Does ESG matter for the financial resilience of companies? Evidence from US firms during the COVID-19 pandemic

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Abstract

This paper contributes to the understanding of the relation between the ESG positioning of companies and financial resilience in the specific context of the COVID-19 crisis. Resilience is measured through two dimensions based on stock price data: the severity of loss, which captures the stability, and the duration of recovery, which captures the flexibility dimension. Using a sample of 1,508 US-based firms, we provide evidence that firms with high ES ratings were more resilient than firms with low ES ratings during the COVID-19 pandemic by lessening the severity of price drops and recovering faster. This effect is enhanced by using a nonlinear approach based on quantiles. Furthermore, we provide evidence that the effect of ES on resilience is focused on environmental and social components. Interestingly, we show that management and shareholders subcategories of the governance rating have no impact on a firm's time to recovery during a pandemic.

Keywords: corporate social responsibility, financial resilience, stock market, US companies
JEL codes: G10, G14 M14

1. Introduction

The COVID-19 pandemic has caused a significant upheaval in the world by impacting individuals' and companies' way of life, global economic systems, and financial markets. Several companies around the globe and particularly in the US saw their supply chains interrupted, demand for their products and services decline, shortages in supplies and inputs, and government-mandated closures. Other companies closed on their own accord, and many of those who remained in business had to modify their operations significantly (Balla-Elliott et al. 2020).

This new situation has led to significant new challenges that have forced companies to react and adapt to an unprecedented context marked by permanent uncertainty and sometimes contradictory expectations. The sanitary measures against COVID-19 immediately impacted some companies that found themselves unable to generate revenue. In the face of the pandemic, companies sought to adapt quickly while maneuvering as best they could in the face of financial and operational challenges. Beyond the short-term economic shock, the COVID-19 pandemic and the exceptional sanitary measures have raised many questions about the lasting consequences of this crisis. Differentiating factors also show that companies are not equal in a crisis situation. Even if the different shocks depending on the sector of activity explain part of the dispersion of individual activity shocks more than in regular times, other factors may have played an essential role in defining the differences in the behavior of firms in the face of this crisis. Among these factors are ESG criteria. Díaz et al. (2021) show that ESG ratings significantly impacted the returns of industry portfolios during the COVID-19 pandemic.

This paper aims to analyze whether the positioning of ESG ratings played a role in companies' financial resilience during the COVID-19 health crisis in the US, that is, their ability to absorb shocks, adapt, resist, and rebound quickly. In particular, this paper aims to test whether companies with high ESG positioning are a priori better positioned than their less well-positioned counterparts to face adverse conditions. To this aim, we consider a sample of 1,508 companies listed on the AMEX, NASDAQ, and NYSE from December 2019 to June 2021. COVID-19 was detected in Wuhan, China, in early December 2019. However, it was officially reported for the first time in the world by the

World Health Organization on December 31, 2019. The number of cases and deaths related to COVID officially started to be recorded on December 31, 2019, which prompted us to select this date as the starting reference for the COVID period.

The traditional ESG performance definition measures a company's performance against a set of ESG criteria. ESG screening criteria refer to companies that have integrated sound environmental practices, strong social responsibility principles, and ethical governance initiatives into their corporate policies and daily operations. It should be noted that the popularity of ESG investing was already increasing before the emergence of the pandemic. ESG criteria represent a significant asset for companies looking for investors. This measure can improve a company's performance and enhance its image. A company that integrates ESG criteria into its CSR approach has real significance to potential investors. The prepandemic period saw a significant increase in responsible investing regarding environmental, social, and governance (ESG) criteria, following the Global Sustainable Investment Alliance 2019. Responsible investing increased by 34% between 2016 and 2018 in major global markets. Arjaliès (2010) and Hasford and Farmer (2016) find that investors' awareness that they can have an ESG impact has increased the accountability of conventional funds for their ESG investment practices. In contrast, Revelli (2017) shows that ESG investment simply remains an opportunity to generate profits.

On the same topic but with a company-oriented analysis, Cornett et al. (2016) looked at the US banking sector during the great financial crisis of 2007–2008. They found a significant correlation between the financial performance of US banks and their ESG scores. For nonfinancial firms, Lins et al. (2017) also found that those with a high ESG score performed better financially than other firms over the period. Hoepner et al. (2019) empirically show that engagement with ESG issues reduces downside risk. Ilhan et al. (2019) show that companies with low ESG scores have higher tail risk (a lower ESG score is associated with higher carbon emissions). This is consistent with the theory that the ESG score induces a certain level of management quality.

In this paper, we first consider an overall ESG score for each company (some studies have focused on the three ESG dimensions and their impact on the general framework (Yeom, 2012; Galbreath, 2013; Tarmuji et al., 2016, Nollet et al., 2016)). In a second step, we analyze the importance of scores for each dimension separately. Indeed, the three dimensions can provide different insights. The

environmental dimension takes into account, among other things, the effect of companies on the environment locally and globally, the use of natural resources, and initiatives to reduce greenhouse gas emissions. The social dimension will focus on social dialogue, relationships with suppliers and subcontractors, and how a firm manages the fair treatment of labor in supply chains. At the same time, the governance dimension focuses on good corporate governance with, for example, the independence of the board of directors, the presence of an audit committee, transparency in the remuneration of executives, and actions to fight corruption.

This study explores the impact of companies' ESG positioning on their financial resilience. Therefore, the implementation of an ESG approach mainly aims to prevent risks and contingencies by planning the strategies that respond to the problems to guarantee compliance with the commitments made. It is, in fact, a process of permanent adaptation that directly promotes resilience, insofar as any crisis situation is considered surmountable thanks to the development of recommended methodologies.

Several papers have focused on measuring financial performance based on ESG criteria before and during the health crisis: Zhao et al. (2018) for Chinese companies, Auel et al. (2016) for the Asia-Pacific region, the United States (US), and Europe, others considered the risk associated with this type of investment, and Cerqueti et al. (2021) and Jawadi et al. (2019) considered CSR and systematic risk in a more global dimension. Other studies have considered resilience at the level of ESG-oriented investment funds (Ortas et al.; 2014) for the Spanish market and Pisani and Russo (2020) did so for several European ESG-oriented investment funds. To our knowledge, no study to date considers the impact of ESG criteria on the financial resilience of companies themselves. Moreover, the question of strong or weak ESG positioning with an overall score and with each dimension separately may shed new light on the ability of companies to absorb shocks during crises. Indeed, considering indices with investment funds can lead to smoothing effects on the data.

The paper is organized as follows. Section 2 presents the hypotheses considered in this paper regarding the impact of ESG factors on the resilience of US companies during the COVID-19 health crisis. Section 3 presents the company sample and the summary statistics. Sections 4 and 5 are devoted to the univariate and multivariate analyses and examine the relation between firms' duration recovery during the COVID-19 crisis and ESG score. Section 6 concludes.

2. Hypothesis development

The prevailing view of socially responsible firms is "doing well by doing good" in the sense that ESG activities maximize shareholder welfare and simultaneously engage in large social goals (e.g., McWilliams and Siegel, 2001). Practitioners provide evidence that ESG activities not only create value for firms (McKinsey and Company, 2020) but also perpetuate the reputation of ESG as a resilience-building factor and, in the extreme view, as an "equity vaccine" (Willis, 2020).[1,2]

Empirical studies provide evidence that firms with higher environmental, social and governance (ESG) ratings exhibit greater resilience during crises. Lins, Servaes, and Tamayo (2017) show that firms with high social capital outperformed low social capital firms during the 2008–2009 financial crisis. Albuquerque, Koskinen, Yang, and Zhang (2020) find that stock prices for firms with high ES scores perform much better than those for other firms. To explain this outperformance, prior research provides numerous explanations.

First, ESG commitment is asserted to be a product differentiation strategy (Navarro; 1988; Bagnoli and Watts, 2003; Siegel and Vitaliano, 2007) that increases customer loyalty (Albuquerque, Koskinen, and Zhang, 2019; Gantchev, Giannetti, and Li, 2022) and, consequently, may help firms be less vulnerable to general shocks and more resilient.

Second, investors that invest in socially responsible investment (SRI) funds are less concerned about negative returns than investors in conventional funds. Renneboog, Ter Horst, and Zhang (2011), who examine the money flows into and out of SRI funds around the world find that SRI investors place more emphasis on nonfinancial attributes in their investment decisions. In other words, socially responsible investors are more resilient to shocks and less likely to engage in sell-offs in downturn cycles (Heinkel, Kraus, and Zechner, 2001; Renneboog, Ter Horst, and Zhang, 2011; Ferriani and Natoli, 2020). In fact, high-ESG firms that attract relatively socially responsible investors are assumed

[1] Source: COVID-19: Implications for business in 2020; December 16, 2020.

2 Blackrock, the largest active investor in the world, reported better risk-adjusted performance across sustainable investment products for the first quarter of 2020 (Blackrock; 2020). Morningstar claimed that 24 of 26 ESG-tilted index funds outperformed their closest conventional counterparts (Hale; 2020). MSCI boasted that all four of their ESG-oriented indices outperformed a broad market counterpart index (Nagy and Giese; 2020).

to be more resilient and less volatile, which makes them better able to weather any exogenous shocks to the stock market (Heinkel et al. (2001).

Third, corporate social responsibility activities help to build social capital and trust in the corporation by promoting civic engagements and collaboration with all stakeholders (employees, customers, suppliers, financiers, government, society, etc.), which in turn helps the firm deal with unexpected shocks relatively better. DesJardine et al. (2019) claim that social and environmental practices foster interdependencies between the organizational system and the social and natural systems in which organizations are embedded. Accordingly, this may help build stability and reduce the severity of loss and time to recovery during a crisis. Studies also show that high ESG firms' commitment offers such downside risk protection during the subprime crisis (Cornett et al., 2016; Lins et al., 2017; Bouslah, et al., 2018; Albuquerque et al., 2020; Ding et al., 2021).

According to DeJardine et al. (2019), there are two mechanisms through which environmental and social practices reinforce interactions with the broader environment: stakeholder relationships and institutional conformity. First, a firm that is more responsive to customers', suppliers' and lenders' broader sets of needs will necessarily foster stakeholder relationships. On the employee side, social and environmental commitments tighten labor relations, which improves employee engagement with the firm (Carmeli and Tishler, 2004). Second, when a firm reflects organizational conformity to institutional pressures through environmental and social practices, it ensures that institutional actors, including environmental actors and industrial and professional associations, share norms. Consequently, such institutional conformity makes those actors experience less scrutiny and firms less sensitive to unsystematic market risk, which improves firm stability (Bansal and Clelland; 2004; Suchman, 1995). All of these points contribute to firm stability, making the price severity of loss for high ESG firms less of a concern during disturbances.

