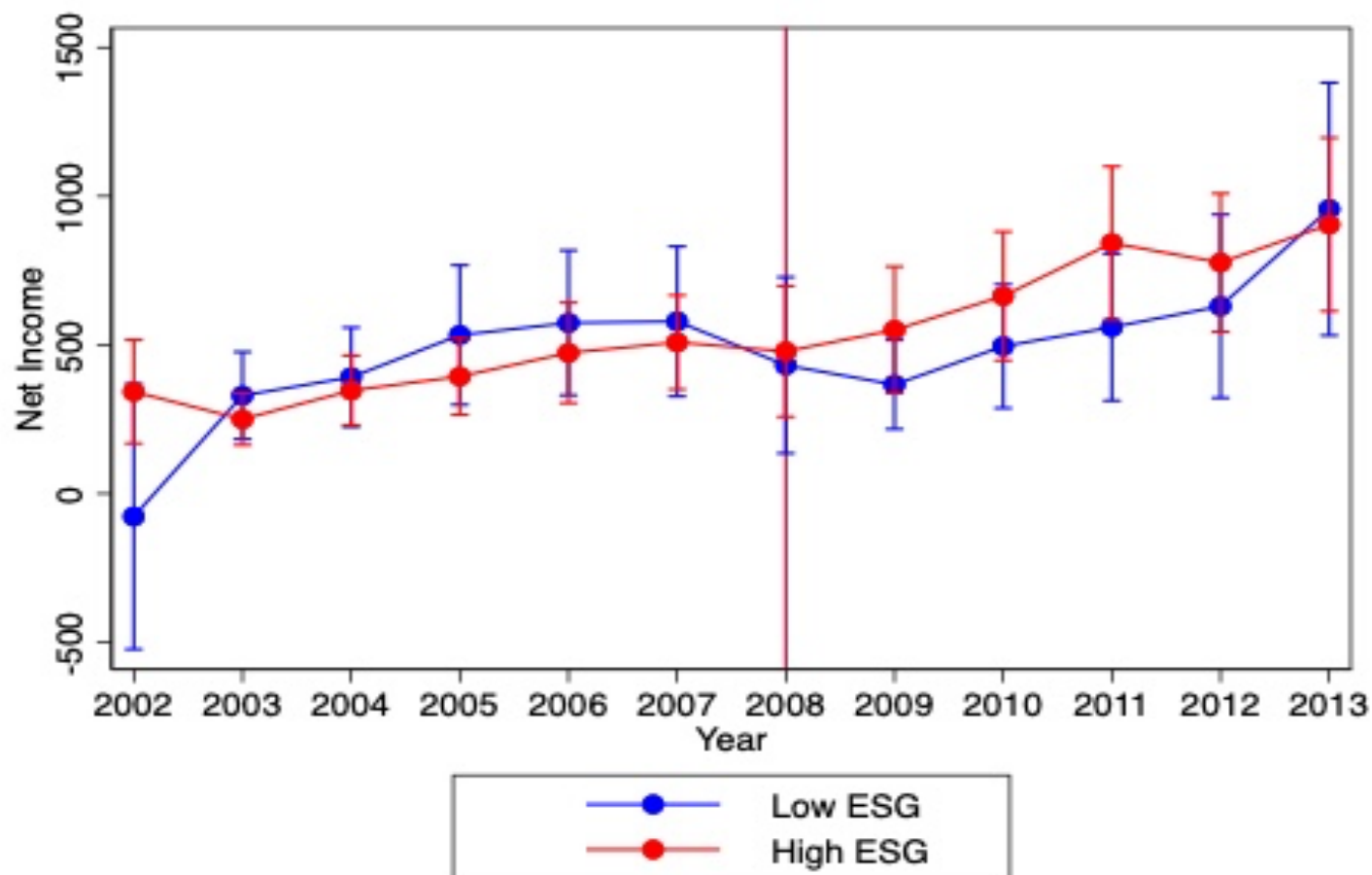
The table provides the number of observations and companies over multiple periods using 2002-2013 unbalanced panel data. An additional two years is added to the preliminary period (2006-2009) each time to establish multiple periods. The observations in each period are used to determine financial performance (e.g., net income and Tobin Q ratio) trends of high and low ESG companies throughout 2002 to 2013 in Graphs 1-2.

Table 10: Number of observations and companies over multiple periods for 2002-2013 balanced panel data

Period	Number of Observations	Number of Companies
2006-2009	3660	915
2005-2010	4605	768
2004-2011	5160	645
2003-2012	5540	554
2002-2013	2772	231

