

Corporate Resilience During Crises:
Evidence from the COVID-19 Pandemic

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ABSTRACT

Corporate Resilience During Crises: Evidence from the COVID-19 Pandemic

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In this paper, we examine the role of environmental, social, and governance (ESG) factors in enhancing the resilience of firms during the COVID-19 pandemic. By analyzing the impact of ESG scores on stock prices during three significant events that occurred in connection with the pandemic in the United States – each with varied market responses – we aim to shed light on whether and how ESG factors affect investor trading in different firms in times of crisis. Although we find that the overall market response to COVID-specific events is significant, our findings indicate that ESG factors offer little to no explanatory power with respect to individual stock price returns. The results are robust when we employ a propensity score matching technique rather than a full-sample analysis and other robustness tests. The results suggest that investors may not prioritize a firm’s ESG performance during periods of economic turbulence, but instead focus on more traditional and shorter-term factors including a firm’s ex-ante financial health.

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I. Introduction

In 1991, Archie B. Carroll argued that companies have a business responsibility to consider the interests of different stakeholders such as the shareholders, customers, their employees, and the community in general to ensure the long-term success of the company (Carroll, 1991). Today, more than 30 years later, this proposition has evolved into a mainstream belief due to a significant shift in the environmental, social, and governance (ESG) landscape. In the last few decades, ESG factors have gained attention from investors, businesses, and legislators. This is driven by a growing acknowledgement of the potential for ESG factors to impact financial performance and the broader societal and environmental impacts of corporate activities. According to Bloomberg Intelligence (2022), ESG assets exceeded \$35 trillion in 2020 to account for a third of the total global assets under management and assuming a 15% growth rate (a third of the actual pace of the past five years), ESG assets could surpass \$50 trillion by the year 2025. This further solidifies the idea that the focus on sustainability has considerably increased. As the conversations around ESG continue being under the spotlight, there exists an increasing pressure on companies to incorporate sustainable practices into their business operations.

In recent years, several ESG regulations and standards have been established with an expectation that companies will display transparency in reporting their ESG impacts. In the United States, the Securities and Exchange Commission (SEC) has put forth the Sustainability Accounting Standards Board (SASB) standards for companies to disclose their ESG practices to maintain reporting consistency and help facilitate comparison. Companies that are regarded as environmentally and socially responsible are often perceived positively and may benefit from an improved reputation and increased consumer trust. Investment firms are now incorporating ESG factors into their investment decision-making process, with some even citing this decision as being a part of their fiduciary duty towards their clients.

Although the relevance of ESG in the modern world is undeniable, its financial benefits are still disputed and it continues being the subject of considerable academic and industrial research. While some people believe that a focus on ESG issues can positively impact a company (due to improved reputation or consumer trust), others believe that this focus can be distracting and that it takes time and resources away from what the primary focus of any business should be: profitability. Researchers have published numerous studies analyzing the resilience of firms that have strong ESG practices. However, because of several varying results over the years, it is difficult to come to a conclusion about the effectiveness of ESG investing, especially in times of market instability.

However, due to the unprecedented period of global turmoil that the world has witnessed over the past three years, we have a unique chance to take a closer look at this subject and truly evaluate the effectiveness of ESG investing. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic, sending stock markets into turmoil. Due to the government lockdowns that were implemented to curb the spread of COVID-19, many businesses were forced to close down or scale back their operations. This led to a decrease in sales and profits. There were also disruptions in the supply chains, which made it harder to get raw materials and distribute final products. Many companies faced new operational and logistical challenges as a result of remote working and social distancing requirements. Thus, as businesses faced a drastically altered economic landscape, a question that naturally arises is how, if, at all, ESG factors affected a company's resilience and ability to weather the crisis.

This paper examines this question by exploring the extent to which companies that focused on ESG concerns were able to safeguard their market performance during the COVID-19 pandemic. By using three distinct events that occurred in 2020 in the United States, this paper investigates the role of ESG factors in creating resilient companies during the pandemic.

The selected events are expected to result in varied overall market outcomes, allowing us to examine the role of ESG in different market situations. First, using the event study methodology, we obtain abnormal returns and cumulative abnormal returns for each event. Next, we perform OLS regressions, with ESG scores as the primary independent variable, to obtain our results. Additionally, as a robustness test, we employ propensity score matching, and then run regressions on the matched firms. Throughout our analysis, we find no significant relationship between ESG and market abnormal returns which indicates that ESG factors did not drive the stock market prices of firms around the pandemic-related events of our study. These findings are particularly noteworthy due to the highly debated controversy in the literature regarding greenwashing. “Greenwashing” is a term used to describe the phenomenon that firms may engage in deceptive practices to appear environmentally responsible such as presenting misleading information about their ESG activities. This can lead to inflated ESG scores which can make companies appear more socially responsible than they are. However, since we do not find any significant evidence that ESG scores affect stock prices in the first place, our study does not suffer from any potential issues that could arise from companies engaging in greenwashing. Overall, by conducting these analyses, we hope to provide comprehensive answers to our research questions and contribute to the growing body of literature on ESG and market performance.

The rest of the paper is structured as follows: In Section II, we review the literature on sustainability and ESG research and introduce our hypotheses and research questions. Section III provides a description of our sample and the variables used in this study, along with descriptive statistics. In section IV, we explain the methodology used to inspect the stock market impact of the three COVID-19 events and the methodology used to link this impact to the ESG performance of companies. Section V presents the empirical results of our analysis. Finally, in Section VI, we conclude with a summary of our findings.

II. Literature Review and hypothesis development

i. A brief history of sustainability in business

In the post-1960s period, sustainability became a popular concept as people began to understand the importance of preserving the environment and using natural resources responsibly. Later, in 1987, the United Nations published a report on sustainable development titled “Our Common Future” (also known as the Brundtland report). This report defined sustainable development as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987). This suggested that businesses needed to adopt a new environmental strategy because traditionally businesses viewed the environment as an unlimited source of natural resources that could be used without consequences. This perspective was no longer sustainable and businesses now needed to consider the long-term impacts of their actions on the environment and take measures to mitigate their overall negative environmental impacts and promote sustainable development (Blowfield, 2013).

One of the earlier papers in line with this “social responsibility” theme was published by Waddock and Graves in 1997 titled “The corporate social performance–financial performance link”. The authors concluded that there was evidence to indicate a positive correlation between corporate social performance and both past and future financial performance (Waddock & Graves, 1997). This paper has been widely cited and was an important contribution to the CSR literature at the time. On a similar note, there were other papers which conducted similar analyses indicating a weakly positive (Margolis & Walsh, 2003) or a positive correlation (Orlitzky et al., 2003) between corporate social responsibility and corporate financial performance.

ii. The rise of “ESG” and its relevance in the corporate world

Since the environmental movement brought the conversation of sustainability and social responsibility under the spotlight, naturally, the early research was focused primarily on the environmental aspect, but over time it has expanded to encompass social and governance issues as well. The term "ESG" has been used in the finance and investment industry since 2005 when it was coined in the report "Who cares wins" by the United Nations Environment Programme Initiative (Kell, 2018). Subsequently, ESG became a popular concept, as many institutions began to measure the social, environmental, and governance impacts of an investment or company so that potential investors could make informed decisions about their investments. Researchers now gained access to these "ESG scores" and used them to assess the financial performance of companies. One of the earlier companies to offer ESG ratings and analytics was KLD Research & Analytics (now known as MSCI ESG Research), and the majority of the early ESG studies used this score to determine how sustainability affected financial performance.

Statman and Glushkov (2009) analyzed the returns of stocks rated on social responsibility by KLD from 1992-2007. Their findings showed that socially responsible investors whose portfolios were leaning in favour of companies with high KLD socially responsible scores outperformed traditional investors in terms of returns. However, the exclusion of stocks from companies associated with controversial industries such as tobacco, alcohol, gambling, firearms, military, and nuclear operations, offset this benefit and reduced returns. Hence, the return of the socially responsible index and that of the S&P500 index were approximately the same. In the study conducted by Gillan et al. (2010), there was a positive correlation between the ESG scores of firms and their operating performance and efficiency. However, their findings on the relationship between institutional ownership and ESG scores were inconsistent. ESG practises were also found to be associated with differences in firm valuation, with higher Tobin's q being correlated with higher net environmental and governance scores.