Corporate social activities require long time horizons, large resource commitments, and significant adjustments to organizational structures (Bansal et al., 2015). Continuous adjustments make the firm open to diverse points of view, such as employee diversity and broad stakeholder engagement. Actor diversity encourages employees' experimentation and prompts independent and new thoughts, which may bring new insights to the firm for unlocking existing routines and conducting new responses to disturbances.

The diversity of thoughts may also stimulate creativity, which in turn improves top management's awareness of problems (Carpenter, 2002). Moreover, it may yield a team to react to complex strategic activities and match the requirements in an uncertain environment (Ferrier, 2001). In such situations, environmental and social practices can help firms recover faster during crises by increasing firm creative responsiveness.

Given this evidence, a positive relation between environmental and social ratings and financial resilience is plausible and suggests that firms with higher ESG ratings are more resilient during crises. We control for several firm characteristics, such as firms' intangible assets, size, operational performance, capital intensity, innovation and momentum. We also tested the impact of the ESG rating by distinguishing the quantile of companies with the highest score against the quantile of companies with the lowest score.

Thus, our baseline hypotheses are as follows.

Hypothesis 1. Firms with higher precrisis ES ratings are more resilient.

In this hypothesis, we explore how ESG may offer organizations some safety when faced with crises and operationally hard situations. The concept of environmental, social, and governance issues can cause conflicts between businesses and stakeholders, including customers, employees, suppliers, and the community. We anticipate that ESG involvement can lessen these conflicts and, consequently, reduce opportunistic behavior by fostering trust and cooperation. Additionally, from the standpoint of the business, a key advantage of ESG is that it frequently offers insurance-like protection by building up reputational assets to support resilience during crises.

The environmental dimension of ESG is associated with resource conservation, product innovation, and emission reduction. Government-imposed formal, legal, and administrative requirements must be met to carry out environmental ESG. The effect of the environmental aspect of ESG on business success is not clearly stated in the literature. Indeed, environmental ESG initiatives contribute to business costs, and their financial benefits are not always apparent or simple to quantify. ESG environmental efforts can spur innovation, save costs, and conserve resources, creating a

competitive edge and devoted customers (Porter and van der Linde, 1995). We, therefore, present the following hypothesis:

Hypothesis 2. The effect of ES ratings on stock resilience differs according to the environmental dimensions.

The social dimension of ESG is linked to employment quality, health and safety, community involvement, human rights, diversity and opportunity, and training and development. The interaction between society and business organizations is explained by the social dimension. Businesses could contribute to society more effectively by incorporating social responsibility into all aspects of their operations. The social component of ESG can increase employee morale and have a beneficial impact on consumer loyalty. These concerns will enhance employee recruitment and retention, attract the most creative and talented individuals, and boost employees' dedication, loyalty, and performance. The feeling of attachment and well-being of employees can be a driving factor for the effective achievement of corporate goals and contribute to firm stability, making the price severity of loss for high ESG firms less of concern during a period of crisis. Thus, we postulate that:

Hypothesis 3. The effect of ES ratings on stock resilience differs according to the social dimensions.

3. Sample and summary statistics

3.1 Sample selection

To investigate the relationship between ESG performance and a firm's financial resilience in the specific context of the COVID-19 crisis, we use a sample of US firms that are listed on the AMEX, NASDAQ and NYSE. The main data source of firms' ESG performance is the Thomson Reuters' Refinitiv ESG database, which is frequently used in the sustainable finance literature (Dyck et al., 2019; Ferrell, et al., 2016). ESG scores from Refinitiv are based on publicly reported data, including annual reports, company websites, nongovernment organizations (NGO) websites, stock exchange filings, corporate social responsibility (CSR) reports and news sources, at an annual frequency. The

assessment of a firm's environmental (E) performance breaks down into three categories: resource use, emissions, and innovation. Social (S) commitments are measured in four areas: workplace, human rights, community, and product responsibility. Governance (G) is evaluated in three dimensions: management, shareholders, and corporate social responsibility strategy. Furthermore, each subcategory contains four themes. For example, resource use includes water, energy, sustainable packaging and the environmental supply chain. The management subcategory contains structure and compensation. The ESG score is a relative sum of the category weights per industry for the environmental and social categories and country for governance ranging between 0 (the lowest) and 100 (the highest). Our main measure, ES, is the average of the environment and social scores divided by 100. We took into account the nonlinear effect by considering the group of companies with the lowest ES score (ES1) against the group of companies with the highest ES score (ES2). As in Lins et al. (2017), we do not include the governance category in our main tests since governance is generally not part of a firm's ESG remit. Nevertheless, this category is examined as a robustness check in additional analysis.

We obtain daily stock prices from Datastream from December 2019 to June 2021. We consider the starting date of the COVID-19 pandemic to be 20 February 2020, following the peak of the stock market in the United States.[3] The precrisis level is defined as the end of December 2019. We restrict the baseline analysis up to December 2020, which we determine to be a sufficiently long period to observe the full recovery of most firms of our sample (~ 60%) while mitigating the potential contaminant events impacting price fluctuations.[4]

We measure resilience through two dimensions based on stock price data: the severity of loss and the duration of recovery. Both measures are commonly used in the literature to capture the stability dimension of resilience and the number of periods for a country to recover to its precrisis level (Reinhart and Rogoff, 2014; Ambrosius, 2017; Dejardine et al., 2019).

Severity of loss is the absolute percentage change in each firm's stock price between the closing price in the precrisis period (i.e., on December 2019) and the lowest price that the firm reached starting from 20 February 2020 until year-end 2020. A higher value indicates a more severe stock price loss.

[3] One month later, prices declined by almost 30%.

[4] We replicate our analysis using extended windows to the first and second quarter of 2021 and found similar results.

The duration of recovery is defined as the time needed for a firm's market price to recover to its precrisis level. Dejardine et al. (2019) and Marsat et al. (2020) measure the duration of recovery by using monthly and weekly stock price recovery at its precrisis level, respectively. To have a more precise resilience measure, we use daily prices to compute the time that it took for a firm's daily stock price to reach its precrisis level. We also impose the condition that the price does not fall again for at least two weeks to ensure a stable recovery. We relate these resilience measures to the ES measure for 2019 to avoid the possibility that by year 2019, firms may have changed their ES policies as a consequence of the pandemic.[5]

We also include proxies to measure a firm's financial health and, thus, its ability to withstand a severe downturn in the economy: Debt-to-total assets ratio (DB) in book value represents the firm's leverage, and return on assets (ROA) captures the firm's profitability. Profitable firms with low debt can continue investing during a crisis, while other firms may be forced to cut investing (Duchin, Ozbas, and Sensoy (2010), Almeida et al. (2012), and Harford, Klasa, and Maxwell (2014)).
Moreover, we control for additional firm characteristics that may be important for a firm's financial resilience, including firms' intangible assets, size, operational performance, capital intensity, innovation and momentum. Market-to-book ratio (MB) is the proxy for intangible assets. Firm size is measured as the natural logarithm of total assets. Sales growth (SG) corresponds to sales in the current year divided by sales in the previous year. Capital expenditure to total assets (CAPEX) denotes capital intensity. We also control for innovation by a dummy variable (RDDUM) that equals one if the firm discloses her research and development expenditure and zero otherwise. Price momentum (momentum) represents the price change three years prior to the crisis period. Appendix A1 defines all the variables used. We measure financial health and firm characteristics at the end of 2019.

After combining firms with sufficient data coverage on the Refinitiv and Datastream, we obtain a sample of 1,508 firms for which all explanatory variables are available for the COVID-19 pandemic crisis.[6] Appendix A2 reports the sample construction.

[5] We repeat all of our analyses using ES measured at year-end 2018, 2020 and 2021. Most of our findings continue to hold.
[6] We drop 787 stocks for which prices are missing to compute duration of recovery. The ESG scores of 150 stocks are also unavailable, which deepens the reduction of the sample size. We also exclude stocks for which control variables are unavailable.

3.2 Summary statistics

Table 1 provides summary statistics for our main variables. The first row of Table 1 Panel A shows that stock prices decrease on average 44% from their precrisis level. The next row indicates that recovery has a mean of 120 days and a median value of 99 days. ES rating has a mean of 0.327 and a median of 0.254, which indicates that the average and median firm does not belong to the ES leaders group.[7] Panel A also provides descriptive statistics for firm characteristics that we use as control variables in our models. Panel B of Table 1 presents the sample distribution across sectors and shows the average stock loss and time to recovery for each sector. Firms are distributed across 10 major sectors, with three main sectors representing more than 50 percent of the overall sample: financials, industrials and health care. On average, firms in Oil & Gas incur the most severe losses, losing approximately 63% of their stock's value. Table 2 presents a correlation matrix of all the variables employed in our main analyses.

4. Results

In this section, we present a multivariate analysis to examine the relation between firms' financial resilience during the COVID-19 crisis and ES scores. We start by presenting the baseline regression results for the severity of loss first and the duration of recovery estimated second. Then, we present several robustness checks based on alternative model specifications, extended time windows and ES ratings at different points in time.

4.1 Baseline results: Severity of loss

We estimate various regression models of severity of loss during the COVID-19 crisis period as a function of a firm's precrisis ES ratings and a number of control variables. First, we apply ordinary least squares (OLS), where we regress the severity of the loss measure on ES rating and control variables using the following model:

$$Severity\ of\ loss_j = \alpha + \beta_1 ES\ Rating_j + MB_j + ROA_j + SIZE_j + DA_j + SG_j + CAPEX_j + RDDUM_j + MOMENTUM_j + \gamma_j + \varepsilon_j \quad (1),$$

[7] Refinitiv classifies firms according to the ESG scores. A score above 0.5 indicates good ESG performance and above average degree of transparency in reporting ESG data publicly.

where *j* indexes the firm. Panel A of Table 3 contains the baseline regression models where the dependent variable is severity of loss. Our variable of interest is the firm's ES measured at year-end 2019. In all models, we include industry dummies (defined at the two-digit SIC level) since some industries may be more likely to invest in environmental and social capital than others and COVID-19 may affect them differentially.

Column (1) of Table 3, Panel A shows that firms with higher ES ratings performed significantly better during the COVID-19 pandemic. The effect of ES on the severity of loss is economically large: a one-standard deviation increase in ES (0.222) is associated with a 2.33 percentage point decrease in the severity of loss. This tends to confirm our first hypothesis.

One concern with the specification reported in Column (1) is that the strong resilience in terms of severity of loss of high-ES firms during the COVID-19 pandemic may be due to omitted variables that happen to be correlated with ES rather than due to ES itself. To address this possibility, in Column (2), we control for a firm's financial health in the year before the pandemic and for other firm characteristics that have been found to affect financial resilience.

The results presented in Column (2) of Table 3 Panel A confirm that high-ES firms experience a lower severity of loss during the COVID-19 pandemic. A one-standard deviation increase in ES ratings (0.222) is associated with a 2.66 percentage point decrease in crisis-period severity of loss.