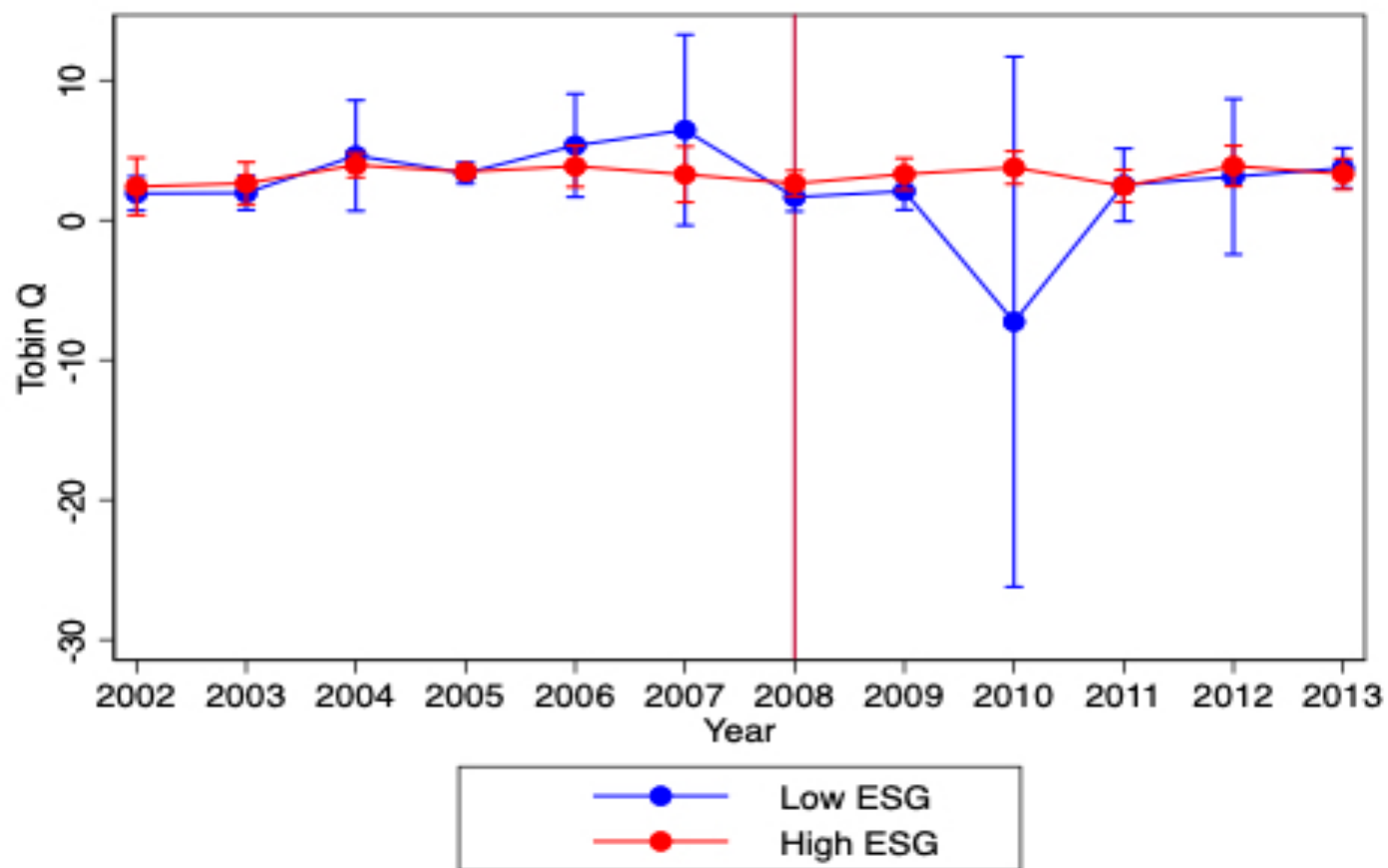
The table provides the number of observations and companies over multiple periods using 2002-2013 balanced panel data. An additional two years is added to the preliminary period (2006-2009) each time to establish multiple periods. The observations in each period are used to determine financial performance (e.g., net income and Tobin Q ratio) trends of high and low ESG companies throughout 2002 to 2013 in Graphs 3 -12.

Graph 1: Net income trends for high and low ESG companies using unbalanced panel data (2002-2013)



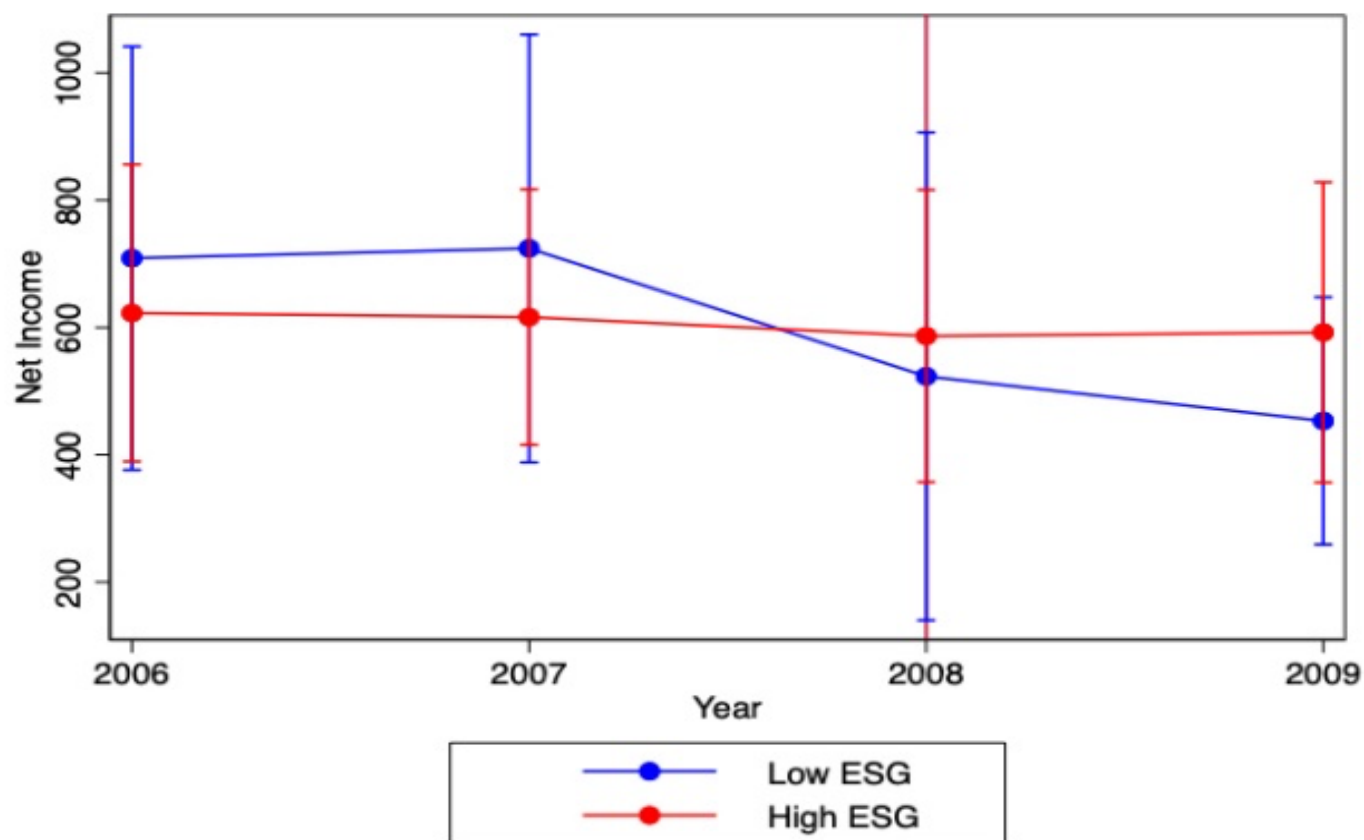
The graph shows net income (in millions) trends of high and low ESG companies from 2002 to 2013 using unbalanced panel data in Table 9. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 2: Tobin Q ratio trends for high and low ESG companies using unbalanced panel data (2002-2013)