Fernando et al. (2010) analyzed the relationship between firm ESG scores and ownership structure, analyst coverage, and firm valuation. They found that sin stocks have higher portfolio returns (and lower valuations) as compared to ESG-neutral stocks. For ESG-strong stocks, they found a significantly positive correlation with portfolio returns, but did not find significant results in terms of valuation. Di Giuli and Kostovetsky (2014) examined the effects of changes in CSR policies (KLD strengths) on the company's value, institutional investors' stock holdings and future operating performance. They concluded that increasing CSR policies within a company lead to future stock underperformance, a decline in institutional ownership, and a decline in operational performance in the long term.

Over the years, numerous other data providers started evaluating ESG performance using their own distinct methods for assessing sustainability performance. This led to even further expansion of ESG studies with researchers using different data sources to find a link between ESG and various aspects of corporate finance.

Ferrell et al. (2016) used CSR data from Vigeo Corporate ESG database, MSCI's Intangible Value Assessment database, and Thomson Reuters' ASSET4 database. They found a positive correlation with firm value, and also a decreased negative relation between managerial entrenchment and firm value due to CSR. Filbeck et al. (2019) studied the Sustainalytics ESG scores and found that the stock price of firms with higher ratings performs better in the long term (even statistically outperforming the S&P 500 index). However, when taking a further look at the ESG components separately, the authors found that firms with strong environmental and social records are more likely to be penalized and the same is true for firms that are less likely to adhere to strong governance principles.

All of these contradictory results make it challenging to fully grasp the impact of ESG on performance, which is especially concerning given the increasing focus on ESG-compliant investments by investors today. Furthermore, the onset of the COVID-19 pandemic now

presents additional complexities, as questions about the effectiveness of ESG during times of market turmoil have arisen.

iii. COVID-19 and the business environment

The pandemic has shifted the focus of laws and policies on public health and safety, resulting in changes in office location, working methods, and operational processes. Firms responded to the pandemic through a combination of CSR motivation, CSR business philosophy, and compliance with government and community expectations and regulations (Parker, 2020). Many aspects of businesses were altered to suit the circumstances. Larcker et al. (2020) found that companies' disclosures about the impact of COVID-19 changed as they came to a better understanding of its effects. In the early months, supply chain impacts were the most commonly disclosed issue, but by May 2020, companies were issuing more forward-looking statements due to the uncertainty of the pandemic's effects. The study also found a significant increase in the disclosure of companies' cash positions, reflecting the growing market concerns about liquidity and solvency.

According to Mazur et al., (2021), different businesses reacted differentially to profit uncertainty caused by the pandemic. Some of them reduced the pay of their top executives and board members, while there was also a subset of corporations that raised senior executive wages or approved new bonus awards. Although some corporations reduced dividend payout amounts, the dividends, in general, were never suspended. In terms of financial performance, Garel and Petit-Romec (2021) studied listed companies in France and found that during COVID-19, companies with higher debt and lower profitability performed poorly on the stock market, highlighting the importance of financial flexibility. The authors also emphasized the importance of long-term oriented and dedicated shareholders in overcoming the effects of market-wide disruptions as their findings showed that firms who had a higher proportion of short-term or active investors among their shareholders experienced a greater decline in stock

returns. Amore et al. (2022) studied Italian firms and found that family-run firms had better market performance and operating profitability compared to non-family firms during the pandemic. They attributed this to a more effective use of labour and a smaller decline in revenues.

These pandemic-financial studies and numerous others are an attempt by researchers to understand the effects of an unprecedented crisis on individuals, communities, and businesses. Larcker et al. (2020) who studied the disclosure practices of firms stated that the COVID-19 pandemic was a so-called “black swan”¹ event that provided them with a rare opportunity to study corporations' disclosure policies relative to peers in real time because it affected essentially every publicly traded company in the United States.

iv. ESG and COVID-19

Thus, as the COVID-19 pandemic unfolded, researchers quickly turned their attention to the business environment and the role that ESG factors might play in shaping corporate response and resilience.

Folger-Laronde et al. (2022) studied the relationship between ETFs, ESG, and the COVID-19 pandemic. Using ESG ratings for ETFs (Eco-fund ratings), they found that having better ratings does not guarantee more resilience for ETFs during a financial market crash. In their study of mutual funds, Döttling and Kim (2022) found that funds which benefited from their higher sustainability or ESG ratings prior to the pandemic lost their “attractiveness” during it. The authors found that these higher-rated funds had a greater decline in retail fund flows during the pandemic period and that this decline was not driven by performance or past flows. Albuquerque et al. (2020) focused only on the E and S components of ESG and found

¹ A black swan event, coined by Nassim Nicholas Taleb, is a rare and unpredictable event that goes beyond what is considered a “normal” situation and has a significant impact on the wider society. See: https://en.wikipedia.org/wiki/Black_swan_theory

that in the first quarter of 2020, firms with higher E and S scores performed much better than firms with lower scores. These firms also witnessed an increase in operating profit margin even with declining sales. Similarly, Broadstock et al. (2021) who studied the Chinese stock market, find that portfolios with higher ESG ratings outperform those with lower ratings and concluded that during a financial crisis, ESG performance can help mitigate risk. However, for this same time period, other studies found no significant correlation between ESG scores and market abnormal returns (Bae et al., 2021; Demers et al., 2021). The latter went further ahead to say that ESG was not able to immunize stocks for the whole COVID year of 2020. Takahashi and Yamada (2021), in their study of Japanese stock returns, find mixed results. They concluded that although ESG ratings are not correlated to abnormal returns during this period, firms that have ESG funds perform better than those that do not.

Based on this vast existing literature, our study tries to confirm which of these findings stands true during a period of crisis. However, instead of focusing on just one market shock like the existing studies, we look at three different events in 2020:

- **Event 1 (March 11, 2020):** This event represents the date that COVID-19 was declared a global pandemic. In their briefing in Geneva, the world health organization stated “WHO has been assessing this outbreak around the clock and we are deeply concerned both by the alarming levels of spread and severity and by the alarming levels of inaction. We have therefore made the assessment that COVID-19 can be characterized as a pandemic” (NPR, 2021).
- **Event 2 (April 3, 2020):** To slow down the spread of coronavirus, the Centers for Disease Control and Prevention (CDC) on April 3rd announced the recommendation to wear a face covering in public spaces (Centers for Disease Control and Prevention, 2020). Although the recommendation stated that this was a “voluntary” measure, this event is still important because, for several weeks

leading to this date, health officials insisted that masks are not a requirement for healthy individuals (Los Angeles Times, 2021).

- **Event 3 (December 11, 2020):** On this date, the Food and Drug Administration (FDA) announced that it had approved Pfizer and BioNTech’s coronavirus vaccine for emergency use. Then US President Donald Trump stated “We’ve delivered a safe and effective vaccine in just 9 months...This is one of the greatest scientific accomplishments in history” and called it a “medical miracle” (CNBC, 2020).

We choose these three events so that we could have a set of varied stock market reactions to analyze the impact of ESG. We expect that event 1 most likely had a negative overall market reaction because of the sudden uncertainty and potential disruption to global economic activity. Event 2 could have caused either a positive or negative market sentiment. This is because while the CDC recommendation could have been perceived as a positive step towards controlling the pandemic, it could also have been seen as an indication of the severity of the situation, considering that for weeks before, the CDC insisted that face masks were not necessary. This could have led to further economic uncertainty, potentially causing a negative market reaction. For event 3, we expect a positive overall market reaction because this event could have been seen as a major step towards a potential return to normalcy and could have increased investor confidence.

v. Research Questions

We focus on two main research questions: (1) Was having a better ESG score beneficial for firms during the pandemic? and (2) Did certain ESG components play a more important role in driving the market performance as compared to the others during our sample period? For our first research question, we hypothesize the following:

H1a: Firms with higher ESG scores had a better market performance during the three COVID-19 events than those with lower ESG scores.

In their meta-study of more than 1000 ESG-related papers between 2015 and 2020, Whelan et al. (2021) find that approximately 58% of the “corporate” studies conducted concluded a positive relationship between ESG and firm performance, while only 8% found a negative relationship; the remaining studies either found neutral or mixed results. Based on this, we conjecture that in the case of an overall positive stock market reaction, the positive impact is more pronounced for firms with higher ESG scores. Likewise, in the case of a negative market reaction, the impact is more pronounced for firms with lower ESG scores.