We acknowledge that potential concerns may exist with the OLS regression. A first concern is that the current ES rating may be independent of past recovery in the sense that a firm that recovered from past crises may be more tempted to engage in ES commitment in the future. A second concern is that the documented association between ES ratings and firm severity of loss could suffer from an omitted correlated variable bias. For example, firms with better management skills are more likely to engage in ES strategies and recover from crises.

To alleviate these concerns, we consider the two-stage least squares (2SLS) estimation using instrumental variables. We use the number of employees, which equals the number of company full- and part-time workers and which captures firm visibility, and the firm R&D expenses, which capture innovation, as instrumental variables. Both instruments are correlated with ES ratings but uncorrelated with the error term in Equation (1). The use of the number of employees as an instrument variable helps mitigate concerns that an unobservable is correlated with both ES rating and firm severity of

loss, since, in a crisis period, investors will no longer prefer a highly visible company to a less visible one. Simultaneously, visible firms seem to be more invested in ES strategies (Adams and Hardwick, 1998; Garcia-Castro, Arino et al., 2010; Udayasankar, 2008). Regarding the use of innovation, prior studies provide evidence of a positive relationship between firm innovation and corporate social responsibility (McWilliams & Siegel, 2001). In addition, innovation may not necessarily help firms prevent losses during crises, since innovation is mostly stopped during this period (Paunov, 2012).

To check the validity of instrumental variables, that is, the number of employees and R&D expenses, we estimate various instrumental variable tests. The results of these tests are shown in Column (1) of Table 3 Panel B. First, we run the Sargan test to check the exogeneity of the instrument. The null hypothesis under this test is that instruments are uncorrelated with the error term in the main regression. The low Sargan statistic for ES rating (Sargan χ^2=1.290, p value=0.2561) accepts the null hypothesis, meaning that the instrumental variables are not directly correlated with the error term.

Furthermore, we examine the magnitude of the correlation of the instrumental variables with the ES rating. To this aim, we report different test statistics in Column (1) of Table 3 Panel B, namely, the Shea partial R^2 (Shea, 1997), the Anderson correlation and the Cragg-Donald tests. First, under the Anderson and Cragg-Donald tests, the null hypothesis stipulates that the equation is weakly identified, meaning that the instruments are weak predictors of ES ratings. The results indicate that the Cragg-Donald F statistic is 21.33, which is significant at the 1% level and exceeds the 5% Wald test critical values (19.93). The Anderson statistic is significant at the 5% level. Moreover, the value of the Shea partial R^2 and the corresponding F value significant at the 1% level confirm the predictive power of both instruments. Overall, we can conclude that both instruments are valid predictors of ES ratings and appropriate to include in the analysis.

The reduced-form equation of ES (the linear combination of the exogenous variables in the system) is shown below in Equation (2). Equation (2) is estimated using OLS and the fitted value, Fit-ES, which is used as an instrumental variable for the ES rating in Equation (3).

$$ES\ Rating_j = \alpha + \beta_1 Number\ of\ employees_j + \beta_2 R\&D_j + MB_j + ROA_j + SIZE_j + DA_j + SG_j + CAPEX_j + RDDUM_j + MOMENTUM_j + \gamma_j + \varepsilon_j \quad (2).$$

$$Severity\ of\ loss_j = \alpha + \beta_1 Fit\_ES\ Rating_j + MB_j + ROA_j + SIZE_j + DA_j + SG_j + CAPEX_j + RDDUM_j + MOMENTUM_j + \gamma_j + \varepsilon_j \quad (3)$$

The first-stage coefficient estimates are shown in Column (1) of Table 3 Panel B. The coefficients on the second stage of the two-stage least squares regression results are shown in Column (2) of Table 3 Panel B. The results of Column (2) confirm those of the OLS models shown in Panel A Table 3. The coefficient on the ES rating is negative and statistically significant at the 5% level. In other words, the higher a firm's ES rating is, the less the stock price drops during the pandemic crisis. Overall, we find strong empirical support for Hypothesis 1 that ES strategies help firms mitigate their losses following the COVID-19 pandemic. These results are consistent with the view that firm investments in environmental and social capital help investors trust firms as the crisis unfolds, leading to a less severe drop in price. We now turn to testing time to recovery.

4.2 Baseline results: Survival analysis estimations

In this subsection, we present the univariate and multivariate statistics for time to recovery.

4.2.1 Univariate tests

Table 4 reports the number of recovered firms during the COVID-19 crisis period and compares their ES scores. The results indicate that 907 firms recovered (60%) their precrisis price during 2020, while 601 firms did not. The mean ES score of recovered firms is 0.351 and 0.291 for unrecovered firms. The t test indicates that recovered firms have higher ES scores than unrecovered firms, with a difference of 0.059, which is statistically significant at the 1% level, in accordance with H1.

To deepen the analysis, we split our sample into two categories based on their ES scores: the high ES group when a firm's ES score is greater than the median and the low ES group alternatively. Then, we performed Kaplan–Meier survival analysis to compare the probability of recovery of both groups. Figure 1 shows that the low ES firm group has a higher probability of remaining in the same

state of non-recovery. Moreover, as the time increases, the curves become more disconnected, suggesting that ES positively affects recovery.

Furthermore, to test the significant difference between the two Kaplan–Meier curves, we conducted the log-rank test for both groups. The results of Table 5 show that the high and low ES rating groups have significantly different Kaplan-Meier curves at the 1% level.

4.2.2 Survival analysis

One concern when measuring recovery times is that some firms did not recover during the sample period, which leads to right-censored date. At the same time, dropping these observations from the sample will bias the results. To address this issue, we employ survival analysis, which is more adapted to deal with censored observations than ordinary least squares regression models. Since the recovery time for some firms is not exactly observed but is known to lie within some interval, the term interval-censoring is more appropriate. In particular, we apply the Cox proportional hazards regression model to study the impact of duration recovery during the COVID-19 crisis period as a function of firms' precrisis ES ratings (Cox, 1972). In the Cox model, the dependent variable is the hazard rate, which is the probability of recovery occurring at time t within the period at risk. To this aim, the model specifies that the hazard function of firm recovery is conditional on covariate estimates. The hazard rate at time t for observation i is assumed to be:

$$h_i(t) = h_{0i}(t)\exp(\beta_1 x_1 + \cdots + \beta_k x_1) \qquad (4)\,,$$

where hi(t) represents the hazard rate for observation i, h0(t) represents the baseline hazard function of recovery at time t, and x represents the covariates (i.e., ESG, MB, ROA, SIZE, DA, SG, CAPEX, RDDUM, MOMENTUM and INDUSTRY). βi is the regression coefficient for its respective covariate i. We report the coefficient rather than the hazard ratios in each survival model by applying the exponential to the coefficients. Hazard ratios are considered as the change in the probability of recovery occurring over the observation period when the corresponding variable increases by one unit. A larger coefficient (and hazard ratio) signals a higher likelihood of recovery and, hence, greater resilience. The origin in our model is February 20, 2020. Observations are daily and continue until the firm exits or the firm fully recovers. The model ends at year-end 2020, but extended time windows are

studied in the sensitivity analysis. In survival analysis, endogeneity is less of a concern since survival analysis computes hazard rates by regressing recovery times on the lagged explanatory variables.

Table 6 provides the baseline regression results of the survival analysis with two specifications: one without any control variables and one with control variables, and both models include industry dummies. Our variable of interest is the firm's ES rating measured at year-end 2019.

The estimated coefficient of Column (1) of Table 6 Panel A is positive and significant at the 1% level. The results indicate that firms with higher ES ratings are more likely to recover faster than firms with lower ES ratings. The results from Column (2) of Table 6, Panel A confirm that a higher ES rating is associated with a shorter duration of recovery and higher resilience. The results on time to recovery further support the main finding of the positive impact of ESG rating on firms' financial resilience and support Hypothesis 1. The coefficients on the control variables are generally consistent with the explanations. Firms that entered the crisis in better financial health (higher profitability and lower debt) are more resilient. During a crisis, profitable firms with low levels of debt continue investing, while other firms may be forced to cut investment (see Lins et al., 2017; Duchin et al., 2010; Almeida et al., 2012; and Harford et al., 2014).

In Table 6 Panel B, to take into account the nonlinear effect, we re-estimate our baseline model, except that the main explanatory variable has been changed from ES rating to two indicator variables by dividing firms into ES quartiles: ES1 and ES2, ranging from the group with the lowest score (ES1) to the group with the highest score (ES2). This approach allows us to assess whether the effect of a firm's ES ratings on financial resilience is more pronounced at high or low levels of ES strategies. The results again show that firms with better ES ratings recovered faster during the COVID-19 pandemic. The coefficient estimates on ES1 are insignificant, implying that there is no trend of financial resilience for the group with the lowest ES rating. In comparison, the coefficient estimates of time to recovery on ES2 are positive and significant at the 1% level, suggesting that the greater the ES standards are high, the faster firms recover to their precrisis price level, supporting Hypothesis 1. In line with the argument of Lins et al. (2017), the results indicate that investors are most concerned when a firm has a low level of social capital and are most reassured when firm social capital is high.

Since prior literature shows that better-governed firms performed better during crises (Lins et al., 2013) and Nguyen et al., 2015), we also ensure that our findings persist after controlling for corporate governance measures. One may think that if governance and ES rating are correlated, it may be possible that the ES rating is simply proxying for governance, which results in an omitted variable bias. To mitigate this concern, we re-estimate our previous models by adding a variety of governance measures as of year-end 2019. We first use the prior excluded governance rating. We also measure governance using Board Independence (whether the company has a policy regarding the independence of its board), Board Size (the total number of board members at the end of the fiscal year), a dummy if the CEO Is Not the Chairman, and a dummy if the CEO Is Board Member.[8]

In Panel C of Table 6, we replicate the analyses from Panel A, but we now add the governance controls. All models include the full set of other control variables employed in Panels A and B. The estimated coefficients for governance rating in Column (1) are negative and significant at the 10% level, which indicates that firms with higher governance ratings performed worse in terms of time to recovery during the COVID-19 pandemic. The results also show that the impact of the ES rating on crisis-period time to recovery is virtually identical to that reported previously. This evidence suggests that the ES effect does not pick up a governance component. The model in Column (2) includes all other governance measures. We again find that the effect of the ES rating on crisis-period time to recovery persists. The results also indicate that when the CEO is not a chair, firms face more difficulties in recovering the precrisis price level. The other governance provisions are insignificant.

Overall, the findings reported in Table 6 show that more socially responsible firms suffered less during the COVID-19 pandemic, and this effect is not due to differences in the financial strength of corporate governance. These results are consistent with the view that firm investments in environmental policies and social capital appear to increase financial resilience after the COVID-19 pandemic crisis. Investors may react positively to a firm's environmental and social engagements, especially during the COVID-19 pandemic. Overall, we find strong empirical support for Hypothesis 1 that greater environmental and social performance leads companies to recover more quickly during the pandemic crisis.