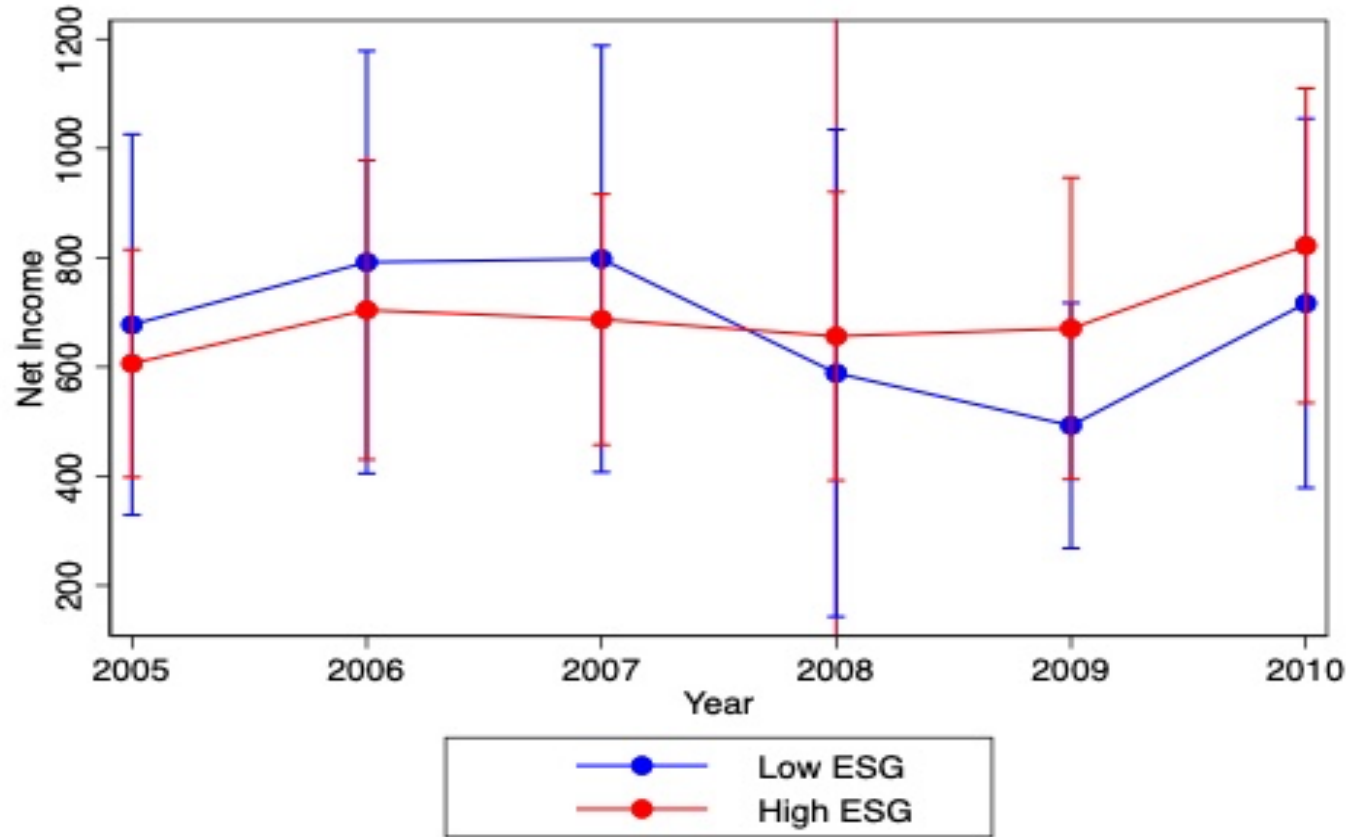
The graph shows Tobin Q ratio trends of high and low ESG companies from 2002 to 2013 using unbalanced panel data in Table 9. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. While ignoring the outliers, it is difficult to analyze the differences in change of Tobin Q ratios for high ESG companies and low ESG companies

Graph 3: Net income trends for high and low ESG companies using balanced panel data (2006-2009)