However, based on the findings of the insignificance of ESG scores by Bae et al. (2021) for the first quarter of 2020, it is also possible that we do not find a significant relation between ESG factors and market performance for all three of our events. Hence, we also hypothesize:

H1b: Higher ESG scores were not able to protect or benefit firms during our COVID-19 events

Looking at the ESG factors individually, the social and governance components are more likely to have some significance. The pandemic brought to light the importance of companies prioritizing the health and safety of their employees, and also the necessity of resilient and transparent governance practices within firms for them to be able to successfully navigate periods of crises. Additionally, it also highlighted the need for businesses to focus on social responsibility and contribute towards the greater good of society. In this sense, it is likely that companies with higher “S” and “G” scores were better equipped to deal with the economic and social impacts and found it easier to work out the challenges posed by the pandemic, for instance, by having better crisis management and risk mitigation plans in place. Hence, we

speculate that investors were more likely to look favourably towards these companies as they would expect them to demonstrate resilience and stability in the face of the pandemic:

H2: Certain ESG components, specifically the social and governance components, are more likely to have a significant impact on the market performance of firms during our three events.

III. Data

i. Sample Description

To test these speculations, we access various firm-level data. First, the ESG scores are taken from Refinitiv for S&P 500 companies in the United States. The data we acquire is in a yearly format. Hence, we make an assumption that during the onset of COVID-19 i.e. early 2020, the latest available ESG scores were that of 2019. We drop all firms with missing scores for the year, and also financial and real estate firms. The final input for the event studies had a total of 397 firms. CRSP stock price data is used for the analysis. For the benchmark, the value-weighted market returns from Kenneth French's website are utilized. For each of the events, based on data availability during the estimation period and the event window, a few more firms are dropped. Hence, for the final regressions, we have a total of 390 firms (for events 1 and 2) and 389 firms (for event 3).

For the fundamentals, we retrieve data from Worldscope. Similar to the pandemic-financial study by Berlinger et al. (2022), we collect firm-level data such as the total assets, cash and equivalents, the return on assets, the price-to-book ratio, and the industry, to control for various factors in the regressions. We then merge this data with the ESG scores and the abnormal returns from the event studies using the PERMNO for each firm.

ii. Variable Definitions

Our main variable of interest i.e. the ESG score comes from Refinitiv, which was formerly the financial and risk division of Thomson Reuters. The ESG scores are calculated by Refinitiv using a combination of quantitative and qualitative data, including information from third-party sources, sustainability reports, and regulatory filings. Each company's performance is evaluated in a number of ESG categories, such as emissions, resource management, human rights, governance, and social impact and given a score between 0 and 100; higher ratings indicate greater ESG performance (Refinitiv, 2022). We use five different variables from Refinitiv. The environmental score assesses how a company impacts living and non-living natural systems and demonstrates the ability of a company to minimize environmental risks and take advantage of environmental opportunities. The social score assesses how well a company is able to foster trust and loyalty among its employees, customers, and society and reflects the reputation of the company as a whole. The governance score assesses the ability of a company to ensure that its board members and executives operate in the best interests of shareholders and generate long-term shareholder value. The ESG controversies score keeps a track of ESG controversies and negative events that occur for each firm. A score of 100 indicates that the firm had no controversies. Finally, the ESGC score is a comprehensive rating based on the individual E, S, and G scores, with an overlay of the ESG controversies score. This score discounts the ESG performance score based on negative media headlines by factoring the impact of significant ESG controversies in the overall score (Refinitiv, 2022). For ease of understanding, from here on, we refer to the ESGC score simply as the ESG Score.

We control for various firm-level variables to ensure that our results are not driven by other firm-level characteristics. To control for firm size, we take the log-normal of total assets. To control for industry effects, we use industry dummies and drop the first one during regressions to avoid a near-singular matrix error. To control for the profitability of a firm, we use the return on assets (ROA) ratio. To control for firm liquidity, we use the cash ratio which

is calculated as a ratio of cash and equivalents and total assets². And finally, we also control for the price to book ratio of the firm.

iii. Descriptive Statistics and Correlation Analysis

In Table 1, we present the descriptive statistics for the ESG and control variables for our sample of 390 firms. The ESG Score has a median value of 58.99 and an average value of 57.61. Notably, none of the firms in our sample achieved a perfect ESG score of 100; the highest score was 92.65. On the other hand, none of the firms received a score of 0; the lowest score was 17.6. We observed that some firms scored 0 on the environmental component, but the social and governance components had minimum scores of 16.03 and 8.81, respectively. Finally, some firms received an ESG Controversies score of 100, indicating that they had no controversial news during the period immediately preceding the pandemic.

*** Insert Table 1 here***

Table 2 displays the correlation between the ESG score and the control variables. We find that none of the control variables exhibit a strong positive or negative correlation with the ESG score. When examining the relationship between the individual components and the control variables, we observe that most of the correlations are either not strong or statistically insignificant. However, in our regressions, we also calculate the variance inflation factor (VIF) to further test for multicollinearity.

*** Insert Table 2 here ***

IV. Methodology

The first stage of this study is conducted using the event study methodology to obtain abnormal returns for stock prices during the event period. This methodology is based on the

² Using the cash ratio allows us to proxy for the financial health of the firm. While this ratio is a commonly used measure, other alternatives such as a company's bond rating or leverage can also be used.

efficient market hypothesis from Fama (1970) and Fama (1991) which states that stock prices of companies reflect all information that is currently available about those companies. Thus, in the event of a market shock such as in our case, the theory states that the company's stock price would reflect all the information that was available at the time and also the investors' expectations regarding the future profitability of the firm.

For this paper, first, we find the abnormal returns for each firm in our sample on each event date using the market model. This model is commonly used in short-term event studies to find the expected return of a security (MacKinlay, 1997). The abnormal returns are obtained by subtracting the expected returns i.e. the returns that would have been realized if the event would not have occurred from the actual returns. This expected return is given as:

$$E(R_{it}) = \alpha_i + \beta_i * R_{mt} + \varepsilon_{it} \quad (1)$$

where $E(R_{it})$ is the expected return for security "i" at time "t". R_{mt} denotes the benchmark returns and ε_{it} is the error term. Thus, the abnormal return for our market model is stated as:

$$AR_{it} = R_{it} - E(R_{it}) \quad (2)$$

where AR_{it} is the abnormal return for security "i" at time "t". R_{it} is the actual return on the event day, and $E(R_{it})$ is the expected return as stated above. The event date is denoted as $t = 0$. The estimation period for the expected returns for event 1 is $t = (-380,-130)$ i.e. we end the estimation period 130 trading days prior to the event to ensure that the stock prices do not reflect any market sentiment regarding the pandemic, and the duration of the period is 250 trading days (or approximately a year). For the other two events, we keep the same estimation period to ensure that the calculations of the "normal" period are not affected by the event. We do so by simply changing the number of days before the event date that we end the estimation period. After obtaining the abnormal returns surrounding the event dates, we then calculate the cumulative abnormal returns across a period of T days as follows:

$$CAR_{it} = \sum_{t-1}^T AR_{it} \quad (3)$$

The second stage of this study are the regressions which are used to ascertain the ESG resilience of firms or lack thereof. The OLS regressions are stated as follows:

$$Y_{iT} = \beta_0 + \beta_1 ESG\ Score_{it} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (4)$$

where the dependent variable Y_{iT} is the AR for firm i on day t or the CAR for firm i during period T . $ESG\ Score$ is our independent variable of interest which denotes the ESG combined score for each firm. X_{it} are the control variables i.e. ROA, size, price-to-book ratio, cash ratio, and industry dummies. We run this regression for all three events of our study. We also further examine the ESG variable by splitting it into the individual components. The equation is given as:

$$Y_{iT} = \beta_0 + \beta_1 Environmental\ Score_{it} + \beta_2 Social\ Score_{it} + \beta_3 Governance\ Score_{it} + \beta_4 Controversies\ Score_{it} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (5)$$

Subsequently, to further strengthen the findings of our study, we also employ the propensity score matching technique. To do this, first, we split the firms into two groups i.e. firms with above-median ESG scores and firms with below-median ESG scores. The former is our treatment group and the latter is the control group. Next, a logit model is used to estimate the propensity scores for each firm, which is the probability of belonging to the treatment group (above-median ESG score) based on a set of observed covariates i.e. the control variables listed in equation 4 and 5. Then, each firm in the treatment group is matched with one firm in the control group that has a similar propensity score within a caliper radius of $0.10 * \sigma$. In the end, there were a total of 132 treatment firms matched with 132 control firms. We then run a regression with the 264 firms. It is given as:

$$Y_{iT} = \beta_0 + \beta_1 Treatment_{it} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (6)$$

where $Treatment_{it}$ is a dichotomous variable that equals to 1 if the firm is a treatment firm, and 0 if the firm is a matched control group. This variable captures the difference in abnormal returns between the above-median ESG firms and below-median ESG firms.