[8] In Datastream, Policy Board Independence variable answers the question whether the company have a policy regarding the independence of its board by taking into account two dimensions: (1) the company strives to maintain a well-balanced board through an adequate number of independent board members and (2) independent board members maintain integrity and independence in decision-making.

4.3 Sensitivity analysis

In this subsection, we report the results of various additional tests conducted to determine whether our main results are robust. We first conduct several alternative models to test the time to recovery. Second, we test the time to recovery using different observation windows. Third, we focus on measuring ES performance at different points in time.

4.3.1 Alternative model specifications

We supplement the baseline regression from Table 6 with robustness tests to ensure that the results are not sensitive to particular model specifications. To this aim, we employ proportional hazards regression with different survival distributions. Similar to the Cox model, the proportional model specifies that the covariates have a multiplicative effect on the hazard function:

$$h_i(t) = h_{0i}(t) \exp(\beta_k x_i) \qquad (5),$$

where $h_0(t)$ takes a specific parametric form. Three distributions are supported: Exponential, Weibull and Gompertz.[9] The three models differ in terms of the assumptions that are made about the distribution of survival times in the population.

Table 7 Panel A provides the regression results with alternative survival models. First, we run Equation (5) with the exponential distribution that assumes that the hazard function is constant, meaning that it will always show up as a horizontal line over time. Second, we rerun Equation (5) with the Weibull distribution, which is an important generalization of the exponential model with two positive parameter shape parameters and scale parameters. The shape parameter allows great flexibility of the model and different shapes of the hazard function that can trend upward or downward, increase at an increasing rate or increase at a decreasing rate. Third, we assume the Gompertz model, which is a continuous probability distribution on [0,∞) that has an exponentially increasing hazard rate.

The coefficient estimates remain positive and statistically significant at the 1% level. The results from alternative survival analysis models suggest that the effect of a firm's ES ratings on time to recovery is robust across various model specifications.

[9] The Cox model is semiparametric while the Exponential, Weibull and Gompertz models are parametric.

4.3.2 Extended time windows

We conduct a timing test with different windows to study the relationship between firms' ES ratings and the duration of recovery. More specifically, we rerun our baseline model by extending the crisis period to March 2021 and June 2021 with control variables and industry dummies.

The results presented in Panel B of Table 7 confirm that the effect of a firm's ES rating on crisis period resilience persists. The magnitude of the high ES resilience is somewhat attenuated when we extend to March 2021, but the number of recovered firms increases from 907 to 1,138 firms. Turning to the second quarter of the 2021 window, 78 additional firms recovered compared to the 2021 first quarter, and the result is statistically significant at the 5% level. Thus, among recovered firms during the extended period (one-fifth of the whole sample), three-fourths of them retrieved their precrisis price level during the first quarter of 2021.

Overall, the empirical evidence suggests that firms with higher ES ratings suffered less during the pandemic, and this effect is not due to differences in financial strength or industry specificity.

4.3.3 ES ratings at different points in time

In our baseline models reported in prior tables, we measure ES performance at the end of 2019, a few months before the onset of the COVID-19 pandemic crisis. However, one potential concern could be that the ES rating at the end of 2019 is correlated with some unobservable measure of the ability to withstand a shock to resilience, and the results we report may not be due to environmental and social commitments but rather to alternative factors.

To address this concern, we investigate whether firm ES ratings measured in 2018 are positively related to crisis period resilience, since 2018 clearly predates any fears of a pandemic crisis. In Columns (1) of Panels A and B of Table 8, we re-estimate Equation (3) for time to severity of loss and Equation (4) for time to recovery above using ES measured in 2018 as the variable of interest. The effect is comparable in magnitude to the effect using 2019 ES for both severity of loss and time to recovery. We next conduct the same test using 2020 ES data. As reported in Columns (2) of Panels A and B of Table 8, the coefficient estimate of ES 2020 on severity of loss is negative but insignificant, while the coefficient estimate on time to recovery is positive and significant at the 5% level.

It is also possible that high-ES firms were more resilient during the pandemic crisis because prior ES activities were actually nonvalue maximizing and firms were forced to not pursue those activities. In other words, firms that engaged more in negative NPV projects precrisis were more financially resilient during the crisis simply because they had more excesses that could be cut (Lins et al.; 2017).

To test this conjecture, in Column (3) of Panels A and B of Table 8, we examine whether our results hold when ES ratings are measured at year-end 2021. Our findings persist: high ES levels measured at the height of the COVID-19 crisis are still associated with better crisis period resilience.

Overall, our results are not sensitive to the time period in which ES investments are measured. The main reason for this lack of sensitivity is that ES levels are relatively persistent over time. For example, the correlation in our ES measure between 2018 and 2019 is 0.94, the correlation between 2019 and 2020 is 0.93, and the correlation between 2018 and 2020 is 0.83.

5. Sensitivity to environmental and social dimensions

Having established a positive relation between firms' ES rating and financial resilience during the pandemic crisis, we now explore which environmental and social aspects helped the firm build resiliency. While ES ratings seem improve financial resilience, the gains may be different depending on the different dimensions of ES policy. We further disentangle the governance dimensions and examine their effect on firms' financial resilience.

First, we re-estimate Equations (3) and (4) by focusing on the environmental pillar and its three categories, namely, resource use, emission and innovation. Refinitiv defines the resource use score as "a company's performance and capacity to reduce the use of materials, energy or water and to find more eco-efficient solutions by improving supply chain management". The emission category measures "a company's commitment and effectiveness toward reducing environmental emissions in its production and operational processes". The last environmental subcategory, innovation, is defined as the "company's capacity to reduce the environmental costs and burdens for its customers, thereby

creating new market opportunities through new environmental technologies and processes or eco-designed products".

As in Panel A of Table 9, we find that the estimated coefficients for environment rating are negatively and significantly related to severity of loss at the 5% level. Moreover, the coefficients for the resource use, emission and innovation subcomponents are also negative and significant at the 5%, 1% and 10% levels, respectively. These results suggest that reducing emissions at the firm level mitigates the price severity of losses during pandemic crises.

In a similar way, we re-estimate the effect of the environmental rating and its subcomponents on time to recovery. The results reported in Panel A of Table 10 show that the coefficients of environmental rating and its three components are in line with our baseline results, that is, they are positive and significant at the 1% level. Overall, consistent with Hypothesis 2, the findings of Panels A, Tables 9 and 10 highlight that emissions significantly decrease a firm's severity of loss during pandemic crises and environmental ratings and that its three underpinnings have a significant impact on resilience.

Second, we re-estimate the baseline regressions by zooming in on the social rating and its subcomponents, namely, workforce, human rights, community and product responsibility, as in Hypothesis 3. We predict that the effect of the ES rating on stock resilience differs according to the social dimensions.

The workforce score measures "a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities and development opportunities for its workforce". The human rights score measures "a company's effectiveness in terms of respecting fundamental human rights conventions". The community score measures "the company's commitment to being a good citizen, protecting public health and respecting business ethics". The product responsibility score reflects "a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity and data privacy".

In Panel B of Table 9, we observe that the estimated coefficients on social rating, workforce, human rights and product responsibility are positive and significant at the 5% level. Community rating does not seem to improve financial resilience in terms of the severity of loss.

Turning to time to recovery, the results of Panel B of Table 10 confirm the previous finding since the estimated coefficients of social rating and workforce are positive and significant at the 1% level.

We also note that the community subcomponent is now positively and significantly related to time to recovery at the 1% level. However, human rights and product responsibility seem to not impact a firm's time to recovery during the pandemic. In this regard, Shan and Tang (2020) show that Chinese companies with higher levels of employee satisfaction seem to have fared better during the COVID-19 stock market downturn than other companies. Firms that safeguard their workforce and supply chains during the stock market crash have higher returns than other firms, according to Cheema-Fox et al. (2020).

This evidence provides some support for Hypothesis 3, which expects that the relation between social rating and financial resilience is more salient among firms that reinforce its workforce conditions and that some social dimensions have more impact on firms' financial resilience than others.

Third, as a robustness check, we also zoom in on the governance rating and its underpinnings, management, shareholders and corporate social responsibility (CSR). The management score measures "a company's commitment and effectiveness toward following best practice corporate governance principles". The shareholders score measures "a company's effectiveness toward equal treatment of shareholders and the use of anti-takeover devices". The CSR strategy score reflects "a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes".

As illustrated in Panel C Table 9, there is no evidence of severity of loss impact for high-governance, management and shareholder ratings firms. However, the CSR sub-governance pillar is negatively and significantly related to the severity of loss at the 5% level. Similarly, governance rating management and shareholders have no impact on firms' time to recovery during the pandemic. However, Column (4) of Panel C Table 10 shows that firms with higher CSR ratings recovered significantly faster during the crisis.

Overall, the findings reported in Panel C of Tables 9 and 10 show that more socially responsible firms suffered less during the crisis in terms of severity of loss and time to recovery. These results are consistent with the view that firm investments in social capital increase their reliability, particularly during crises, leading to stock price resilience.

6. Conclusion

The year 2020 represents an exceptional time for US stock markets: it peaked on February 19, and a month later, prices declined by almost 30% related to an unexpected, exogenous health shock in the form of a pandemic. Such an exogenous event is particularly interesting since it allows us to disentangle endogeneity issues from environmental and social capital and financial resilience. We exploit this period to examine whether firm-level ES ratings pay off during a crisis period in terms of a firm's severity of loss and time to recovery.

In particular, we find that firms with high ES ratings were more resilient than firms with low ES ratings during the COVID-19 pandemic by lessening the severity of price drops and recovering faster. The results are robust to alternative survival models, alternative time windows and ES ratings measured at different points in time.

In additional analyses, we examine whether the positive effect of ESG ratings on financial resilience varies across ES dimensions. We find that the effect of ES on resilience is focused on environmental and social components. Interestingly, the governance dimension of ESG rating has no significant impact on a firm's resilience except its subcomponent CSR, which has a greater impact than other governance concepts on resilience outcomes.

Overall, our results have important implications for firms, investors and managers considering ESG commitments. From a firm's perspective, investing in environmental and social capital could help them resist future shocks and may represent an insurance policy that pays off during crises. From an investor perspective, environmental and social policies might decrease a firm's exposure risk in the case of a crisis. The findings imply that managers should concentrate on environmental, and especially social, practices to enhance financial resilience. Such a tactical application of ESG might result in competitive advantages. This paper also indicates that environmental and social capital, in addition to financial capital, can be important determinants of firm resilience and identifies the circumstances under which ES can be beneficial for firm financial health.

References

Adams, M., Hardwick, P., 1998. An analysis of corporate donations: United Kingdom evidence. Journal of Management Studies, 35, 641-654.