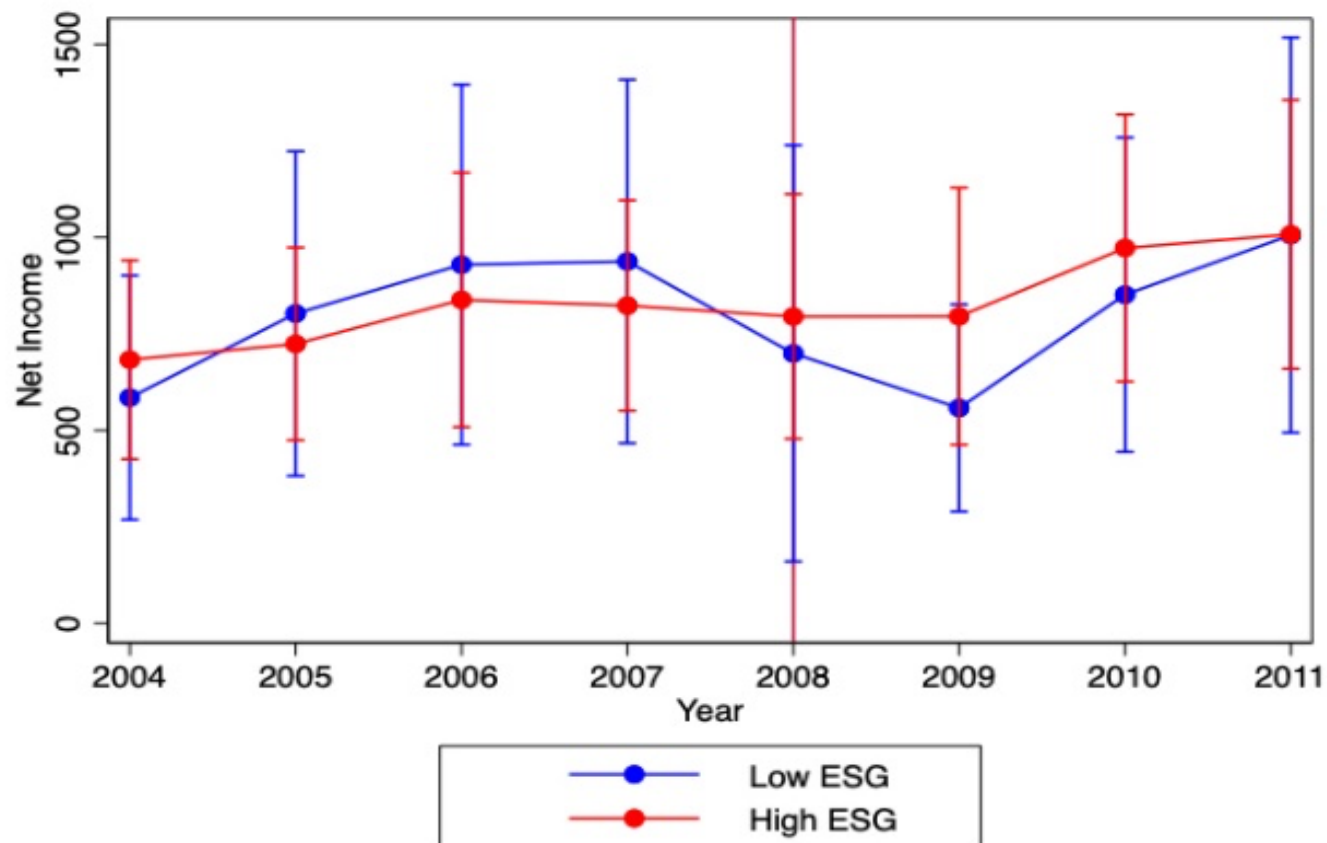
The graph shows net income (in millions) trends of high and low ESG companies from 2006 to 2009 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 4: Net income trends for high and low ESG companies using balanced panel data (2005-2010)



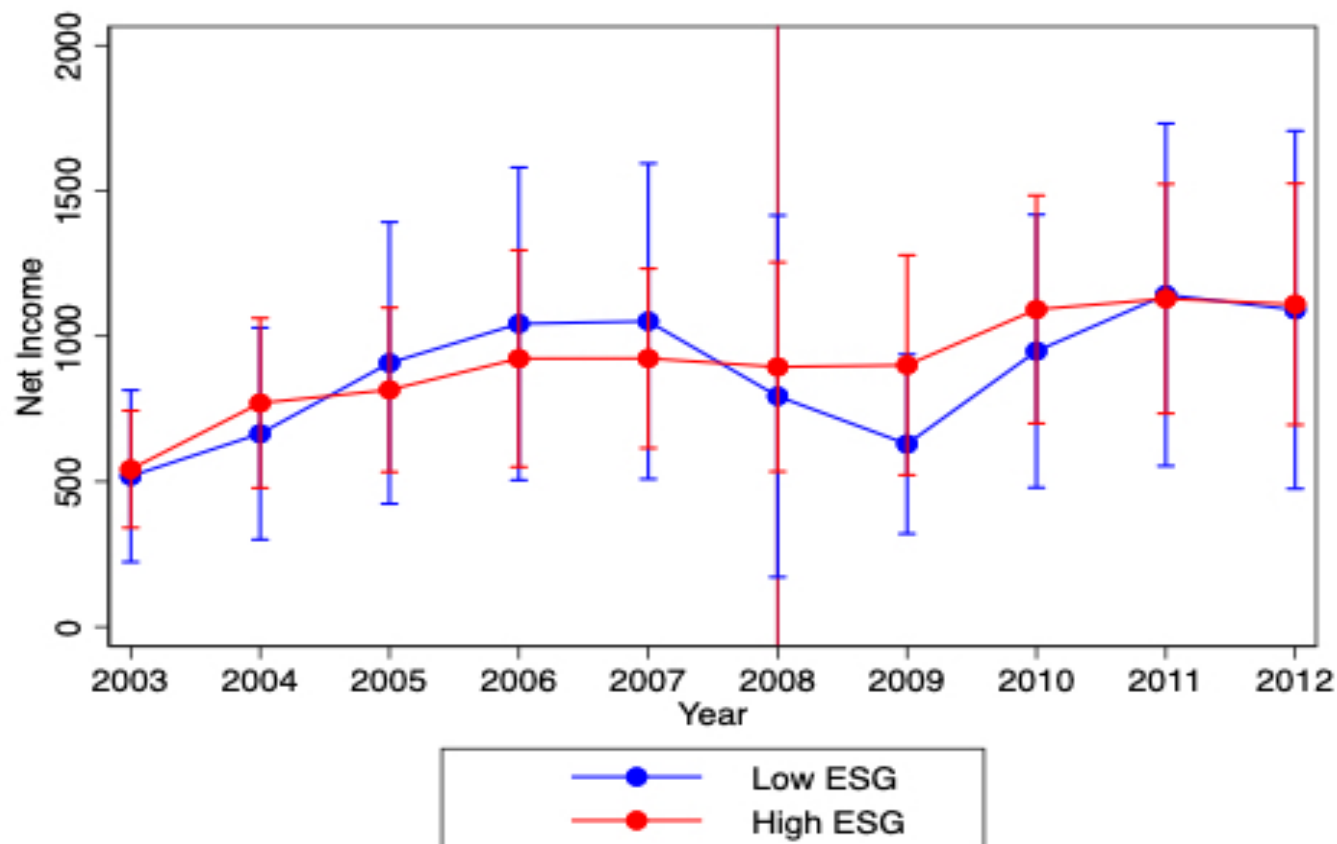
The graph shows net income (in millions) trends of high and low ESG companies throughout 2005 to 2010 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 5: Net income trends for high and low ESG companies using balanced panel data (2004-2011)



