Does CSR Help Firms to Face Supply Chain Disruptions?

Evidence from the Suez Canal Ever Given Obstruction*

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Abstract: We investigate whether Corporate Social Responsibility (CSR) compliant procurement activities reduce firm exposure to supply chain disruptions. The Suez Canal obstruction in March 2021 by the Ever Given container ship provides the needed exogenous shock. We collect measures of intensity of firms' CSR procurement activities in the Refinitiv ESG database for a large sample of European listed firms accounting for more than sixty percent of the Euro STOXX Total Market index capitalization. Using a differences-in-differences approach, our results indicate that CSR active firms suffer significantly less from supply chain disruptions. This result resists to several robustness checks and identifies a new channel through which CSR activities contribute to firm value creation.

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On March 23, early in the morning local time, the Ever Given container ship, a 400 meter long giant, blocked maritime traffic in the Suez Canal. A clear sign of the importance of this route in the organization of the global energy and commercial goods supply chain was the next day's 4% rise in crude oil prices amidst fears that the Suez Canal could be closed for a long time, a worrisome scenario. Five days later, on March 28, 369 ships were queuing to pass through the Suez Canal, with a daily estimate of USD 9.6 billion in merchandise held up ('Suez blockage is holding up $9.6bn of goods a day' – BBC News). During the first few days, there were great uncertainties as to how long it would take to reopen the route. On March 26, Y. Cholteeva wrote, "while concentrated efforts to free the ship are being made, they have made little progress so far and experts predict that it could take weeks to remove the Ever Given" (offshore-technology.com), a quote representative of the specialized press opinion based on the situation on March 25.

The Ever Given incident highlights the fragility of our modern just-in-time production processes, hanging on timely merchandise deliveries. But for the academic community, it offers a neat quasi-experiment to explore factors mitigating firm exposure to such supply chain disruptions. We take this opportunity to investigate whether engagement in Environmental, Social and Governance/Corporate Social Responsibility (ESG/CSR[1]) plays such a mitigating role. This question deserves investigation. Major supply chain disruptions indeed happen. One may think for example to the 2011 tsunami that hit Japan, the 2011 floods that devastated Thailand and, more recently, the supply of face masks during the early days of the COVID-19 pandemic or the current shortage of semi-conductor components. Evidence corroborating that CSR compliant procurement activities helps firms to overcome these major disruptions would identify a new channel through which CSR commitment contributes to firm value creation.

Why would a CSR compliant procurement policy help firms to shelter from supply chain disruptions? The supply chain management academic research suggests a potential mechanism. Numerous contributions investigate optimal responses to demand and supply side sources of uncertainty, devoting particular attention to adequate strategies to brace for major supply chain

[1] For clarity, we use the term Corporate Social Responsibility (CSR) in the rest of the paper as in Godfrey, Merrill and Hansen (2009) except when we refer explicitly to the Refinitiv ESG score.

disruptions. In their literature review, Ho, Zheng, Yildiz and Tallurt (2015) conclude that "there is a consensus that dual sourcing strategy outperforms a single sourcing one in the presence of supply disruption". Chopra and Shodhi (2014) argue in favor of segmenting and regionalizing the supply chain as ways to implement supply chain diversification and to temper the impact of disruptions. Criteria to which CSR compliant souring policy has to respond parallels this emphasis on local and diversified procurement policies as ways to account for sustainable production and environmental practices. These concerns very specifically translate into evaluation criteria by CSR rating agencies. For example, Refinitiv ESG ratings account for energy sources diversification (complementing fossil ones by renewable ones such as solar and wind), and local suppliers selection (to limit transportation emissions). This convergence between best practices advised by the supply chain management literature to face disruptions and best practices promoted by CSR engagement to respect the environment grounds our main hypothesis: CSR compliant procurement activities reduce firm exposure to supply chain disruptions.