Albuquerque, R., Koskinen, Y., Yang, S., Zhang, C., 2019. Corporate Social Responsibility and Firm Risk: Theory and Empirical Evidence. Management science, 65, 4451-4469.

Albuquerque, R., Koskinen, Y., Yang, S., Zhang, C., 2020. Resiliency of environmental and social stocks: An analysis of the exogenous COVID-19 market crash. Review of Corporate Finance Studies, 9, 593–621.

Almeida, H., Campello, M., Laranjeira, B.,Weisbenner, S., 2012. Corporate debtmaturity and the real effects of the 2007 credit crisis. Critical Finance Review, 1, 3–58.

Ambrosius, C., 2017. What explains the speed of recovery from banking crises?, Journal of International Money and Finance 70, 257–287.

Bansal, P., Clelland, I., 2004. Talking Trash: Legitimacy, Impression Management, and Unsystematic Risk in the Context of the Natural Environment. The Academy of Management Journal, 47, 93-103.

Bansal, P., Jiang, G. F., Jung, J., C., 2015. Managing responsibly in tough economic times: Strategic and tactical CSR during the 2008-2009 global recession. Long Range Planning, 48: 69-79.

Bagnoli, M., Watts S.G., 2004. Selling to Socially Responsible Consumers: Competition and The Private Provision of Public Goods. Journal of Economics and Management Strategy. 12(3): 419-445.

Blackrock. 2020. Sustainable investing: resilience amid uncertainty. https://www.blackrock.com/corporate/about-us/ sustainability-resilience-research.

Bouslah K., Kryzanowski L., Bouchra M., 2018. Social performance and firm risk: impact of the financial crisis. Journal of Business Ethics, 149, 643–669.

Carmeli A., Tishler A., 2004. The Relationships between Intangible Organizational Elements and Organizational Performance. Strategic Management Journal.Volume 25, Issue 13 p. 1257-1278.

Carpenter, M. A., 2002. The implications of strategy and social context for the relationship between top management team heterogeneity and firm performance. Strategic Management Journal, 23: 275-284.

Cheema-Fox A., LaPerla B.R., Serafeim G., Wang H., 2020. Corporate Resilience and Response During COVID-19. Harvard Business School Working Paper 20-1.

Cornett M. M, Erhemjamts O., Tehranian H., 2016. Greed or good deeds: An examination of the relation between corporate social responsibility and the financial performance of U.S. commercial banks around the financial crisis. Journal of Banking and Finance, 70, C, 137-159.

Cox, D. R., 1972, Models and life-tables regression, Journal of the Royal Statistical Society. Series B (Methodological) 34, 187–220.

DesJardine, M., P. Bansal, and Y. Yang, 2019. Bouncing back: building resilience through social and environmental practices in the context of the 2008 global financial crisis. Journal of Management 45, 1434–1460.

Ding W., Levine R., Lin C., Xie W., 2021. Corporate Immunity to the COVID-19 Pandemic. Journal of Financial Economics, Elsevier, 141(2), 802-830.

Duchin, Ran, Oguzhan Ozbas, and Berk A. Sensoy, 2010. Costly external finance, corporate investment, and the subprime mortgage credit crisis. Journal of Financial Economics, 97, 418–435.

Dyck, A., Lins, K.V., Roth, L., and Wagner, H., 2019. Do institutional investors drive corporate social responsibility? International evidence. Journal of Financial Economics131, 693-714.

Ferrell, A., H. Liang, Renneboog, L,. 2016. Socially responsible firms. Journal of Financial Economics, 122:585–606.

Edmans, A., 2011. Does the stock market fully value intangibles? Employee satisfaction and equity prices, Journal of Financial Economics, 101, 621–640.

Ferriani F., Natoli F., 2020. ESG risks in times of Covid-19. Applied Economics Letters, 28.

Ferrier, W., J., 2001. Navigating the competitive landscape: The drivers and consequences of competitive aggressiveness. Academy of Management Journal, 44: 858-877.

Gantchev N., Giannetti M., Li R. 2022. Does Money Talk? Divestitures and Corporate Environmental and Social Policies. Review of finance, 1-40.

Garcia-Castro, R., Arino, M. A., Canela, M. A. 2010. Does social performance really lead to financial performance? Accounting for endogeneity. Journal of Business Ethics, 92: 107-126.

Hale, J., April 3, 2020. Sustainable funds weather the first quarter better than conventional funds. Morningstar Sustainability Matters.

Harford, J., Klasa S., Maxwell W., F., 2014. Refinancing risk and cash holdings. Journal of Finance, 69, 975–1012.

Heinkel R., Kraus A., Zechner J., 2001. The Effect of Green Investment on Corporate Behavior. Journal of Financial and Quantitative Analysis, 36, 4 431-449.

Marsat, S., Pijourlet G., Ullah M., 2020. Is there a trade-off between environmental performance and financial resilience? International evidence from the subprime crisis?. Accounting and Finance 61, 4061-4084.

McWilliams , A., Siegel D., 2001. Corporate Social Responsibility: A Theory of the Firm Perspective. The Academy of Management Review, 26, 117-127.

Nagy, Z., Giese, G. April 22, 2020. MSCI ESG indexes during the coronavirus crisis. https://www.msci.com/www/blog-posts/ msci-esg-indexes-during-the/01781235361

Navarro, P. 1988. Why do corporations give to charity?. Journal of Business, 61:1, 65–93.

Nguyen, T., Nguyen, H.G., Yin X., 2014. Corporate Governance and Corporate Financing and Investment during the 2007-2008 Financial Crisis. Financial Management,44, 115-146.

Porter, M., van der Linde, C. (1995). Toward a New Conception of the Environment Competitiveness Relationship, *The Journal of Economic Perspectives*, 9, 97-118.

Lins K.V., Servaes H., Tamayo A., 2017. Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis. Journal of finance, 4, 1785-1824.

Lins K.,V., Volpin, P., Wagner, H. F., 2013. Does Family Control Matter? International Evidence from the 2008–2009 Financial Crisis. The Review of Financial Studies, 26, 10, 2583–2619.

Paunov, C., 2012. The global crisis and firms' investments in innovation. Research Policy, 41: 24-35.

Reinhart, C. M., Rogoff, K. S., 2014, Recovery from financial crises: evidence from
100 episodes. American Economic Review, 104, 50–55.

Renneboog L., Ter Horst J., and Zhang C., 2011. Is ethical money financially smart? Nonfinancial

attributes and money flows of socially responsible investment funds. Journal of financial intermediation, 20, 562-588.

Siegel, S. D., Vitaliano D.F., 2007. An Empirical Analysis of the Strategic Use of Corporate Social Responsibility. Journal of Economics and Management Strategy, 16, 3. 773-792.

Shan, C., Tang D. Y., 2022. The Value of Employee Satisfaction in Disastrous Times: Evidence from COVID-19. Forthcoming Review of Finance.

Shea, J., 1997. Instrument relevance in multivariate linear models: A simple measure. Review of Economics and Statistics, 79: 348-352.

Suchman, 1995. Managing Legitimacy: Strategic and Institutional Approaches. The Academy of Management Review, 20, 571-610.

Udayasankar, K. 2008. Corporate social responsibility and firm size. Journal of Business Ethics, 83: 167-175.

Van Der Vegt, G. S., Essens, P., Wahlstrom, M., George, G., 2015. Managing risk and resilience. Academy of Management Journal, 58: 971-980.

Willis, A., April 24,2020. ESG as an equity vaccine. Morningstar Market Insights. https://www.morningstar.ca/ca/news/ 201741/esg-as-an-equity-vaccine.aspx

Appendix A1: Variable definitions and data sources

Variable	Definition	Source
Severity of loss	Absolute percentage loss in stock price following the start of the crisis: [(minimum stock price between February 20, 2020, and December 31, 2020 – closing stock price on December 2019)/closing stock price on December 2019] – 1.	Datastream.
Recovery	Duration of market price recovery (in days) to its precrisis level.	Datastream.
ES	Average between Refinitiv Environment Pillar Score and Social Pillar Score divided by 100 and measured in 2019. Environment (Social) Pillar Score is the weighted average relative rating of a company based on the reported environmental (social) information and the resultant three (four) environmental (social) category scores.	Refinitiv ESG
Control variables		
MB	Market value of equity/Book value of equity.	Datastream
ROA	Return on assets.	Datastream
SIZE	Natural log of firm's total assets.	Datastream
DA	Book value of debts/Book value of assets.	Datastream
SG	Sales growth (sales in current year divided by sales in previous year).	Datastream
RDDUM	R&D dummy equals 1 if firms have R&D expenditure and 0 otherwise.	Datastream
CAPEX	Capital expenditures/Book value of assets value of assets.	Datastream
MOMENTUM	Stock price MOMENTUM, three years' market price change before crisis.	Datastream
INDUSTRY	Dummy for industry from the GICS 2-digitclassification.	Datastream
Number of employees	The number of full and part time workers.	Datastream
R&D expenses	Research and development expenses.	Datastream

Appendix A2: Sample construction	
Firms in the sample	
Total number of firms in the sample.	3,536
Less: Firm stock prices not available on DataStream, necessary for calculating our main variable of interest (i.e., resilience).	(503)
Less: Firms ES score ratings not available.	(150)
Less: Firms' market-to-book value (MB) observations not available.	(141)
Less: Firms' sales growth (SG) observations not available.	(916)
Less: Firms MOMENTUM observations not available.	(247)
Less: Firms CAPEX observations not available.	(71)
Final sample	1,508

Table 1: Summary statistics

Panel A of this table reports the summary statistics (number of observations, mean, standard deviation, and 25th, median and 75th percentiles) for all variables. Panel B reports the summary statistics by sectors. Panel B reports the number of firms by sector. Table A1 in the appendix defines all variables used in the paper.

Panel A

Variables	N	Mean	SD	P25	P50	P75
Severity of loss	1508	0.441	0.203	0.312	0.439	0.569
Recovery	1,508	120	122	0.000	99	211
ES	1,508	0.327	0.222	0.153	0.254	0.479
MB	1,508	2.827	47.659	1.260	2.195	4.295
ROA	1,508	0.705	0.703	0.189	0.564	1.003
SIZE	1,508	14.652	1.904	13.415	14.634	15.848
DA	1,508	0.264	0.242	0.058	0.230	0.406
SG	1,508	3.853	92.299	0.893	0.991	1.103
RDDUM	1,508	0.426	0.495	0.000	0.000	1.000
CAPEX	1,508	4.388	6.772	0.870	2.460	5.645
MOMENTUM	1,508	0.730	23.417	-0.023	0.042	0.203
Number of employees	1,508	14 ,318	44,259	476	2,460	9,326
R&D expenses	1,508	205,141	1,518,583	0	0	42,567

Panel B: Distribution of Firms Across Industry Divisions

Sector	N	Severity of loss	
		Mean	SD
Financials	344	0.469	0.148
Industrials	300	0.437	0.170
Health Care	241	0.357	0.256
Consumer Goods	160	0.439	0.198
Consumer Services	146	0.563	0.207
Technology	133	0.377	0.185
Basic materials	58	0.485	0.168
Oil & Gas	57	0.634	0.198
Utilities	47	0.283	0.120
Telecommunications	22	0.292	0.153

Table 2: Instrumental Variables Approach: First Stage Regression of ES

This table presents a correlation matrix of all the variables employed in our main analyses. Table A1 in the appendix defines all variables used in the paper.