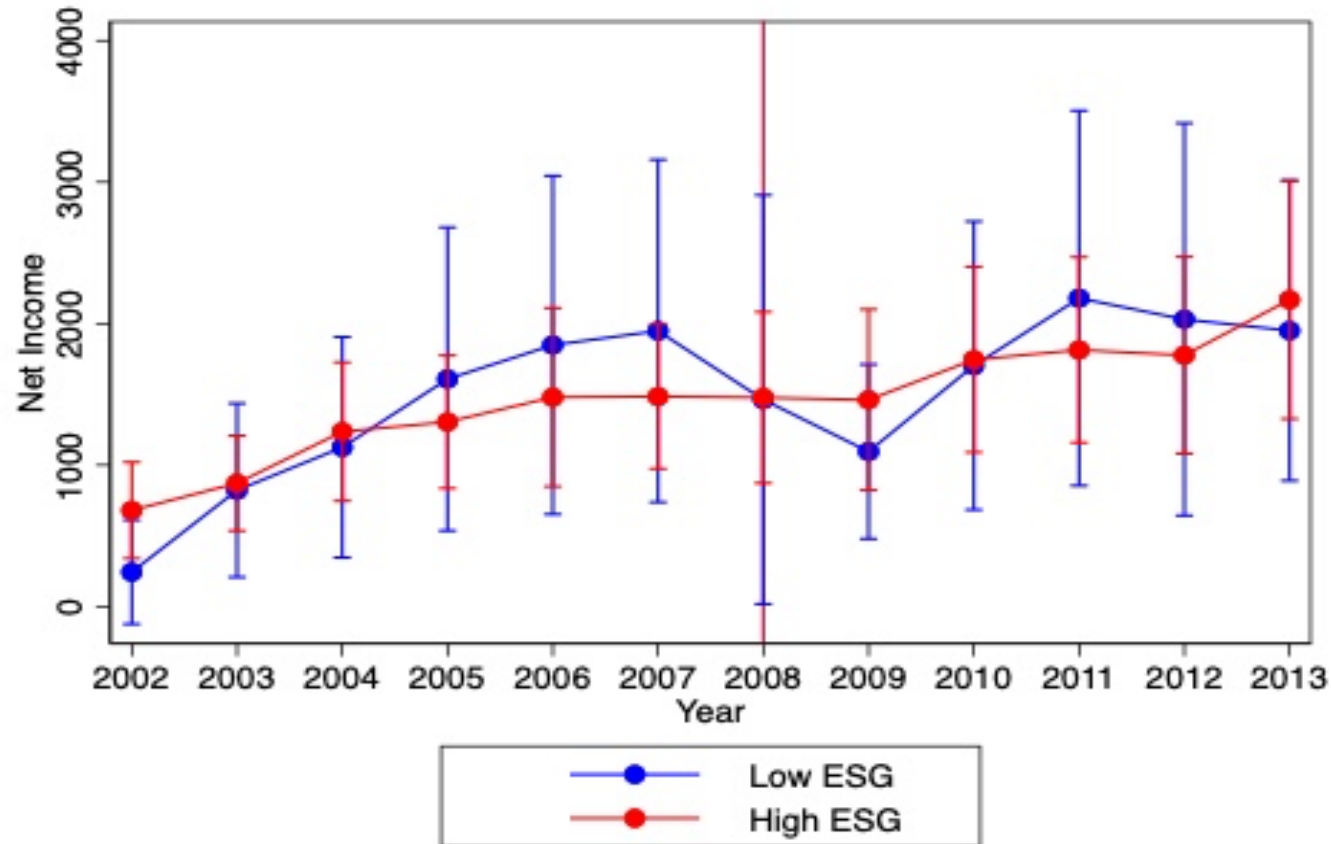
The graph shows net income (in millions) trends of high and low ESG companies from 2004 to 2011 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 6: Net income trends for high and low ESG companies using balanced panel data (2003-2012)



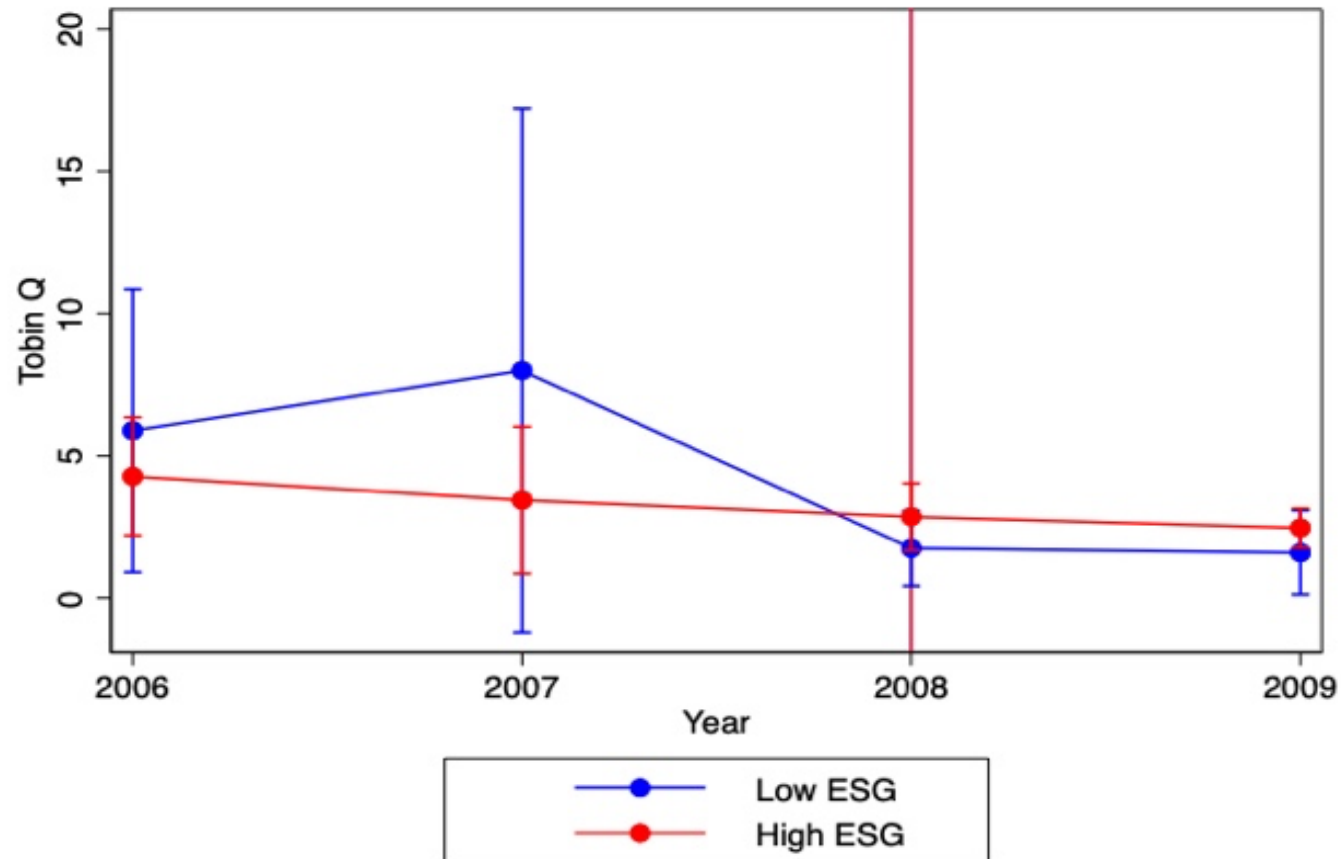
The graph shows net income (in millions) trends of high and low ESG companies from 2003 to 2012 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 7: Net income trends for high and low ESG companies using balanced panel data (2002-2013)