The recent decision by Stellantis automotive manufacturing corporation, the new entity born in 2021 from the Italian-American conglomerate Fiat Chrysler Automobiles and French PSA group, to source lithium from the German Vulcan Energy Resources supplier as of 2026 is a typical example of the mechanism that we are hunting for. The project is described as part of a zero-carbon lithium strategy, dropping the use of fossil energies and limiting the use of water to produce lithium. An additional benefit of such CSR compliant procurement decision is to limit the dependence on Chilian lithium, that accounts for close to 30% of the world production. Looking for solutions to produce cleaner electric vehicles goes hand in hand with diversifying lithium sourcing, providing the additional benefit of sheltering (at least partially) Stellantis from a Chilean production disruption.

To test whether the CSR activities help firms to mitigate supply chain disruption risks, we follow an empirical strategy comparable to Hendricks, Singhal and Zhang (2009) and study how firm stock returns relate to the intensity of CSR activities in the event of a supply chain disruption. The Suez Canal Ever Given obstruction provides a particularly interesting quasi-experiment. Resulting from the combination of particularly unfavorable weather conditions and, apparently,

human errors, the Ever Given Suez Canal obstruction is to be considered as an exceptional event[2]. The combination of natural unpredictable causes and infrequent occurrence guarantees exogeneity. The Ever Given obstruction was also an economically significant event. According to statistics published by Visual Capitalist (Figure 1), 12% of global trade transits through the Suez Canal (considering container shipments alone, this percentage rises to 30%). A long-lasting closure of the Suez Canal would have significantly hit supply deliveries to western European Countries.

We collect CSR activity indicators for a large sample of listed firms potentially affected by this supply chain disruption using Refinitiv ESG ratings. The Refinitiv data collection process relies on a network of 150 analysts, with local language expertise, who process publicly available sources such as annuals reports, company websites, stock exchange filings, and CSR reports. Since the creation of the database in 2002, the firm universe coverage has been regularly expanding, currently reaching 80% of the global market capitalization of listed firms, across more than 450 different CSR metrics.[3] In our analyses we focus on the ESG score itself, its environmental pillar, and the resource use category, which contains 20 items such as energy efficiency, toxic chemical reduction and renewable energy use, items specifically related to supply chain management.

Due to the importance of the Suez Canal for western Europe's energy and merchandise supply chains, we selected European listed firms, within the Eurozone, present in the Refinitiv ESG database at the end of 2020 to build our sample. Retaining non-financial firms for which market value, revenue, total assets are available, as well as the required CSR score, we collected information on 299 listed firms from Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and the United Kingdom[4], representing 62% of the capitalization of the Euro STOXX Total Market index (Euro STOXX henceforth) at the end of 2020, which covers 95% of the market capitalization of the Eurozone.

Our baseline econometric specifications are differences-in-differences (DiD) regressions with interaction terms that allow to explore the potentially mitigating role of CSR-compliant

[2] The last time that such an obstruction lasting several days happened was in 2004, when the Russian oil tanker Tropic Brilliance ran aground after mechanical problems (offshore-energy.biz).
[3] Refinitiv. 2020. "Environmental, Social, and Governance (ESG) scores from Refinitiv".
[4] The two Eurozone firms with the Datastream "Nation" item classified as "UK" are CNH Industrial and Stellantis, which are both headquartered in the Netherlands and listed in the Eurozone.

procurement activities on the value effect of the Suez Canal obstruction. The group of treated firms is composed of firms belonging to the highest quintile of firms ranked by CSR compliant activities and the control group by firms belonging to the lowest one. In addition, we explicitly account for CSR dependent exposure to risk factors. Used in combination with an exogenous shock and a large and representative sample of listed firms, these specifications strengthen the causal interpretation of our estimates.