V. Results

i. Full Sample Event Study

Our analysis begins by examining the impact of the three events on the stock prices of our sample as a whole, in order to understand the overall effect of the news. Since it can be challenging to pinpoint the exact time of the announcements, we measure the immediate stock price reaction as the cumulative abnormal return during the announcement date and the following day, denoted as days 0 and 1. This methodology ensures that we capture the market's reaction on the day following the announcement, even if the announcement was made after the closing time (4:00 pm Eastern Time) for major U.S. stock markets.

To gain further insight into the stock price movements, we also analyze other event windows post the event date. By examining a range of event windows, we can better understand how the stock price reacts to the news and identify any potential delayed effects. Additionally, we examine the CAR for the five-day period leading up to the announcement (days -5 to -1) to examine any potential pre-event drift in the stock price. This helps us isolate the impact of the announcement on the stock price and understand whether any trends in the stock price prior to the announcement could have influenced the reaction. Table 3 provides an overview of the results for Event 1 (Panel A), Event 2 (Panel B), and Event 3 (Panel C).

*** Insert table 3 here***

In panel A, we observe a strong negative market reaction to the news. Specifically, the mean cumulative abnormal return for days (0,1) following the event on March 11, 2020, was -0.66%, and this decline intensified over the next few days, with a mean CAR of -3.74% for

days (0,5). These findings are significant for both the Portfolio Time Series test and the Standardized Cross Sectional test.³ Although we observe a small negative reaction of -0.49% during the pre-event window (-5,-1), only one of the tests showed statistical significance (at the 10% level), indicating that the negative trend in the stock prices was primarily driven by the announcement.

Turning our attention to Panel B, we observe a sharp contrast to the results in Panel A. The mean CAR for all days following the event is positive and highly significant. The CAR increases to 3.21% until days (0,3) post-event, and although it slightly drops to 2.38% on days (0,5), it remains positive. Moreover, during the days (-5,-1) prior to the event, the CAR is significant and negative at -2.36%. These results suggest that the stock market reacted positively to the CDC's mask recommendation on April 3, 2020. One possible explanation for this could be that the recommendation instilled confidence among investors that the pandemic could be controlled and that the economic recovery would not be disrupted as severely.

In panel C, we observe a mild negative market reaction to the news. The mean CAR for days (0,1) is -0.33%, and while it fluctuates over the next few days, it continues to be negative. However, these results are only statistically significant for one of the tests. This could be because the market had already priced in the potential approval of the vaccine and the news did not come as a surprise to investors on December 11, 2020.

ii. Full Sample Regression analysis

Next, we conduct OLS regressions for each event using CAR of days (0,1), (0,3), and (0,5) as the dependent variables, and the ESG scores and individual component scores as the independent variables.

*** Insert table 4 here***

³ The Standardized Cross Sectional Test, introduced by Boehmer et al. (1991), allows us to account for any potential COVID-19 event-induced variance in stock prices and hence provides further robustness to our analysis.

Table 4 gives the results of the regressions for March 11, 2020. In panel A, we observe that the coefficient for the ESG score is small in magnitude and is not statistically significant for any of the event windows. This suggests that having a higher ESG score did not make firms more (or less) resilient on the day of the announcement. The outcomes for panel B are consistent with those of panel A. The coefficients for individual E, S, G, and C components are small and insignificant. Among the control variables, one variable that consistently remains positive and significant is the cash ratio. This indicates that having a higher cash reserve may have helped firms weather the negative impacts of COVID-19 on the stock market. Firms with higher cash reserves could have been seen as better equipped to cover unexpected expenses and maintain their operations, and hence were not negatively affected by the news.

In this regression, we also conducted tests for multicollinearity by calculating the VIFs for each variable, and since all the factors were within the acceptable range (1-5), we concluded that there is no evidence of multicollinearity among the independent variables. The results of Panel A and B are consistent with the findings of Bae et al. (2021), Demers et al. (2021), and Takahashi and Yamada (2021). One possible explanation for our findings is that the negative impact of this news on the stock market may have overwhelmed any potential protective effect of high ESG scores for firms. Next, we examine the regression results presented in Table 5.

*** Insert table 5 here ***

The findings of the regression analysis conducted in Panel A and Panel B provide insights into the relationship between firm ESG score and CARs following the CDC mask recommendation event. In Panel A, the coefficients for ESG are both small and statistically insignificant, indicating that there is no significant relationship between a firm's ESG score and its CARs in the days following the event. This suggests that, despite the positive reaction of the overall market to the CDC mask recommendation, the ESG scores of firms did not play a significant role in determining their CARs. Similarly, in Panel B, all the coefficients for the

individual E, S, G, and C components are both small and insignificant, indicating that none of the aspects of a firm's ESG score were significantly associated with its CARs in the days following the event.

Surprisingly, the regression results also show negative and significant coefficients for firm size, cash ratio, and ROA. These unexpected findings suggest that larger firms, firms with higher cash ratios, and firms with higher ROA experienced lower CARs following the CDC mask recommendation event. Since our study focuses on ESG, we do not investigate the reasons behind these unexpected findings for the control variables, but they do point to interesting avenues for future research. Further research can explore the potential reasons for these negative coefficients and whether they are specific to the context of the CDC mask recommendation announcement or indicative of broader trends in the market.

The results of the regressions for our final event on December 11, 2020, are given in table 6.

*** Insert Table 6 here ***

In Panel A, we observe that the ESG Score variable has a statistically significant relationship with the CARs on days (0,1). However, the coefficient is very small, with a value of -0.0002. Likewise, in Panel B, we find significant results for the environmental score on days (0,1) and (0,3) at the 5% and 10% significance levels, respectively. However, the coefficients are almost zero, indicating that the relationship between the environmental score and CARs is very weak for this event. The cash ratio variable is positive and significant denoting that firms with higher cash reserves had a positive impact on their stock returns on the day of the announcement. On the other hand, the firm size variable is negative and significant, suggesting that larger firms experienced negative CARs on the day the vaccine was approved for emergency use for the first time.

Overall, while some of the control variables show significant relationships with the CARs in our three events, the ESG score and the individual ESG components have overwhelmingly insignificant relationships. The former is consistent with our hypothesis 1b suggesting that ESG did not protect or benefit firms during our sample period. To ensure the validity of our results, we conducted additional regression analyses using different event windows such as (0,2) and (0,4), as well as using abnormal returns solely for day 0. We also used Fama-French abnormal returns for day 0 to further verify our findings. The results from these analyses, which can be found in the appendix, were consistent with our initial findings, confirming the robustness of our conclusions.

iii. Propensity Score Matching

As a final test, we employed the propensity score matching technique to match high-ESG firms with low-ESG firms. With the help of the matched treatment and control groups, we first perform a series of univariate tests as a preliminary examination. We use two-sample t-tests to test for the significance of differences in mean CARs.

Table 7 gives the results of the difference in the CARs for days (0,1), (0,3) and (0,5) between the matched high-ESG and low-ESG firms.

*** Insert Table 7 here ***

Upon initial examination, it appears that the mean values of the CARs exhibit very small differences for our subsets for all event windows in every panel. Furthermore, it can be observed that none of the differences between the means are statistically significant. This suggests that, in terms of CARs, there is no significant difference between the high-ESG and low-ESG firms during the pandemic period. However, it is important to note that this analysis does not account for other factors that may have influenced the stock prices. Hence, we then conducted a regression using a “treatment” variable, which was equal to 1 for the treatment group (high-ESG firms) and 0 for the matched control (low-ESG firms). In this regression, we

include the same control variables as the previous regressions. The results are presented in Table 8.

*** Insert table 8 here ***

Similar to our previous results, the treatment variable is not significant for any of the event windows for all three of our events. This result indicates that there was no significant difference in CARs between high-ESG score firms and low-ESG score firms while controlling for other firm-level factors, suggesting that these scores did not have a significant impact on the abnormal returns following the events.