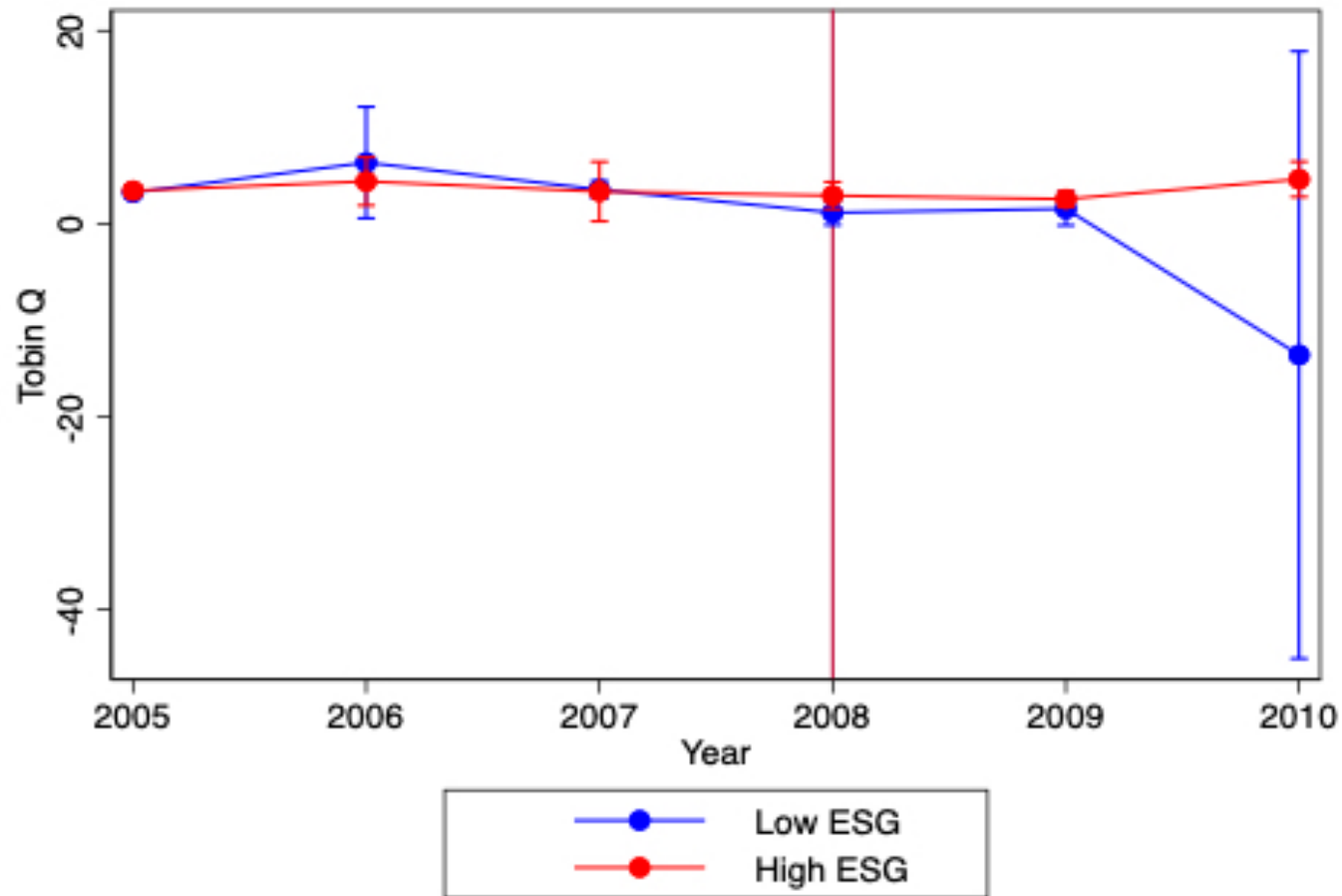
The graph shows net income (in millions) trends of high and low ESG companies from 2002 to 2013 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is positively correlated with short-term financial performance improvement.