Our results are unambiguous: whether using the aggregate Refinitiv ESG score or its environmental and resource use sub-scores, treated firms (highly CSR compliant firms) stock excess returns display a superior performance than control firms (lowly CSR compliant firms) from March 23 to March 25, 2021, the period of Ever Green grounding with high uncertainty about the duration of Suez Canal obstruction. We obtain comparable results whether controlling for the market excess return or for the Fama and French (2015) five risk factors (the market excess return, the size, book-to-market, profitability and investment factors). Point estimates are sizeable: high CSR firms excess returns are around 105 to 126 basis points higher than low-CSR ones on the March 23-25 three days, after adjusting for risk factors. Importantly, our tests support the parallel trends between the treated and control group during the pre-event period, the key identifying assumption behind DiD identification research designs (Angrist and Pischke, 2009). We next replicate these analyses on a subsample of 107 firms that belong to the Manufacturing, Energy and Utilities industry according to the Fama-French 5 (FF5) industry classification and get consistent evidence despite the drastic sample size reduction. Substituting measures of treatment intensity (the CSR scores themselves) to our treatment indicator variables (belonging to the highest quintile of CSR scores) leads again to similar conclusions and allows us to confirm that the resource use score, which contains data items specifically related to supply chain management, is the main driver of the CSR effect on stock market reaction to the Ever Given grounding . We finally report results form a placebo test in which we replace our sample of European listed firms by a sample of Australian listed firms, less affected by the Suez Canal obstruction thanks to their geographical location. This time, we observe no statistically significant differences of excess return between strong- and poor-CSR firms. Taken collectively, these results

strongly support our main hypothesis according to which CSR-compliant sourcing activities reduce firm exposure to supply chain disruptions.

Daily stock returns are contemporaneously correlated in the cross-section. Even if we control explicitly for risk factors driving such correlation in our DiD specifications, one may worry that this source of correlation leads to under-evaluated standard errors. To test the robustness of our results, we adopt a portfolio approach, as in Eckbo, Nygaard and Thorburn (2021). To this end, we rank firms by CSR ratings and group them into five equally sized portfolios, computing daily equally weighted returns for each portfolio over a time window starting on March 23, 2020 and ending on March 25, 2021. We then regress these portfolio returns on the Morgan Stanley Capital International (MSCI) European stock market index and dummy variables identifying event days. We finally test whether the cumulative abnormal returns (CARs) of the first and fifth CSR-ranked portfolios display statistically significant differences. Results obtained with this alternative approach are qualitatively similar to those obtained with our baseline DiD approach.

We finally investigate the cross-sectional determinants of CARs at the firm level. To this end, we run regressions of firm level CARs (calculated as in the portfolio approach) on CSR ratings, industry fixed effects, the natural logarithm of sales (size) and market-to-book (valuation) control variables, as well as the daily stock return standard deviation (risk) and a measure of firm level exposure to oil prices. These cross-sectional regressions allow us to investigate further potential channels driving our results. Theses are again consistent with our DiD baseline ones: high-CSR firms' stock returns dominate those of low-CSR firms from March 23 to March 25, controlling for industry fixed-effects, size, valuation and risk. Moreover, the cross-sectional regressions allow us to show that oil prices sensitive firms suffered more during our event window.

Our main contribution to the existing literature is to uncover a new and very specific channel through which CSR potentially contributes to firm value creation: supply chain diversification. In this respect, our results complement the moral capital mechanism highlighted in Godfrey, Merrill and Hansen (2009), Albuquerque, Koskinen and Zhang (2019) and Albuquerque, Koshingen, Yang and Zhang (2020) and contribute more generally to the ongoing and active debates on the CSR roles of private corporations (Edmans, 2020).

We begin with a short summary of the relevant CSR literature. Next, we introduce the Suez Canal and underline its importance in energy and commercial goods supply deliveries for western European countries. We then detail the Ever Given case. After describing our method, with an emphasis on the Refinitiv ESG score content, we finally introduce our DiD, portfolio and cross-sectional firm level regressions-based results, before concluding.

1. Literature Review and Hypothesis Rationale

1.1. Supply Chain Disruption Risks

Supply chain managers face both demand side and supply side sources of uncertainty. On the supply side, in addition to supplier idiosyncratic sources of variability, major disruptions happen. Classic cases referred in the literature are the 2011 Japanese tsunami or catastrophic Thailand floods. According to Pettit, Croxton and Fiksel (2013), the nuclear power shut-downs due the Japanese tsunami forced Toyota to scale down production, costing USD 72 million in profits by day. More recently, the COVID-19 pandemic put under pressure the supply of face masks and shortage of semi-conductor components, which did strongly affect activities of car manufacturing plants. Modern just-in-time supply chain optimization, while motivated by profitability arguments, has increased firm exposure to these disruptions.