VI. Conclusion

In this study, we examine the impact of environmental, social, and governance (ESG) scores on firm stock prices in response to three significant events related to the COVID-19 pandemic. Our initial event study for our sample indicated a negative stock market reaction to COVID-19 being declared a pandemic, a positive stock market reaction to the CDC recommending face masks, and a mildly negative reaction to the first COVID-19 vaccine being approved for emergency use in the United States. However, once we introduced the ESG variables into our analysis, there was no significant relationship between the ESG score of firms and the cumulative abnormal returns (CARs) for the days following the events. This was true even when we used the propensity score matching (PSM) technique to control for differences between firms with high and low ESG scores.

Therefore, based on our analysis, we did not find any substantial evidence to suggest that ESG factors play a significant role in driving stock prices in the context of the COVID-19 pandemic. One possible reason for this could be that due to the pandemic, investors' focus may have shifted from long-term ESG factors to immediate short-term company performance. They may have been more concerned about the companies' capability to weather the ongoing effects

of the pandemic, such as disruptions in daily work processes due to social distancing laws, reduced demand among consumers, and liquidity issues, than with its ESG performance. Hence, the firms were neither rewarded nor penalized for their high ESG scores.

While other studies in the past have proven the outperformance of ESG-Strong firms in normal times, this paper provides insights into their performance during a period of crisis. Admittedly, the COVID-19 pandemic has created a challenging situation, making it difficult to isolate the impact of ESG factors from other pandemic-related and macroeconomic factors. While our study is subject to some of these limitations, it contributes to the growing body of literature on the relationship between ESG and business. Our findings demonstrate the need for a more thorough investigation into this topic, especially to understand the reasons behind why ESG factors fail to protect the market returns of firms during times of crisis. To further solidify our findings, future studies can also use other ESG data sources such as Sustainalytics or Bloomberg. This may help in eliminating any potential limitations or biases of any one particular data vendor.

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Tables

Table 1: Descriptive Statistics

The table reports the summary statistics of the variables. We report the mean, median, maximum (max), minimum (min), standard deviation (std. dev.), skewness, and kurtosis for our sample of 390 firms. ESG Score stands for the Refinitiv ESG Combined score for each firm out of 100. The E, S, G, & C components are also reported individually as Environmental Score, Social Score, Governance Score, and ESG Controversies respectively. Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm.

| Variables | Mean | Median | Max | Min | Std. Dev. | Skewness | Kurtosis |
|---------------------|-------|--------|--------|----------|-----------|----------|----------|
| ESG SCORE | 57.61 | 58.99 | 92.65 | 17.60 | 16.66 | -0.25 | 2.29 |
| ENVIRONMENTAL SCORE | 56.59 | 62.21 | 97.97 | 0.00 | 25.42 | -0.65 | 2.51 |
| SOCIAL SCORE | 64.95 | 67.36 | 99.41 | 16.03 | 19.21 | -0.40 | 2.33 |
| GOVERNANCE SCORE | 62.25 | 65.30 | 97.28 | 8.81 | 19.53 | -0.49 | 2.51 |
| ESG CONTROVERSIES | 80.94 | 100.00 | 100.00 | 1.22 | 30.62 | -1.46 | 3.67 |
| CASH RATIO | 0.12 | 0.06 | 0.81 | 0.00 | 0.15 | 2.08 | 7.39 |
| PRICE TO BOOK | 1.51 | 3.88 | 502.89 | -1423.18 | 82.56 | -12.96 | 233.28 |
| ROA (in %) | 10 | 8 | 48 | -15 | 8 | 1.42 | 6.95 |
| SIZE | 23.60 | 23.58 | 27.43 | 18.02 | 1.24 | -0.08 | 3.65 |

Table 2: Correlation Table

The table below gives the Pearson/Spearman correlation coefficients for each variable. The p-values are given in the brackets below the variable. ESG Score stands for the Refinitiv ESG Combined score for each firm out of 100. The E,S,G,&C components are also reported individually as Environmental Score, Social Score, Governance Score, and ESG Controversies respectively. Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----|---------------------|-----------------------|------------------------|------------------------|-----------------------|------------------------|------------------------|------------------------|------------------------|--------|
| 1 | ESG SCORE | 1.0000 | | | | | | | | |
| | | ----- | | | | | | | | |
| 2 | ENVIRONMENTAL SCORE | 0.6419*** (0.0000) | 1.0000 | | | | | | | |
| | | | ----- | | | | | | | |
| 3 | SOCIAL SCORE | 0.6512** (0.0000) | 0.6764*** (0.0000) | 1.0000 | | | | | | |
| | | | | ----- | | | | | | |
| 4 | GOVERNANCE SCORE | 0.4725*** (0.0000) | 0.2919*** (0.0000) | 0.2051*** (0.0000) | 1.0000 | | | | | |
| | | | | | ----- | | | | | |
| 5 | ESG CONTROVERSIES | 0.2264*** (0.0000) | -0.2693*** (0.0000) | -0.2267*** (0.0000) | -0.0547 (0.2809) | 1.0000 | | | | |
| | | | | | | ----- | | | | |
| 6 | CASH RATIO | -0.0939* (0.0638) | -0.0909* (0.0731) | 0.0337 (0.507) | -0.1051** (0.0381) | -0.0452 (0.3729) | 1.0000 | | | |
| | | | | | | | ----- | | | |
| 7 | PRICE TO BOOK | -0.0547 (0.2814) | -0.0673 (0.185) | -0.0002 (0.9972) | -0.0860* (0.09) | 0.0481 (0.343) | 0.3138*** (0.0000) | 1.0000 | | |
| | | | | | | | | ----- | | |
| 8 | ROA | -0.0341 (0.5022) | -0.0519 (0.3062) | -0.0131 (0.7969) | -0.1186** (0.0192) | 0.1109** (0.0286) | 0.4319*** (0.0000) | 0.4646*** (0.0000) | 1.0000 | |
| | | | | | | | | | ----- | |
| 9 | SIZE | 0.1183** (0.0195) | 0.4088*** (0.0000) | 0.3390*** (0.0000) | 0.2137*** (0.0000) | -0.5022*** (0.0000) | -0.2846*** (0.0000) | -0.3028*** (0.0000) | -0.4121*** (0.0000) | 1.0000 |
| | | | | | | | | | | ----- |

Table 3: Event Study Results

The table provides the results of the short-term event study for COVID-19-related event dates in the USA for the firms in our final sample. Panel A gives the results for March 11, 2020, the date on which the WHO declared COVID-19 a pandemic. Panel B shows the results for April 3, 2020, the date when the CDC recommended that individuals wear masks to prevent the spread of COVID-19. Finally, panel C displays the results for December 11, 2020, the day the U.S. FDA approved the first COVID-19 vaccine for emergency use. In each panel, we present CARs for various event days. To test the significance of these CARs, we use a t-test (Portfolio Time Series (CDA) test) and a Z-test (Standardized cross-sectional test). ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Event Window | Mean CAR | Portfolio Time Series (CDA) test | Standardized Cross Sectional Z test |
|----------------------------|----------|-------------------------------------|--|
| Panel A: March 11, 2020 | | | |
| (0,+1) | -0.66% | -2.796*** | -2.623*** |
| (0,+2) | -1.71% | -5.965*** | -4.659*** |
| (0,+3) | -1.69% | -5.103*** | -3.489*** |
| (0,+5) | -3.74% | -9.189*** | -3.905*** |
| (-3,+3) | -1.89% | -4.313*** | -2.614*** |
| (-5,-1) | -0.49% | -1.313* | -0.672 |
| Panel B: April 3, 2020 | | | |
| (0,+1) | 1.35% | 5.795*** | 6.167*** |
| (0,+2) | 2.20% | 7.688*** | 7.069*** |
| (0,+3) | 3.21% | 9.710*** | 8.254*** |
| (0,+5) | 2.38% | 5.878*** | 5.313*** |
| (-3,+3) | 1.92% | 4.388*** | 5.154*** |
| (-5,-1) | -2.36% | -6.391*** | -4.129*** |
| Panel C: December 11, 2020 | | | |
| (0,+1) | -0.33% | -1.39 | -3.134*** |
| (0,+2) | -0.21% | -0.712 | -1.82* |
| (0,+3) | -0.55% | -1.642* | -4.092*** |
| (0,+5) | -0.43% | -1.066 | -2.543** |
| (-3,+3) | -0.25% | -0.565 | -2.406*** |
| (-5,-1) | 0.39% | 1.049 | 0.932 |