Variable	1	2	3	4	5	6	7	8	9	10	11
1.Severity of loss											
2.ES	-0.099***										
3.MB	0.012	-0.027									
4.ROA	0.051	0.022	0.036								
5.SIZE	-0.032	0.572***	-0.031	-0.182***							
6.DA	0.155***	0.189***	-0.056	-0.053	0.210***						
7.SG	-0.115***	-0.022	0.021	-0.030	-0.083***	-0.033					
8.CAPEX	0.075***	0.077***	-0.011	0.039	0.008	0.130***	-0.019				
9.RDDUM	-0.230***	0.087***	-0.010	0.011	-0.276***	-0.090***	0.036	-0.112***			
10.MOMENTUM	-0.027	-0.003	-0.001	-0.013	0.086***	-0.013	-0.001	-0.007	-0.022		
11.Number of employees	-0.043	0.380***	-0.019	0.123***	0.396***	0.060	-0.010	0.037	-0.046	0.226***	
12.R&D expense	-0.120***	0.192***	0.008	-0.011	0.222***	-0.001	-0.003	0.025	0.157***	0.005	0.384***

Table 3: Severity of Loss: OLS regression and Instrumental Variables 2SLS (First- and Second-Stage Regression)

Ordinary least squares (OLS) of model Severity of $\text{loss}_j = \alpha + \beta_1 \text{ES Rating}_j + \text{MB}_j + \text{ROA}_j + \text{SIZE}_j + \text{DA}_j + \text{SG}_j + \text{CAPEX}_j + \text{RDDUM}_j + \text{MOMENTUM}_j + \gamma_j + \varepsilon_j$ are shown in Panel A. The ES rating is measured at year-end 2019. γ_j corresponds to industry dummies. Negative coefficients indicate that an increase in the value of that variable decreases the likelihood of severity of loss. Two-stage least squares (2SLS) regression results of model $\text{ES Rating}_j = \alpha + \beta_1 \text{Number of employees}_j + \beta_2 \text{R\&D}_j + \text{MB}_j + \text{ROA}_j + \text{SIZE}_j + \text{DA}_j + \text{SG}_j + \text{CAPEX}_j + \text{RDDUM}_j + \text{MOMENTUM}_j + \gamma_j + \varepsilon_j$ and $\text{Severity of loss}_j = \alpha + \beta_1 \text{Fit\_ES Rating}_j + \text{MB}_j + \text{ROA}_j + \text{SIZE}_j + \text{DA}_j + \text{SG}_j + \text{CAPEX}_j + \text{RDDUM}_j + \text{MOMENTUM}_j + \gamma_j + \varepsilon_j$ are shown in Panel B. Column (1) presents the first-stage regression results and Column (2) of Panel B presents the second-stage regression results with Number of employees and R&D expense as dependent variables, respectively. In all models, we include industry dummies (defined at the two-digit SIC level). ES is a firm's average between Refinitiv Environment Pillar Score, Social Pillar Score divided by 100. MB represents market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents book value of debt divided by book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided by Book value of assets. RDDUM represents an R&D dummy, equal to1 if the firm discloses R&D expenditure and 0 otherwise. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. Table A1 in the appendix defines all variables used in the paper.

Panel A : OLS regression

Variables	**Model 1**	**Model 2**
	(1)	**(2)**
ES	-0.105***	-0.120***
	(-4.92)	(-4.14)
MB		0.001
		(1.06)
ROA		-0.004
		(-0.63)
SIZE		-0.001
		(-0.05)
DA		0.129***
		(4.99)
SG		-0.001***
		(-11.98)
CAPEX		-0.001
		(-0.13)
RDDUM		-0.044***
		(-3.39)
MOMENTUM		-0.001***

		(-4.45)
Constant	0.316***	0.317***
	(10.07)	(4.26)
Industry	Yes	Yes
Observations	1,508	1,508
R^2	0.144	0.192

Panel B : Instrumental Variables 2SLS (First- and Second-Stage Regression)

	First stage	**Second stage**
Variables	**ES**	**Time to recovery**
	(1)	**(2)**
Number of employees	0.779***	
	(6.52)	
R&D expense	-0.005*	
	(-1.73)	
Fit_ES		-0.359**
		(-2.04)
MB	-0.001	0.001
	(-0.13)	(0.83)
ROA	0.022***	0.002
	(3.09)	(0.24)
SIZE	0.073***	0.019
	(25.66)	(1.31)
DA	0.052***	0.141***
	(2.84)	(6.23)
SG	0.001	-0.001***
	(1.31)	(-3.94)
CAPEX	0.003***	0.001
	(4.11)	(0.66)
RDDUM	0.098***	-0.022
	(8.52)	(-1.01)
MOMENTUM	-0.001***	-0.001
	(-4.05)	(-1.62)
Constant	-0.793***	0.056
	(-15.22)	(0.28)
Industry	Yes	Yes
Observations	1,508	1,508
Wald $\chi 2$		331.30***

Sargan χ^2	1.290	
Cragg-Donald F statistic	21.33***	
Anderson statistic χ^2	6.435 **	
Shea partial R^2	0.028	
Adjusted R^2	0.463	0.155
F statistic	8.852 ***	

Table 4: Matched t test of ES comparison between recovered and unrecovered firms' groups

This table reports the ES score of recovered and unrecovered firms during the Covid19 crisis period. The last line tests the hypothesis of no significant difference in means (t test) between the recovered and unrecovered groups of firms. Coefficients ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Group	N	Mean	Std. Err.	Std. Dev.
Recovered firms	907	0.351	0.007	0.227
Unrecovered firms	601	0.291	0.008	0.210
Combined	1,508	0.327	0.005	0.222
Difference		-0.059***		

Figure 1: Kaplan–Meier survival estimates between the high and low EP groups

This figure shows the Kaplan–Meier curves for both groups, which were split according to the median. The x-axis shows the analysis time, and the y-axis shows the probability of remaining in the same state of non-recovery. High probability shows lower resilience. The 95 percent confidence intervals are represented by shaded areas.

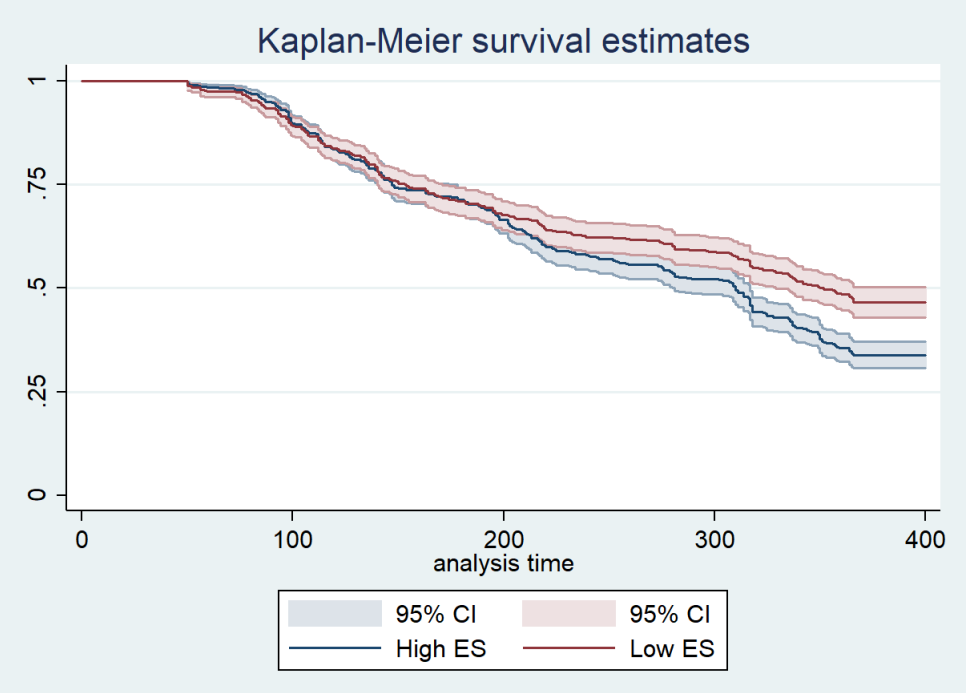

Table 5: Log-rank test for equality of Kaplan–Meier curves

This table shows the statistical significance of the difference between the Kaplan–Meier curves, indicating that both curves are significantly different from each other.

Groups	Events observed	Events expected
Low ES group	377	440.65
High ES group	530	466.35
Total	907	907.00
	chi2(1) = 18.05	Pr>chi2 = 0.000

Table 6: Time to Recovery (Cox Survival Analysis)

This table presents the Cox proportional hazard regression model. The crisis period is calculated from February 20, 2020 to year-end 2019. Negative coefficients indicate that an increase in the value of that variable decreases the likelihood of recovery. ES is a firm's average between Refinitiv Environment Pillar Score and Social Pillar Score divided by 100. In Panel A, we use a linear measure of ES which the mean of environmental and social ratings. In Panel B, the main explanatory variable has been changed from the ES rating to two indicator variables by dividing firms into ES quartiles: ES1 and ES2 ranging them from the group with the lowest score (ES1) to the group with the highest score (ES2). In Panel C, we employ the linear measure of ES and add measures of corporate governance. Governance rating corresponds to governance performance that were excluded from the initial ESG rating. Board Independence corresponds to whether the company has a policy regarding the independence of its board. Board Size refers to total number of board members at the end of the fiscal year, a dummy if the CEO Is Not the Chairman, and a dummy if the CEO is a Board Member. MB represents the market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents the book value of debt divided by the book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided by the Book value of assets. RDDUM represents an R&D dummy, equal to1 if the firm discloses R&D expenditure and 0. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively. Table A1 in the appendix defines all variables used in the paper.