Graph 8: Tobin Q ratio trends for high and low ESG companies using balanced panel data (2006-2009)



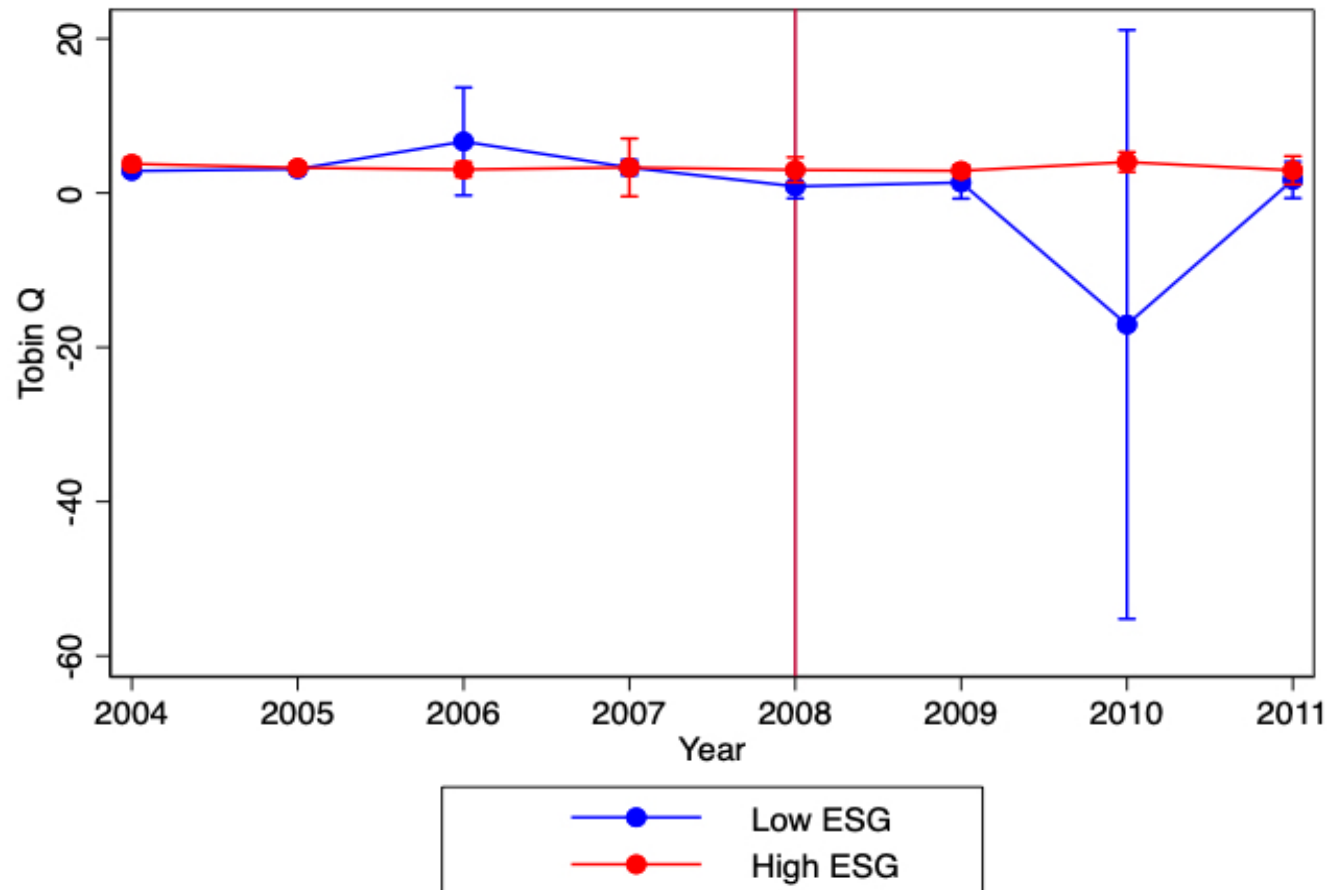
The graph shows Tobin Q ratio trends of high and low ESG companies throughout 2006 to 2009 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis.

Graph 9: Tobin Q ratio trends for high and low ESG companies using balanced panel data (2005-2010)



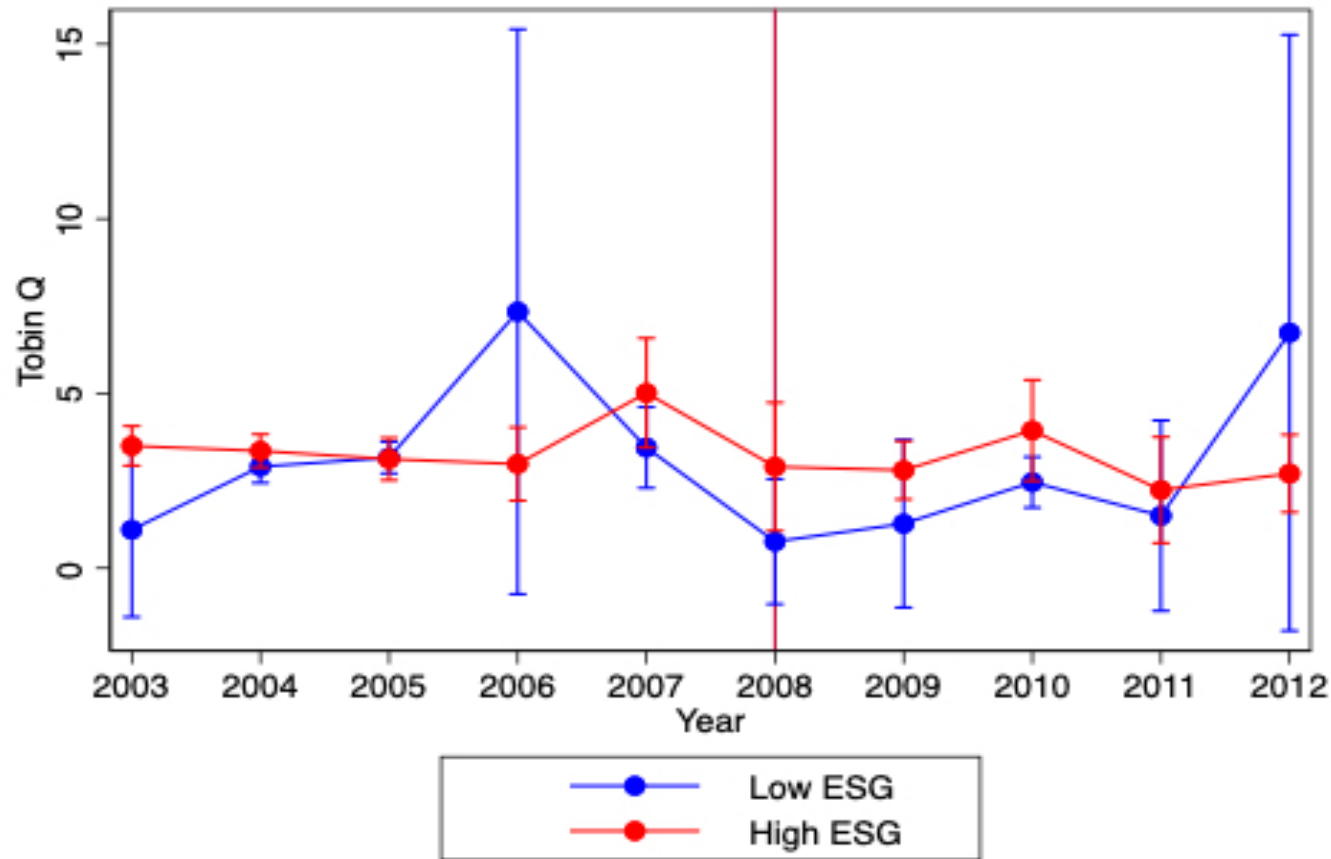
The graph shows Tobin Q ratio trends of high and low ESG companies throughout 2005 to 2010 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis.