To brace for supply chain disruptions, classic mitigation strategies are carrying buffer inventories, diversifying suppliers and strengthening customer-supplier relations (Whitney, Luo and Heller, 2014). Diversification reduces risks of losing major chunks of resources at once, offers opportunities to learn from alternative procurement channels and invigorates competition among suppliers. But, as pointed out by the authors, these benefits come with their own costs: increased operational and organizational complexity, reduced opportunities to develop mutual trust with suppliers and forgone scales of economies.

The existence of a diversification costs/benefits trade-off has led to an abundant literature focusing on optimal supply chain policy. To cite a few contributions in this field, Anupindi and Akella (1993) focus on supply side uncertainty and derive optimal ordering policies as a function of the characteristics of delivery contracts and the level of uncertainty. Federgruen and Yang (2009) on their side introduce a planning model designed to deal with demand side uncertainty

in case of multiple sources of procurements. Numerous contributions specifically address supply chain disruption risks. Berger, Gerstenfeld and Zheng (2004) analyze the optimal number of suppliers in presence of catastrophic risks, distinguishing between "super-events" (all suppliers are hit simultaneously) and "unique-events" (suppliers are impacted separately and independently). Mak and Shen (2012) take into account simultaneous supply side disruptions and demand uncertainty, and argue that diversification is favorable in these circumstances. Schmitt, Sun, Snyder and Shen (2015) argue that if supply is exposed to disruptions, demand is stochastic and the firm is risk averse, a decentralized inventory design reduces cost variance through diversification. Grossman, Helpman and Lhuillier (2021) adopt a public policy perspective, studying whether governments should promote resilience by subsidizing backup sources (buffer inventories) or encourage firms to source from closer and safer domestic suppliers. The authors conclude that, in case of constant elasticity of substitution, public policies that subsidy diversification dominate policies that promote reshoring or offshoring. Chopra and Shodhi (2014) argue that disruptive risks require companies to build resilience despite being costly and suggest two strategies: segmenting and regionalizing the supply chain. In their literature review, Ho et al. (2015) conclude that "there is consensus that a dual sourcing strategy outperforms a single sourcing one in the presence of supply disruption" but indicates that multiple sourcing strategies benefits are not necessarily significant.

To summarize, the extant supply chain literature indicates that diversification is a main venue to prepare for disruption risks and even indicates that regionalizing (Chopra and Sodhi, 2014) and sourcing from closer and domestic suppliers (Grossman et al., 2021) are practices to promote. Such procurement policy recommendations find echo in the CSR literature, as we argue in the next section.

1.2. Corporate Social Responsibility Activities

The academic literature on CSR is extremely abundant. Friede, Busch and Bassen (2015) report aggregated evidence on more than 2,000 empirical studies already. Gillan, Koch and Starks (2020) classify contributions in this field according to five main topics of investigations that relate firms'

CSR to market characteristics, board and executive compensation, ownership characteristics, firm performance and value, and firm risk.

CSR also strengthens attention paid to supply chain. As nicely summarize on the Library of (the U.S.) Congress internet site, "companies need to be aware of the following areas of social responsibilities as they pertain to the supply chain: human rights (including working conditions, slave labor, and child labor), occupational health and safety, as well as sustainable production and environmental practices."[5]. Unsurprisingly, CSR rating agencies account for these criteria. As a typical example, CSR scores reported in the Refinitiv ESG database, among the metrics used, account explicitly for energy procurements (favoring non-fossil fuel) and the use of local alternatives to imported (agricultural and manufactured) products in its so-called environmental pillar, within the resource use category. As mentioned hereabove, these requirements of alternative energy sourcing and local procurements parallels Chopra and Sodhi (2014) and Grossman et al. (2021) recommendations to brace for supply chain risk disruptions. This leads us to posit our main hypothesis: CSR compliant procurement activities reduce firm exposure to supply chain disruptions.