Panel A : Overall ESG

Variables	**Model 1**	**Model 2**
	(1)	**(2)**
ES	0.653***	0.788***
	(4.32)	(3.90)
MB		0.001
		(0.34)
ROA		0.151***
		(2.67)
SIZE		-0.034
		(-1.24)
DA		-0.044
		(-0.29)
SG		0.001***
		(4.26)
CAPEX		0.013**
		(2.36)
RDDUM		0.298***
		(3.35)
MOMENTUM		0.002*
		(1.66)

Industry	Yes	Yes
Likelihood ratio	-6,121***	-6,104***
Observations	1,508	1,508
Panel B : Dummies for Quartiles of ESG Score:		
Variables	**Model 1**	**Model 2**
	(1)	**(2)**
ES1	0.916	1.122
	(1.34)	(1.58)
ES2	0.699***	0.851***
	(3.64)	(3.55)
MB		0.001
		(0.35)
ROA		0.151***
		(2.66)
SIZE		-0.035
		(-1.27)
DA		-0.043
		(-0.28)
SG		0.001***
		(4.26)
CAPEX		0.013**
		(2.37)
RDDUM		0.296***
		(3.33)
MOMENTUM		0.002*
		(1.69)
Industry	Yes	Yes
Likelihood ratio	-6,121***	-6,104***
Observations	1,508	1,508
Panel C : Controlling for Corporate Governance		
Variables	**Model 1**	**Model 2**
	(1)	**(2)**
ES	0.887***	0.801***
	(4.24)	(3.92)
Governance rating	-0.301*	
	(-1.77)	
Board Independence		0.180

		(1.42)
Board Size		-0.022
		(-1.14)
CEO Is Not Chair		-0.119*
		(-1.73)
CEO Is Board Member		0.053
		(0.23)
MB	0.001	0.001
	(0.28)	(0.32)
ROA	0.154***	0.159***
	(2.75)	(2.81)
SIZE	-0.030	-0.026
	(-1.12)	(-0.84)
DA	-0.055	-0.017
	(-0.37)	(-0.11)
SG	0.001***	0.0012***
	(4.21)	(4.22)
CAPEX	0.013**	0.012**
	(2.33)	(2.10)
RDDUM	0.291***	0.279***
	(3.28)	(3.10)
MOMENTUM	0.002	0.002
	(1.57)	(1.64)
Industry	Yes	Yes
Likelihood ratio	-6,102***	-6,062***
Observations	1,508	1,491

Table 7: Time to Recovery: Robustness checks

Panel A presents alternative survival models, namely, the Exponential, Weibull and Gompertz hazard models. Panel B represents results for the extended time window. More specifically, we rerun our baseline model by extending the crisis period to March 2021 and June 2021 with control variables and industry dummies Negative coefficients indicate that an increase in the value of that variable decreases the likelihood of recovery. ES is a firm's average between the Refinitiv Environment Pillar Score and the Social Pillar Score divided by 100. MB represents market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents the book value of debt divided by the book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided the Book value of assets. RDDUM represents an R&D dummy, equal to1 if the firm discloses R&D expenditure and 0 otherwise. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

Panel A : Alternative models

Variables	**Exponential Model**	**Weibull model**	**Gompertz model**
	(1)	**(2)**	**(3)**
ES	0.673***	0.810***	0.787***
	(3.34)	(4.00)	(3.88)
MB	0.001	0.001	0.001
	(0.26)	(0.26)	(0.28)
ROA	0.146***	0.160***	0.161***
	(2.63)	(2.78)	(2.83)
SIZE	-0.027	-0.029	-0.028
	(-1.02)	(-1.07)	(-1.02)
DA	-0.013	-0.0682	-0.057
	(-0.09)	(-0.45)	(-0.38)
SG	0.001*	0.001***	0.001**
	(1.80)	(2.98)	(2.31)
CAPEX	0.011**	0.014**	0.014**
	(2.09)	(2.51)	(2.44)
RDDUM	0.275***	0.312***	0.306***
	(3.10)	(3.51)	(3.45)
MOMENTUM	0.002	0.002*	0.002*
	(1.55)	(1.68)	(1.70)
Constant	-5.401***	-9.212***	-5.976***
	(-11.83)	(-17.25)	(-12.94)
Ln(p)		0.524***	

		(18.40)	
γ			0.004***
			(12.21)
Industry	Yes	Yes	Yes
Likelihood ratio	-1636***	-1499***	-1562***
Observations	1,508	1,508	1,508

Panel B : Different time windows

Variables	**Extended to 1st quarter 2021**	**Extended to 2nd quarter 2021**
ES	0.527***	0.439**
	(2.89)	(2.45)
MB	0.001	0.001
	(0.23)	(0.60)
ROA	0.113**	0.093*
	(2.11)	(1.72)
SIZE	-0.015	-0.005
	(-0.61)	(-0.22)
DA	-0.114	-0.214
	(-0.81)	(-1.55)
SG	0.001***	0.001***
	(4.21)	(4.30)
CAPEX	0.008	0.008*
	(1.57)	(1.82)
RDDUM	0.217***	0.182**
	(2.66)	(2.32)
MOMENTUM	0.001	0.001
	(1.29)	(1.11)
Industry	Yes	Yes
Likelihood ratio	-7236***	-7664***
Recovered firms	1,138	1,216
Observations	1,508	1 ,508

Table 8: ES ratings at different points in time

Panel A presents the results of estimating the following regression model $ES\ Rating_j = \alpha + \beta_1 Number\ of\ employees_j + \beta_2 R\&D_j + MB_j + ROA_j + SIZE_j + DA_j + SG_j + CAPEX_j + RDDUM_j + MOMENTUM_j + \gamma_j + \varepsilon_j$ and $Severity\ of\ loss_j = \alpha + \beta_1 Fit\_ES\ Rating_j + MB_j + ROA_j + SIZE_j + DA_j + SG_j + CAPEX_j + RDDUM_j + MOMENTUM_j + \gamma_j + \varepsilon_j$ where ES Rating is measured at year-end 2018, 2020 and 2021. Panel B presents the results of the Cox proportional hazard regression model where ES Rating is measured at year-end 2018, 2020 and 2021. ES is a firm's average between the Refinitiv Environment Pillar Score and the Social Pillar Score divided by 100. MB represents the market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents the book value of debt divided by the book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided by Book value of assets. RDDUM represents an R&D dummy, equal to 1 if the firm discloses R&D expenditure and 0 otherwise. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

Panel A : Severity of Loss: Instrumental Variables 2SLS (Second-Stage Regression):

Variables	**ES2018**	**ES2020**	**ES2021**
	(1)	**(2)**	**(3)**
ES	-0.344**	-0.337	-0.629**
	(-2.01)	(-0.99)	(-2.12)
MB	0.001	0.001	0.001
	(0.96)	(1.02)	(0.93)
ROA	0.004	0.001	0.011
	(0.35)	(0.04)	(0.83)
SIZE	0.014	0.011	0.043*
	(0.97)	(0.49)	(1.94)
DA	0.154***	0.196***	0.127***
	(6.26)	(5.73)	(3.60)
SG	-0.001***	-0.001***	-0.001**
	(-3.82)	(-3.81)	(-2.54)
CAPEX	-0.001	0.001	0.001
	(-0.03)	(0.12)	(0.77)
RDDUM	-0.030	-0.007	0.023
	(-1.45)	(-0.16)	(0.74)
MOMENTUM	-0.001	-0.001	-0.001*
	(-1.35)	(-1.10)	(-1.73)
Constant	0.130	0.128	-0.223

	(0.64)	(0.47)	(-0.81)
Industry	Yes	Yes	Yes
Wald $\chi 2$	307***	135***	122***
Observations	1,334	636	730
R^2	0.190	0.190	0.200

Panel B: Time to Recovery

Variables	**ES2018**	**ES2020**	**ES2021**
	(1)	**(2)**	**(3)**
ES	0.552***	0.765**	1.183***
	(2.65)	(2.14)	(3.77)
MB	0.001	0.001	0.001
	(0.07)	(0.53)	(0.20)
ROA	0.144**	0.255***	0.092
	(2.18)	(3.95)	(1.23)
SIZE	0.017	-0.030	-0.133***
	(0.59)	(-0.69)	(-3.17)
DA	-0.196	0.151	0.001
	(-1.20)	(0.65)	(0.00)
SG	0.001***	0.001***	0.007***
	(4.39)	(3.61)	(3.05)
CAPEX	0.014**	0.019***	0.015*
	(2.50)	(3.11)	(1.81)
RDDUM	0.297***	0.521***	0.089
	(3.19)	(3.56)	(0.68)
MOMENTUM	0.001	0.002	0.002**
	(1.21)	(1.64)	(2.19)
Industry	Yes	Yes	Yes
Likelihood ratio	-5453***	-2187***	-2529***
Observations	1,334	636	730

Table 9: Severity of Loss: Instrumental Variables 2SLS (Second-Stage Regression): Zoom on ES DIMENSIONS

In Panel A, we re-estimate Equation (3) by focusing on the environmental pillar and its three categories, namely, resource use, emission and innovation. Refinitiv defines the resource use score as a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management‖. The emission category measures a company's commitment and effectiveness toward reducing environmental emissions in its production and operational processes‖. The last environmental subcategory, innovation, is defined as a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products‖. Panel B, we re-estimate the baseline regressions by zooming on social rating and its subcomponents, namely, workforce, human rights, community and product responsibility. The workforce score measures a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities and development opportunities for its workforce‖. The human rights score measures a company's effectiveness in terms of respecting fundamental human rights conventions‖. The community score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics‖. The product responsibility score reflects a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity and data privacy. In Panel C, we also zoom in on governance rating and its sub-pillars, management, shareholders and corporate social responsibility (CSR). The management score measures a company's commitment and effectiveness toward following best practice corporate governance principles‖. The shareholders score measures a company's effectiveness toward equal treatment of shareholders and the use of anti-takeover devices‖. The CSR strategy score reflects a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes MB represents the market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents the book value of debt divided by the book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided by the Book value of assets. RDDUM represents an R&D dummy, equal to1 if the firm discloses R&D expenditure and 0 otherwise. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

Panel A : Environmental dimension

Variables	**Environmental**	**Ressource use**	**Emission**	**Innovation**
Environmental	-0.276**			
	(-2.12)			
Ressource Use		-0.002**		
		(-1.99)		
Emission			-0.004***	
			(-2.62)	
Innovation				-0.004*
				(-1.88)
MB	0.001	0.001	0.001	0.001

	(0.81)	(1.12)	(0.81)	(0.20)	
ROA	-0.001	0.001	0.002	0.005	
	(-0.04)	(0.01)	(0.27)	(0.48)	
SIZE	0.014	0.016	0.034**	0.011	
	(1.21)	(1.18)	(1.98)	(0.94)	
DA	0.143***	0.146***	0.159***	0.123***	
	(6.44)	(6.36)	(6.28)	(5.63)	
SG	-0.001***	-0.001**	-0.001**	-0.001**	
	(-2.60)	(-2.56)	(-2.08)	(-2.52)	
CAPEX	0.001	0.001	0.001	-0.001	
	(0.60)	(0.45)	(1.25)	(-0.55)	
RDDUM	-0.032*	-0.026	-0.03*	-0.017	
	(-1.87)	(-1.31)	(-1.79)	(-0.67)	
MOMENTUM	-0.001	-0.001	-0.001**	-0.001	
	(-1.43)	(-1.56)	(-2.08)	(-0.70)	
Industry	Yes	Yes	Yes	Yes	
Observations	1,508	1,503	1,503	1,503	
Wald $\chi 2$	335.21***	329.35***	292.50***	285.37***	
R^2	0.157	0.146	0.027	0.014	