Graph 10: Tobin Q ratio trends for high and low ESG companies periods using balanced panel data (2004-2011)



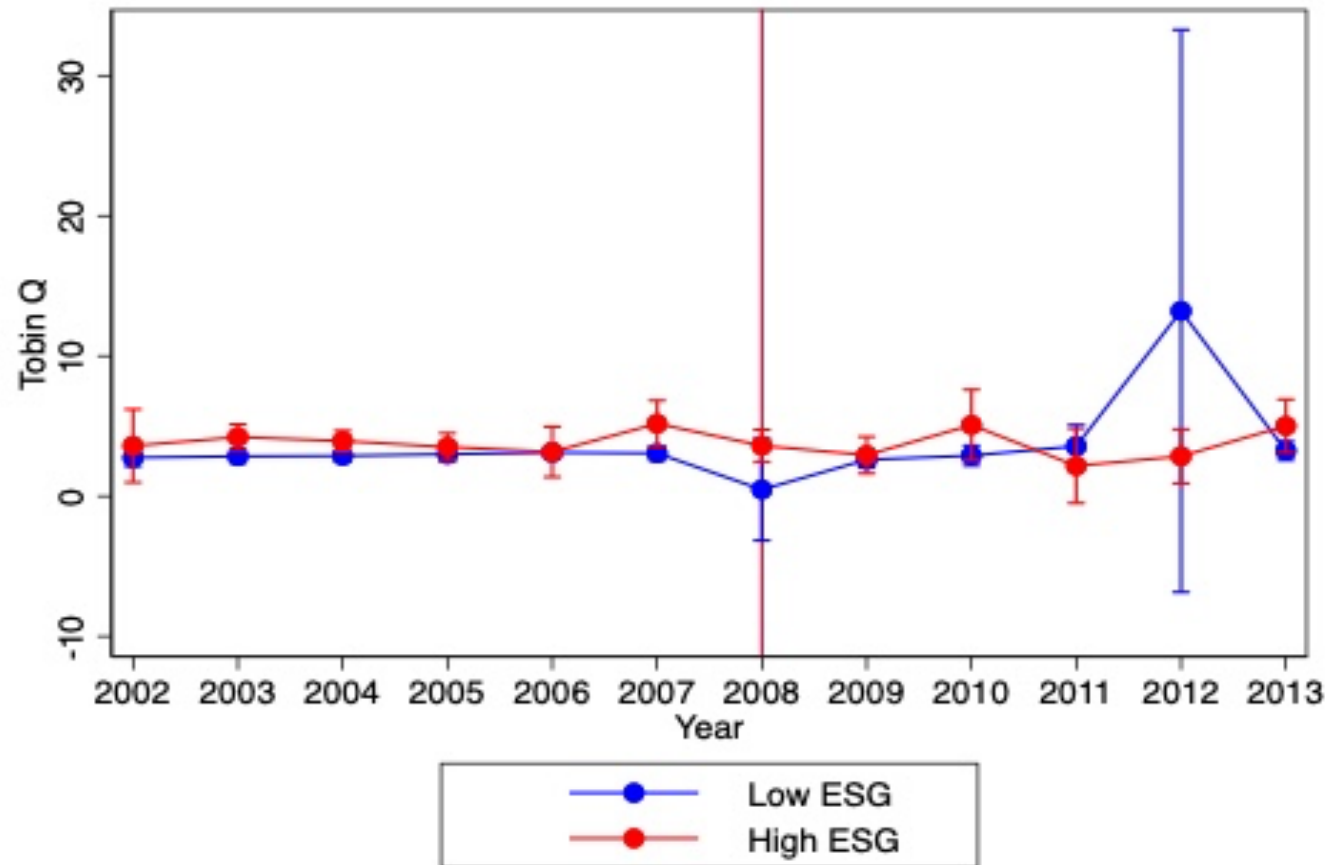
The graph shows Tobin Q ratio trends of high and low ESG companies throughout 2004 to 2011 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis.

Graph 11: Tobin Q ratio trends for high and low ESG companies using balanced panel data (2003-2012)



The graph shows Tobin Q ratio trends of high and low ESG companies throughout 2003 to 2012 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is negatively correlated with long-term financial performance improvement.

Graph 12: Tobin Q ratio trends for high and low ESG companies using balanced panel data (2002-2013)



The graph shows Tobin Q ratio trends of high and low ESG companies from 2002 to 2013 using balanced panel data in Table 10. Companies with high ESG scores and companies with low ESG scores are set to be the treatment group and control group, respectively. Intervention is set to be the 2008 financial crisis. It implies ESG score is negatively correlated with long-term financial performance improvement.

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