Table 4: OLS Regression Analysis of Abnormal Returns and ESG Scores and Components for March 11, 2020

Table 4 presents the results of the regression for Event 1 i.e. March 11, 2020 (The day WHO declared COVID-19 a pandemic). Considering this date as $t = 0$, we regress various cumulative abnormal returns for the surrounding days against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. In the last column of the panels, we report the variance inflation factor (VIF) for each variable. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | | Panel B: E,S,G, & C Components | | | |
|---------------------|-----------------------------|-------------------------|-------------------------|-----|--------------------------------|-------------------------|-------------------------|-----|
| | CAR(0,1) | CAR(0,3) | CAR(0,5) | VIF | CAR(0,1) | CAR(0,3) | CAR(0,5) | VIF |
| | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | |
| Intercept | -0.0135 (0.8748) | -0.3395** (0.0175) | -0.7495*** (0.0021) | | 0.0152 (0.8838) | -0.2051 (0.2356) | -0.5252** (0.0188) | |
| ESG SCORE | -0.0002 (0.2311) | 0.0000 (0.9286) | 0.0003 (0.5695) | 1.1 | | | | |
| ENVIRONMENTAL SCORE | | | | | 0.0000 (0.95) | 0.0002 (0.5161) | 0.0006 (0.2017) | 2.6 |
| SOCIAL SCORE | | | | | -0.0001 (0.5793) | 0.0002 (0.6451) | -0.0002 (0.6991) | 2.5 |
| GOVERNANCE SCORE | | | | | 0.0000 (0.876) | -0.0003 (0.4093) | -0.0003 (0.3786) | 1.3 |
| ESG CONTROVERSIES | | | | | -0.0001 (0.4088) | -0.0002 (0.3608) | 0.0000 (0.9572) | 1.6 |
| CASH RATIO | 0.0829*** (0.0019) | 0.1540*** (0.0005) | 0.1985*** (0.0084) | 1.5 | 0.0820*** (0.0025) | 0.1452*** (0.0013) | 0.1114* (0.0539) | 1.6 |
| PRICE TO BOOK | 0.0000 (0.7653) | 0.0000 (0.4844) | 0.0000 (0.9457) | 1.2 | 0.0000 (0.7765) | -0.0001 (0.4528) | 0.0000 (0.7469) | 1.2 |
| ROA | 0.0381 (0.4507) | 0.0589 (0.4834) | 0.2221 (0.1207) | 1.5 | 0.0364 (0.4759) | 0.0435 (0.6072) | 0.1217 (0.2657) | 1.5 |
| SIZE | -0.0026 (0.4007) | 0.0060 (0.2434) | 0.0163* (0.0634) | 1.4 | -0.0036 (0.3606) | 0.0007 (0.9124) | 0.0110 (0.1873) | 2.3 |
| Industry Dummies | Yes | Yes | Yes | | Yes | Yes | Yes | |
| Adjusted R-squared | 0.3235 | 0.2584 | 0.1638 | | 0.3176 | 0.2584 | 0.1570 | |
| F-statistic | 7.6434 | 5.8411 | 3.7219 | | 6.8396 | 5.3720 | 3.3371 | |
| Prob(F-statistic) | 0.0000 | 0.0000 | 0.0000 | | 0.0000 | 0.0000 | 0.0000 | |

Table 5: OLS Regression Analysis of Abnormal Returns and ESG Scores and Components on April 3, 2020

Table 5 presents the results of the regression for Event 2 i.e. April 3, 2020 (The day the CDC first recommended masks). Considering this date as $t = 0$, we regress various cumulative abnormal returns for the surrounding days against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | Panel B: E,S,G, & C Components | | |
|---------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | CAR(0,1) Coefficient (Pvalue) | CAR(0,3) Coefficient (Pvalue) | CAR(0,5) Coefficient (Pvalue) | CAR(0,1) Coefficient (Pvalue) | CAR(0,3) Coefficient (Pvalue) | CAR(0,4) Coefficient (Pvalue) |
| Intercept | 0.1898*** (0.0019) | 0.3210*** (0.0014) | 0.3036*** (0.0046) | 0.1937*** (0.0091) | 0.3538*** (0.0038) | 0.3653*** (0.0051) |
| ESG SCORE | 0.0000 (0.8475) | 0.0002 (0.3962) | 0.0002 (0.3458) | | | |
| ENVIRONMENTAL SCORE | | | | 0.0001 (0.6337) | 0.0002 (0.5193) | 0.0000 (0.9583) |
| SOCIAL SCORE | | | | -0.0001 (0.5012) | -0.0001 (0.8523) | 0.0001 (0.6729) |
| GOVERNANCE SCORE | | | | 0.0000 (0.749) | 0.0002 (0.4103) | 0.0003 (0.2737) |
| ESG CONTROVERSIES | | | | 0.0000 (0.9269) | 0.0000 (0.9304) | -0.0001 (0.565) |
| CASH RATIO | -0.0418** (0.0269) | -0.1024*** (0.001) | -0.0706** (0.0331) | -0.0409** (0.0331) | -0.1034*** (0.0011) | -0.0755** (0.0249) |
| PRICE TO BOOK | 0.0000 (0.8) | 0.0000 (0.984) | 0.0000 (0.8201) | 0.0000 (0.7961) | 0.0000 (0.9881) | 0.0000 (0.8168) |
| ROA | -0.0835** (0.0202) | -0.1634*** (0.0058) | -0.2073*** (0.0011) | -0.0847** (0.0199) | -0.1677*** (0.0052) | -0.2099*** (0.001) |
| SIZE | -0.0061*** (0.0056) | -0.0115*** (0.0015) | -0.0114*** (0.0033) | -0.0062** (0.0247) | -0.0131*** (0.0043) | -0.0142*** (0.0036) |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.1299 | 0.1796 | 0.1923 | 0.0560 | 0.1749 | 0.1885 |
| F-statistic | 1.9254 | 4.0421 | 4.3072 | 1.7450 | 3.6598 | 3.9157 |
| Prob(F-statistic) | 0.0038 | 0.0000 | 0.0000 | 0.0096 | 0.0000 | 0.0000 |

Table 6: OLS Regression Analysis of Abnormal Returns and ESG Scores and Components on December 11, 2020

Table 6 presents the results of the regression for Event 3 i.e. December 11, 2020 (The day the first vaccine was approved for emergency use in the United States). Considering this date as $t = 0$, we regress various cumulative abnormal returns for the surrounding days against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm . All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | Panel B: E,S,G, & C Components | | |
|---------------------|-----------------------------|-------------------------|-------------------------|--------------------------------|-------------------------|-------------------------|
| | CAR(0,1) | CAR(0,3) | CAR(0,5) | CAR(0,1) | CAR(0,3) | CAR(0,5) |
| | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) |
| Intercept | 0.0501* (0.093) | 0.0745* (0.0672) | 0.1422*** (0.0066) | 0.0166 (0.6455) | 0.0655 (0.1849) | 0.1265** (0.0466) |
| ESG SCORE | -0.0002** (0.0195) | -0.0001 (0.2132) | -0.0002 (0.1874) | | | |
| ENVIRONMENTAL SCORE | | | | -0.0001** (0.05) | -0.0002* (0.0941) | -0.0001 (0.4201) |
| SOCIAL SCORE | | | | 0.0000 (0.9368) | 0.0001 (0.4828) | 0.0000 (0.9718) |
| GOVERNANCE SCORE | | | | -0.0001 (0.3971) | 0.0000 (0.8754) | -0.0001 (0.4153) |
| ESG CONTROVERSIES | | | | 0.0000 (0.717) | 0.0000 (0.6159) | 0.0000 (0.8545) |
| CASH RATIO | 0.0258*** (0.0054) | 0.0370*** (0.0034) | 0.0481*** (0.003) | 0.0275*** (0.0034) | 0.0363*** (0.0046) | 0.0485*** (0.0033) |
| PRICE TO BOOK | 0.0000 (0.2342) | 0.0000 (0.9141) | 0.0000 (0.9656) | 0.0000 (0.26) | 0.0000 (0.9478) | 0.0000 (0.9624) |
| ROA | 0.0196 (0.2677) | 0.0282 (0.2419) | 0.0323 (0.2946) | 0.0242 (0.173) | 0.0321 (0.1867) | 0.0351 (0.2611) |
| SIZE | -0.0020** (0.0589) | -0.0040*** (0.0068) | -0.0073*** (0.0001) | -0.0006 (0.6469) | -0.0036* (0.0502) | -0.0064*** (0.0069) |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.2441 | 0.1478 | 0.2247 | 0.2455 | 0.1458 | 0.2201 |
| F-statistic | 5.4754 | 3.4034 | 5.0154 | 5.0732 | 3.1356 | 4.5317 |
| Prob(F-statistic) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Table 7: Difference-in-Means Comparison for High-ESG and Low-ESG Firms