Panel B : Social Dimension

Variables	**Social**	**Workforce**	**Human Rights**	**Community**	**Product Responsibilty**
Social	-0.514**				
	(-2.00)				
Workforce		-0.874**			
		(-2.26)			
Human Rights			-0.353**		
			(-2.26)		
Community				0.301	
				(0.71)	
Product Responsibilty					-0.505**
					(-2.08)
MB	0.001	0.001	0.001	0.001	0.0001
	(0.87)	(1.01)	(0.19)	(0.64)	(0.96)
ROA	0.005	0.009	0.006	-0.016	0.001

	(0.43)	(0.69)	(0.56)	(-1.20)	(0.11)
SIZE	0.026	0.067*	0.019	-0.031	0.017
	(1.42)	(1.95)	(1.44)	(-1.05)	(1.25)
DA	0.135***	0.135***	0.147***	0.127***	0.125***
	(6.06)	(4.97)	(6.08)	(5.85)	(5.25)
SG	-0.001**	-0.001	-0.001**	-0.001***	-0.001**
	(-2.10)	(-1.58)	(-2.45)	(-2.86)	(-1.97)
CAPEX	0.001	0.002	0.001	-0.001	0.0001
	(0.74)	(1.29)	(0.19)	(-0.99)	(0.10)
RDDUM	-0.004	0.011	-0.009	-0.076**	0.002
	(-0.14)	(0.33)	(-0.37)	(-2.57)	(0.08)
MOMENTUM	-0.001*	-0.001**	-0.001	0.001	-0.001*
	(-1.87)	(-2.20)	(-1.07)	(0.03)	(-1.81)
Industry	Yes	Yes	Yes	Yes	Yes
Wald $\chi 2$	294.71***	191.53***	22.59***	292.08***	242.39***
Observations	1508	1503	1503	1503	1503
R^2	0.051	. 0.051	0.001	0.057	. 0.051

Panel C : Governance Dimension

Variables	**Governance**	**Management**	**Shareholders**	**Corporate Social Responsibility**
Governance	-0.510			
	(-1.02)			
Management		0.433		
		(0.60)		
Shareholders			-0.882	
			(-1.31)	
Corporate Social Responsibility				-0.326**
				(-2.24)
MB	0.00000104	0.000186	0.0000553	0.0000303
	(0.01)	(0.95)	(0.32)	(0.29)
ROA	0.00897	-0.0248	0.0134	0.00315
	(0.46)	(-0.87)	(0.61)	(0.32)
SIZE	0.0100	-0.0268	-0.00472	0.0219
	(0.49)	(-0.97)	(-0.73)	(1.49)
DA	0.114***	0.142***	0.102***	0.151***

	(4.55)	(3.84)	(2.60)	(6.27)
SG	-0.000172***	-0.000138**	-0.000263**	-0.000120**
	(-2.85)	(-2.08)	(-2.17)	(-2.18)
CAPEX	0.000176	-0.00109	0.000541	0.000362
	(0.16)	(-0.88)	(0.36)	(0.42)
RDDUM	-0.0412*	-0.0703***	-0.0763***	-0.0203
	(-1.95)	(-2.64)	(-2.90)	(-0.97)
MOMENTUM	-0.000418	-0.0000188	-0.000535	-0.000429*
	(-1.32)	(-0.05)	(-1.23)	(-1.84)
Constant	0.341**	0.518***	0.741***	-0.0395
	(2.56)	(4.30)	(3.10)	(-0.17)
Industry	Yes	Yes	Yes	Yes
Wald $\chi 2$	255.31***	235.22***	110.38***	308.39***
Observations	1,503	1,503	1,503	1,503
R^2	0.094	0.094	0.094	0.094

Table 10: Time to Recovery (Cox Survival Analysis): Zoom in on ES DIMENSIONS

In Panel A, we re-estimate Equations (4) by focusing on the environmental pillar and its three categories, namely, resource use, emission and innovation. Refinitiv defines the resource use score as a company's performance and capacity to reduce the use of materials, energy or water, and to find more eco-efficient solutions by improving supply chain management‖. The emission category measures a company's commitment and effectiveness toward reducing environmental emissions in its production and operational processes‖. The last environmental subcategory that is innovation is defined as a company's capacity to reduce the environmental costs and burdens for its customers, thereby creating new market opportunities through new environmental technologies and processes or eco-designed products‖. In Panel B, we re-estimate the baseline regressions by zooming in on the social rating and its subcomponents, namely, workforce, human rights, community and product responsibility. The workforce score measures a company's effectiveness in terms of providing job satisfaction, a healthy and safe workplace, maintaining diversity and equal opportunities and development opportunities for its workforce‖. The human rights score measures ―a company's effectiveness in terms of respecting fundamental human rights conventions‖. The community score measures the company's commitment to being a good citizen, protecting public health and respecting business ethics‖. The product responsibility score reflects a company's capacity to produce quality goods and services, integrating the customer's health and safety, integrity and data privacy. In Panel C, we also zoom in on governance rating and its sub-pillars, management, shareholders and corporate social responsibility (CSR). The management score measures a company's commitment and effectiveness toward following best practice corporate governance principles‖. The shareholders score measures a company's effectiveness toward equal treatment of shareholders and the use of anti-takeover devices‖. The CSR strategy score reflects a company's practices to communicate that it integrates economic (financial), social and environmental dimensions into its day-to-day decision-making processes. MB represents market-to-book value. ROA represents return on assets. SIZE is the natural log of a firm's total assets. DA represents the book value of debt divided by the book value of assets. SG represents sales growth. CAPEX represents Capital expenditures divided by the Book value of assets. RDDUM represents an R&D dummy, equal to1 if the firm discloses R&D expenditure and 0 otherwise. Standard errors are in parentheses. *, ** and *** indicate statistical significance at the 10, 5 and 1 percent levels, respectively.

Panel A : Environmental dimension

Variables	**Environmental**	**Ressource use**	**Emission**	**Innovation**
Environmental	0.673***			
	(4.07)			
Ressource Use		0.466***		
		(3.34)		
Emission			0.520***	
			(3.65)	
Innovation				0.503***
				(3.66)
MB	0.001	0.001	0.001	0.001
	(0.33)	(0.27)	(0.30)	(0.42)

ROA	0.153***	0.149***	0.154***	0.154***
	(2.69)	(2.62)	(2.73)	(2.71)
SIZE	-0.032	-0.019	-0.024	0.004
	(-1.21)	(-0.71)	(-0.91)	(0.16)
DA	-0.041	-0.051	-0.037	-0.009
	(-0.27)	(-0.34)	(-0.25)	(-0.06)
SG	0.001***	0.001***	0.001***	0.001***
	(4.29)	(4.32)	(4.30)	(4.39)
CAPEX	0.0129**	0.0132**	0.0127**	0.015***
	(2.32)	(2.39)	(2.28)	(2.78)
RDDUM	0.312***	0.319***	0.343***	0.322***
	(3.55)	(3.60)	(3.94)	(3.65)
MOMENTUM	0.002	0.002	0.002*	0.001
	(1.56)	(1.55)	(1.67)	(1.27)
Industry	Yes	Yes	Yes	Yes
Likelihood ratio	-6,103***	-6,096***	-6,095 ***	-6,095***
Observations	1,508	1,503	1,503	1,503

Panel B : Social Dimension

Variables	**Social**	**Workforce**	**Human Rights**	**Community**	**Product Responsibilty**
Social	0.561***				
	(2.81)				
Workforce		0.443***			
		(2.72)			
Human Rights			0.178		
			(1.35)		
Community				0.507***	
				(2.87)	
Product Responsibilty					-0.038
					(-0.27)
MB	0.001	0.001	0.001	0.001	0.001
	(0.33)	(0.37)	(0.35)	(0.22)	(0.32)
ROA	0.159***	0.155***	0.159***	0.154***	0.167***
	(2.83)	(2.77)	(2.80)	(2.73)	(3.00)
SIZE	-0.008	-0.006	0.018	-0.002	0.036

	(-0.31)	(-0.25)	(0.75)	(-0.08)	(1.59)
DA	-0.037	-0.026	-0.038	-0.014	-0.025
	(-0.25)	(-0.17)	(-0.25)	(-0.09)	(-0.17)
SG	0.001***	0.001***	0.001***	0.001***	0.001***
	(4.32)	(4.37)	(4.42)	(4.30)	(4.46)
CAPEX	0.014**	0.014**	0.014***	0.014***	0.014***
	(2.51)	(2.52)	(2.65)	(2.67)	(2.70)
RDDUM	0.316***	0.341***	0.349***	0.346***	0.378***
	(3.55)	(3.90)	(3.94)	(3.96)	(4.27)
MOMENTUM	0.002	0.002	0.001	0.002	0.001
	(1.59)	(1.62)	(1.32)	(1.61)	(1.27)
Industry					
Likelihood ratio	-6,108***	-6,097***	-6,100***	-6,097***	-6,101***
Observations	1508	1503	1503	1503	1503

Panel C : Governance Dimension

Variables	**Governance**	**Management**	**Shareholders**	**Corporate Social Responsibility**
Governance	-0.094			
	(-0.57)			
Management		-0.119		
		(-0.96)		
Shareholders			-0.001	
			(-0.01)	
Corporate Social Responsibility				0.269*
				(1.91)
MB	0.001	0.001	0.001	0.001
	(0.30)	(0.29)	(0.32)	(0.39)
ROA	0.169***	0.169***	0.167***	0.158***
	(3.03)	(3.04)	(2.98)	(2.81)
SIZE	0.037*	0.038*	0.034	0.006
	(1.68)	(1.75)	(1.59)	(0.22)
DA	-0.031	-0.035	-0.026	-0.040
	(-0.20)	(-0.23)	(-0.17)	(-0.27)
SG	0.001***	0.001***	0.001***	0.001***
	(4.44)	(4.43)	(4.45)	(4.35)

CAPEX	0.014***	0.014***	0.014***	0.014**
	(2.70)	(2.69)	(2.69)	(2.57)
RDDUM	0.376***	0.376***	0.374***	0.348***
	(4.32)	(4.33)	(4.30)	(3.95)
MOMENTUM	0.001	0.001	0.001	0.001
	(1.25)	(1.25)	(1.29)	(1.47)
Industry	Yes	Yes	Yes	Yes
Likelihood ratio	-6101***	-6101***	-6101***	-6099***
Observations	1,503	1,503	1,503	15,03