2. The Suez Canal

The Suez Canal construction, undertaken at the initiative of Ferdinand de Lesseps, started in 1859 and lasted ten years. This opened a maritime route between the Mediterranean and Red seas, offering a direct connection between the Indian and North Atlantic oceans. By doing so, it dramatically shortens travelling time for vessels delivering supplies between these regions. Alternative routes require going around Africa, via the Cape of Good Hope, a detour of several weeks. With a length of around 190 kilometers, the Suez Canal can be considered as one of the most remarkable technical achievements of the nineteenth century. Nationalized in 1956 by President Nasser, the canal is operated by the Egyptian stated-owned firm Suez Canal Authority. Its strategic importance became clear during the Six-Day War in June 1967 between Egypt and Israel, when the Egyptian authorities decided to close it, a state of affairs that lasted eight years. A major expansion of the canal began in 2014, intended to nearly double its capacity. The so-

[5] https://guides.loc.gov/corporate-social-responsibility/company-informaton/supply-chain-management.

called New Suez Canal was opened in 2016, offering a maritime route to close to 100 vessels a day.

The Suez Canal has become a vital commercial maritime route. As highlighted in Figure 1 (Visual Capitalist), 12% of global trade transits through it, and in terms of container shipments alone, this figure rises to no less than 30%. According to the Suez Canal Authority[6], in 2020, south–north energy transport was mainly composed of crude oil, gas and diesel oil, fuel oils, motor spirits, naphtha, and liquefied petroleum gas (LPG), while other goods shipments notably included cereals, ores and metals, coal and coke, liquefied natural gas (LNG), chemicals, fabricated metals, and fertilizers. Figure 2 depicts their respective weights.

The importance of the Suez Canal route for European countries emerges clearly in the statistics reported by the Suez Canal Authority. Table 1 provides yearly cargo shipments in tons by geographic region, from 2011 to 2019. Figure 3 displays the corresponding percentages by destination for 2019. Northbound shipments through the Suez Canal rose significantly during that period, from 357 million tons of cargo to 458 million tons, an almost 30% increase. The cumulated share of northern and western European countries (including United Kingdom) is around one-third, stable over time. With shipments of 154 million tons of cargo towards European countries in 2019, it is no surprise that the Suez Canal plays a major role in timely supply deliveries for European producers.

In its edition of March 31, 2021, The Economist published an article entitled “Global supply chains are still a source of strength, not weakness”. The emphasis is on the vulnerabilities that dependence on supply chains, the result of specialization strategies pursued since the early 1990s to maximize efficiency, has generated. Cited in the article is the case of the pharmaceutical firm Pfizer, whose production relies on over 5,000 suppliers from all over the world. Just-in-time production, low inventories and globalization have created an explosive mixture. The Ever Given case is one (more) spectacular accident corroborating this diagnostic. As pointed out in Section 1.1, the supply chain management literature argues that diversification of supply sources and channels is a major venue to shelter firms from such disruptions, converging de facto towards

[6] https://www.suezcanal.gov.eg/.

CSR sourcing best practices, which notably insist on combining various sources of energy supplies as well as increasing local sourcing.

3. The Ever Given Grounding

The Ever Given vessel is operated by the Taiwanese container shipping company Evergreen Marine (evergreen-marine.com), established in 1968 and currently the world's fifth largest company in containerized freight shipping. The Evergreen Marine fleet comprises over 150 ships, connecting 240 ports worldwide, centered around five general routes, among which east Asia to northern Europe and the Mediterranean region. Construction of Evergreen Marine's fleet began in 1975, with successive classes over time displaying an impressive growth in capacity. The 1975/1976 Ever Spring class, composed of 4 ships, had a capacity of 646 twenty-foot equivalent units (TEU). The most recent currently operated class, to which belons the Ever Green, the Ever G class, reaches 20,000 TEU, a thirty-fold rise. The company has more than 6,000 employees, with revenue of over USD 7 billion in 2020. Its main competitors are Mediterranean Shipping Company (revenue of USD 22 billion, Switzerland), Orient Overseas (USD 6 billion, China), Hanjin Shipping (USD 6 billion, South Korea, liquidated in 2017) and APL (USD 6 billion, Singapore). The containerized freight market has enjoyed impressive growth over the last 30 years, with global capacity of container ships in seaborne trade rising from 11 deadweight tonnage (DWT) in the early nineties to 275 in 2020[7] thanks to globalization. This strong growth pattern has led shipping companies to develop and operate gigantic container ships like the Ever Given.