Table 7 presents the differences in the mean CARs for our two subsets which were obtained through propensity score matching. Panel A gives the results for March 11, 2020, the date on which the WHO declared COVID-19 a pandemic. Panel B shows the results for April 3, 2020, the date when the CDC recommended that individuals wear masks to prevent the spread of COVID-19. Finally, panel C displays the results for December 11, 2020, the day the U.S. FDA approved the first COVID-19 vaccine for emergency use. We employ t-tests to test for the equality of the mean CARs between high-ESG and low-ESG firms. The differences in the means and the p-values are denoted in the last column. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| | Mean High ESG | Mean Low ESG | Difference (p-value) |
|-----------------------------------|------------------|-----------------|-------------------------|
| Panel A: March 11, 2020 | | | |
| CAR (0,1) | -0.0141 | -0.0089 | 0.0052 (0.5505) |
| CAR (0,3) | -0.0252 | -0.0309 | -0.0057 (0.6884) |
| CAR (0,5) | -0.0522 | -0.0538 | 0.0016 (0.9409) |
| Panel B: April 3, 2020 | | | |
| CAR (0,1) | 0.0110 | 0.0150 | 0.0041 (0.4483) |
| CAR (0,3) | 0.0339 | 0.0363 | 0.0023 (0.8029) |
| CAR (0,5) | 0.0262 | 0.0226 | -0.0036 (0.7234) |
| Panel C: December 11, 2020 | | | |
| CAR (0,1) | -0.0048 | -0.0031 | 0.0017 (0.5577) |
| CAR (0,3) | -0.0070 | -0.0044 | 0.0026 (0.4417) |
| CAR (0,5) | -0.0066 | -0.0038 | 0.0028 (0.5466) |

Table 8: Regression Results using Treatment and Control Firms from Propensity Score Matching

Table 8 presents the results of the regressions for March 11, April 3, and December 11 in Panel A, B, and C, respectively. We regress various cumulative abnormal returns for the surrounding days against the treatment variable. This treatment variable is obtained from the propensity score matching method. The variable is equal to 1 if the firm is in the treatment group, and 0 if it was in the matched control group. Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: March 11, 2020 | | | Panel B: April 3, 2020 | | | Panel C: December 11, 2020 | | |
|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|----------------------------|-------------------------|-------------------------|
| | CAR(0,1) | CAR(0,3) | CAR(0,5) | CAR(0,1) | CAR(0,3) | CAR(0,5) | CAR(0,1) | CAR(0,3) | CAR(0,5) |
| | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) |
| C | 0.0589 (0.5484) | -0.1450 (0.3824) | -0.4392 (0.1108) | 0.0980 (0.1659) | 0.2334** (0.0479) | 0.1849 (0.1391) | 0.0257 (0.4615) | 0.0219 (0.6119) | 0.0772 (0.1689) |
| TREATMENT | -0.0069 (0.3469) | -0.0006 (0.9642) | -0.0049 (0.8105) | -0.0038 (0.4765) | -0.0018 (0.8357) | 0.0045 (0.6312) | -0.0024 (0.3601) | -0.0028 (0.3894) | -0.0032 (0.4376) |
| CASH RATIO | 0.0712** (0.0452) | 0.1510*** (0.0122) | 0.2234** (0.0251) | -0.0494* (0.0537) | -0.1005** (0.0185) | -0.0795* (0.0785) | 0.0201* (0.0934) | 0.0231 (0.1189) | 0.0313 (0.1036) |
| PRICE TO BOOK | -0.0001 (0.439) | -0.0003 (0.13) | 0.0000 (0.8642) | 0.0000 (0.868) | -0.0001 (0.6484) | -0.0001 (0.4822) | 0.0000 (0.9062) | 0.0000 (0.8708) | 0.0000 (0.5904) |
| ROA | 0.0949 (0.1246) | 0.1247 (0.2321) | 0.2717 (0.1164) | -0.1100** (0.0138) | -0.2085*** (0.0051) | -0.1918** (0.015) | 0.0167 (0.4136) | 0.0069 (0.784) | 0.0303 (0.3549) |
| SIZE | -0.0062* (0.0953) | -0.0021 (0.7414) | 0.0042 (0.6831) | -0.0023 (0.3912) | -0.0073* (0.0966) | -0.0061 (0.1926) | -0.0013 (0.299) | -0.0021 (0.1677) | -0.0051** (0.01) |
| Adjusted R-squared | 0.3196 | 0.2542 | 0.1271 | 0.0695 | 0.1442 | 0.1745 | 0.2073 | 0.1282 | 0.2149 |
| F-statistic | 6.1486 | 4.7360 | 2.5954 | 1.8180 | 2.8459 | 3.3157 | 3.6444 | 2.4866 | 3.7673 |
| Prob(F-statistic) | 0.0000 | 0.0000 | 0.0001 | 0.0133 | 0.0000 | 0.0000 | 0.0000 | 0.0001 | 0.0000 |

Appendices

Table A1: Additional OLS Regression Analysis on March 11, 2020.

Table A1 presents the results from additional regression analyses conducted to ensure the validity of our findings on the relationship between ESG and CARs for Event 1 i.e. March 11, 2020 (The day WHO declared COVID-19 a pandemic). Considering this date as $t = 0$, we regress different event windows such as CARs for days (0,2) and (0,4), as well as abnormal returns (AR) solely for day 0 and also the Fama-French 3-factor abnormal returns for day 0 (AR (0) FF) against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | | Panel B: E,S,G, & C Components | | | |
|---------------------|-----------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| | AR (0) Coefficient (Pvalue) | CAR(0,2) Coefficient (Pvalue) | CAR(0,4) Coefficient (Pvalue) | AR (0) FF Coefficient (Pvalue) | AR (0) Coefficient (Pvalue) | CAR(0,2) Coefficient (Pvalue) | CAR(0,4) Coefficient (Pvalue) | AR (0) FF Coefficient (Pvalue) |
| Intercept | -0.0669 (0.1108) | -0.3095*** (0.0005) | -0.5903*** (0.0014) | -0.0640 (0.1279) | -0.0680 (0.1836) | -0.2587** (0.0166) | -0.5252** (0.0188) | -0.0591 (0.2487) |
| ESG SCORE | 0.0000 (0.8966) | 0.0001 (0.7554) | 0.0001 (0.8312) | 0.0000 (0.9184) | | | | |
| ENVIRONMENTAL SCORE | | | | | 0.0000 (0.656) | 0.0002 (0.3134) | 0.0006 (0.2017) | 0.0000 (0.8566) |
| SOCIAL SCORE | | | | | 0.0000 (0.7792) | 0.0000 (0.8816) | -0.0002 (0.6991) | 0.0000 (0.8672) |
| GOVERNANCE SCORE | | | | | 0.0000 (0.9609) | -0.0001 (0.6198) | -0.0003 (0.3786) | 0.0000 (0.7212) |
| ESG CONTROVERSIES | | | | | 0.0000 (0.8945) | 0.0000 (0.738) | 0.0000 (0.9572) | 0.0000 (0.8402) |
| CASH RATIO | 0.0213 (0.1012) | 0.0499* (0.069) | 0.1114* (0.0504) | 0.0069 (0.5958) | 0.0208 (0.1154) | 0.0478* (0.0865) | 0.1114* (0.0539) | 0.0064 (0.6295) |
| PRICE TO BOOK | 0.0000 (0.8757) | 0.0000 (0.9835) | 0.0000 (0.7868) | 0.0000 (0.728) | 0.0000 (0.8711) | 0.0000 (0.9789) | 0.0000 (0.7469) | 0.0000 (0.7224) |
| ROA | 0.0158 (0.5227) | 0.0787 (0.1319) | 0.1406 (0.1941) | 0.0059 (0.8124) | 0.0169 (0.5006) | 0.0702 (0.1833) | 0.1217 (0.2657) | 0.0062 (0.8061) |
| SIZE | 0.0010 (0.5004) | 0.0072** (0.0248) | 0.0133** (0.0455) | 0.0009 (0.5438) | 0.0011 (0.5733) | 0.0053 (0.1931) | 0.0110 (0.1873) | 0.0007 (0.7255) |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.1624 | 0.1990 | 0.1588 | 0.1145 | 0.1559 | 0.1958 | 0.1570 | 0.1075 |
| F-statistic | 3.6930 | 4.4509 | 3.6225 | 2.7966 | 3.3170 | 4.0552 | 3.3371 | 2.5118 |
| Prob(F-statistic) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Table A2: Additional OLS Regression Analysis on April 3, 2020.