The Ever Given was laid down in 2015 and completed in 2018. Close to 400 meters in length (four soccer fields in a row!), the Ever Given is simply a sea giant. Its height from keel to main deck (called hull depth) is almost 33 meters (an 11-story building). The Ever Given had its first accident in February 2019, when it collided with a ferry boat near the harbor of Hamburg in high winds.

On March 23, the weather conditions were also challenging, with sudden wind gusts. March marks the beginning of a season known as khamsin in that part of the world, a two-month period characterized by sporadic, powerful dust storms that blow in from the Sahara. But whether these

[7] https://www.statista.com/statistics/267603/capacity-of-container-ships-in-the-global-seaborne-trade/.

difficult conditions are enough to explain the Ever Given's grounding is still the subject of debate, with experts arguing that heavily-laden container ships pass through the Suez Canal all the time without issue, suspecting either some technical or human error. Whatever the exact causes of the grounding, the consequence was indisputable: the obstruction of the Suez Canal.

From March 23 to March 31, the Wall Street Journal (WSJ) has no fewer than 23 articles about the Suez Canal obstruction.[8] Their chronological appearances are displayed in Figure 4, with the corresponding list provided in Appendix 1. The first and potentially surprising observation is the absence of any publication on March 23. This clearly indicates that an obstruction of the Suez Canal due to the grounding of a giant container ship was an unanticipated event for which the WSJ was mostly unprepared.

Three articles were released on March 24. The first announced the obstruction, describing the Ever Given grounding and (unsuccessful) efforts to refloat it. The second provided background information on the Suez Canal and its importance for Egypt. The third highlighted potential consequences of the canal's closure for the global supply chain (headline: "Even brief disruption of the vital passage for oil and gas and global trade in clothing and electronics could have significant impact"), mentioning among other consequences an immediate rise in oil prices.

Two new articles appeared on March 25. The first emphasized that attempts to clear the Ever Given were still failing and that, should the blockage last, supply chain disruptions were to be expected. The second indicated that European and international companies were looking for alternative routes, either sending goods by airfreight or sailing around Africa via the Cape of Good Hope, but that these alternatives would cause long delays or be expensive.

March 26 saw five publications: the first announced progress in the efforts to unlock the Ever Given, the second returned to the consequences of the Suez Canal obstruction for the global supply chain, the third pinpointed impacts on Asian and European exporters, the fourth questioned whether the Ever Given grounding could delay the post-COVID-19 pandemic return to normality and, finally, the fifth looked back on the Suez Canal expansion inaugurated in 2015, which proved to be insufficient in light of the blockage. Importantly in our case, the March 26 publication insisted that "Fresh efforts at digging out the ship are 'going well'", citing a person

[8] https://www.wsj.com/news/archive.

involved in the operation who added, “We may get it moving earlier than originally thought”. March 26 marked the end to the period of high uncertainty over the duration of the blockage.

Three new publications were released on March 27. They focused on the causes and economic and financial consequences of the disruption. The role of a seasonal sandstorm and sudden burst of wind was put forward, but human error was not ruled out. The trend towards ever bigger ships under pressure of economic efficiency was also called into question, the Ever Given being a symbol of this. Potential consequences for insurance companies were also analyzed.

On March 28, the WSJ began by reminding readers that the Ever Given had already an accident in 2019, colliding with a ferry boat near Hamburg harbor. Its second article focused on fresh hopes thanks to high tides in the Suez Canal. The third publication of that day indicated that shipping companies had begun to reroute vessels because, even in the event of the Ever Given being quickly removed, it would take time to work through the accumulated backlog of ships waiting to pass through the Suez Canal.