Table A2 presents the results from additional regression analyses conducted to ensure the validity of our findings on the relationship between ESG and CARs for Event 2 i.e. April 3, 2020 (The day the CDC first recommended masks). Considering this date as $t = 0$, we regress different event windows such as CARs for days (0,2) and (0,4), as well as abnormal returns (AR) solely for day 0 and also the Fama-French 3-factor abnormal returns for day 0 (AR (0) FF) against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | | Panel B: E,S,G, & C Components | | | |
|---------------------|-----------------------------|-------------------------|-------------------------|-------------------------|--------------------------------|-------------------------|-------------------------|-------------------------|
| | AR (0) | CAR(0,2) | CAR(0,4) | AR (0) FF | AR (0) | CAR(0,2) | CAR(0,4) | AR (0) FF |
| | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) | Coefficient (Pvalue) |
| Intercept | 0.0697* (0.0798) | 0.2597*** (0.0013) | 0.3972*** (0.0008) | 0.0972** (0.0188) | 0.1226** (0.0111) | 0.3119*** (0.0015) | 0.4111*** (0.0042) | 0.1555*** (0.002) |
| ESG SCORE | -0.0001 (0.1288) | 0.0001 (0.4793) | 0.0003 (0.2212) | -0.0001 (0.1741) | | | | |
| ENVIRONMENTAL SCORE | | | | | 0.0000 (0.6087) | 0.0001 (0.4746) | 0.0000 (0.99) | 0.0000 (0.7569) |
| SOCIAL SCORE | | | | | 0.0000 (0.9429) | 0.0000 (0.9172) | 0.0002 (0.6309) | 0.0000 (0.8882) |
| GOVERNANCE SCORE | | | | | 0.0000 (0.8977) | 0.0001 (0.5158) | 0.0002 (0.3902) | 0.0000 (0.8439) |
| ESG CONTROVERSIES | | | | | -0.0002*** (0.0099) | -0.0001 (0.5924) | 0.0000 (0.8848) | -0.0002*** (0.0097) |
| CASH RATIO | 0.0238* (0.0538) | -0.0520** (0.0373) | -0.1084*** (0.0029) | 0.0157 (0.2188) | 0.0193 (0.1212) | -0.0547** (0.0312) | -0.1105*** (0.0029) | 0.0112 (0.3858) |
| PRICE TO BOOK | 0.0000 (0.4878) | 0.0000 (0.9841) | 0.0000 (0.873) | 0.0000 (0.66) | 0.0000 (0.4563) | 0.0000 (0.9994) | 0.0000 (0.8631) | 0.0000 (0.6276) |
| ROA | -0.0681*** (0.0039) | -0.1239*** (0.0093) | -0.2338*** (0.0008) | -0.0844*** (0.0006) | -0.0694*** (0.0034) | -0.1293*** (0.0073) | -0.2337*** (0.0009) | -0.0864*** (0.0005) |
| SIZE | -0.0023 (0.1052) | -0.0104*** (0.0004) | -0.0139*** (0.0011) | -0.0034** (0.0219) | -0.0042** (0.0194) | -0.0126*** (0.0006) | -0.0149*** (0.0057) | -0.0056*** (0.0029) |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.1058 | 0.1417 | 0.2431 | 0.1522 | 0.1110 | 0.1379 | 0.2367 | 0.1573 |
| F-statistic | 2.6445 | 3.2940 | 5.4610 | 3.4944 | 2.5675 | 3.0064 | 4.8905 | 3.3426 |
| Prob(F-statistic) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Table A3: Additional OLS Regression Analysis on December 11, 2020

Table A3 presents the results from additional regression analyses conducted to ensure the validity of our findings on the relationship between ESG and CARs for Event 3 i.e. December 11, 2020 (The day the first vaccine was approved for emergency use in the United States). Considering this date as $t = 0$, we regress different event windows such as CARs for days (0,2) and (0,4), as well as abnormal returns (AR) solely for day 0 and also the Fama-French 3-factor abnormal returns for day 0 (AR (0) FF) against the ESG Score (in panel A) and E,S,G,&C individual components (in panel B). Cash Ratio is the ratio of cash and equivalents to total assets. Price to Book is the ratio of the current market value of the company to its book value. ROA is the return on assets. Size is the natural logarithm of the total assets of the firm. All regressions also include industry dummies. ***, **, and * indicate significance at the 1%, 5%, and 10% significance level, respectively.

| Variable | Panel A: ESG Combined Score | | | | Panel B: E,S,G, & C Components | | | |
|---------------------|-----------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| | AR (0) Coefficient (Pvalue) | CAR(0,2) Coefficient (Pvalue) | CAR(0,4) Coefficient (Pvalue) | AR (0) FF Coefficient (Pvalue) | AR (0) Coefficient (Pvalue) | CAR(0,2) Coefficient (Pvalue) | CAR(0,4) Coefficient (Pvalue) | AR (0) FF Coefficient (Pvalue) |
| Intercept | -0.0032 (0.8767) | 0.0800** (0.0137) | 0.0875* (0.0524) | 0.0062 (0.7649) | -0.0242 (0.3375) | 0.0618 (0.1159) | 0.0725 (0.1862) | -0.0121 (0.6298) |
| ESG SCORE | 0.0000 (0.4751) | -0.0001* (0.0697) | -0.0001 (0.2489) | 0.0000 (0.5478) | | | | |
| ENVIRONMENTAL SCORE | | | | | -0.0001 (0.1599) | -0.0002** (0.0481) | -0.0001 (0.3253) | -0.0001 (0.2198) |
| SOCIAL SCORE | | | | | 0.0001 (0.3743) | 0.0001 (0.5836) | 0.0000 (0.9081) | 0.0001 (0.4113) |
| GOVERNANCE SCORE | | | | | 0.0000 (0.5558) | 0.0000 (0.7549) | 0.0000 (0.6739) | 0.0000 (0.7712) |
| ESG CONTROVERSIES | | | | | 0.0000 (0.3092) | 0.0000 (0.7855) | 0.0000 (0.8811) | 0.0000 (0.3553) |
| CASH RATIO | 0.0064 (0.3185) | 0.0183* (0.0687) | 0.0360** (0.0101) | 0.0021 (0.743) | 0.0075 (0.2487) | 0.0186 (0.0679) | 0.0363** (0.0107) | 0.0032 (0.6255) |
| PRICE TO BOOK | 0.0000 (0.7967) | 0.0000 (0.8031) | 0.0000 (0.7949) | 0.0000 (0.9521) | 0.0000 (0.8509) | 0.0000 (0.8495) | 0.0000 (0.812) | 0.0000 (0.99) |
| ROA | 0.0188 (0.1268) | 0.0142 (0.457) | 0.0266 (0.3185) | 0.0125 (0.3076) | 0.0211* (0.0899) | 0.0185 (0.3397) | 0.0296 (0.2721) | 0.0145 (0.2421) |
| SIZE | 0.0002 (0.7916) | -0.0034*** (0.0037) | -0.0054*** (0.0011) | -0.0002 (0.814) | 0.0010 (0.3028) | -0.0027* (0.07) | -0.0047** (0.0232) | 0.0005 (0.6216) |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Adjusted R-squared | 0.0295 | 0.1806 | 0.1832 | 0.0180 | 0.0307 | 0.1796 | 0.1781 | 0.0165 |
| F-statistic | 1.4207 | 4.0538 | 4.1074 | 1.2547 | 1.3962 | 3.7400 | 3.7121 | 1.2095 |
| Prob(F-statistic) | 0.0797 | 0.0000 | 0.0000 | 0.1783 | 0.0820 | 0.0000 | 0.0000 | 0.2089 |