Among the two press articles on March 29, the most important was clearly the announcement that the Ever Given had been freed thanks to six days of intensive rescue operations but also an unusually hide tide that made the job easier. The second publication once again looked at the global shortage of container supplies that the obstruction could create.

Over the next two days, no fewer than eight new press articles were published, despite the Suez Canal having reopened. Among them, the role of a supermoon generating a stronger tidal effect and helping engineers to free the Ever Given is explained, stressing once again the role of nature in this episode.

In light of this succession of events and in order to use the Ever Given stranding as the cleanest possible exogenous shock, we will use the three days from March 23 to March 25 as our event window. During this period, the uncertainty about the duration of the obstruction was at its peak, while it was already clear that a long-term Suez Canal closure would have huge consequences for supply chains, especially for western European countries.

Does the Ever Given case qualify as an exogenous shock on supply chains, a key requirement for our research design? We believe so. First and foremost, the Suez Canal obstruction was a

significant shock for global supply chains, a necessary condition to qualify as disruption. Next, the accident being most probably caused by the combination of specific weather conditions and human errors, there is no reason to suspect any correlation with latent factors, themselves correlated with, for example, firm management practices. The Ever Given case cannot be traced back to the adoption of legal rules or institutional contexts. It is therefore not subject to the sources of endogeneity analyzed in Karpoff and Wittry (2018), such as firm lobbying or heterogeneity of situations before the shock. Finally, to the best of our knowledge, we are the first to use the Ever Given case as a quasi-experiment. We are therefore not exposed to the multiple hypotheses test concern raised in the context of quasi-experiments by Heath, Riggenberg, Samadi and Werner (2020).

4. Method

4.1. Empirical Strategy

Ideally, testing whether CSR compliant procurement practices mitigate firm exposure to supply chain disruptions would require collecting detailed firm level data on supply sources, finding an exogenous shock on CSR compliant practices and a set of supply chain disruptions. The measure of the causal effect would collapse to some simple test of difference of average sourcing delays around supply chain disruptions between sub-samples of treated (impacted by the CSR exogenous shock) and untreated (unaffected by the CSR exogenous shock) firms. Firm-level supply sources are however a private information unavailable to the econometrician, at least on a large scale, and we do not have at hand an exogenous shock on CSR practices. We have therefore to rely on a second-best empirical strategy.

Our empirical strategy follows Hendricks et al. (2009) and relates investors' reactions to the Ever Given grounding as a function of CSR compliant procurement policy. For listed firms, stock returns provide a measure of investors' reactions and the Refinitiv ESG score deliver the necessary CSR ratings. Armed with these, we are in position to implement a DiD test around the Ever Given grounding. One may question whether CSR compliant activities affect firm performance and risk exposure for other reasons, such as the building of investors' and

consumers' moral capital and loyalty (Godfrey et al., 2008; Albuquerque et al., 2020), or investors' preferences (Bollen, 2007; Renneboog et al., 2011). This is most probably the case but our focus on an exogenous shock on supply chain routes allows us to isolate the relationship between CSR compliant procurement policy and its implications on supply chain resiliency. One may also question whether CSR activities correlate with many other risk factors related to firm expected returns. Our econometric specification controls for this source of endogeneity, as explained in Section 4.2.

4.2. Econometric specification

Our baseline econometric specifications are differences-in-differences (DiD) regressions. We use two specifications, the first one applying the classical DiD approach, the second one taking advantage of the flexibility of the DiD setup:

$$r_{it} - r_{ft} = \alpha + \beta\ HighCSR_i + \gamma\ Event_t + \delta\ (HighCSR_i \times Event_t) + \boldsymbol{Factors}_t'\ \boldsymbol{\mu} + \epsilon_{it} \quad (1)$$

$$r_{it} - r_{ft} = \alpha_i + \beta_t + \delta\ (HighCSR_i \times Event_t) + (HighCSR_i \times \boldsymbol{Factors}_t)'\ \boldsymbol{\mu} + \epsilon_{it} \quad (2)$$

Notations are as follows: i and t are respectively the firm and the day subscripts. r_{it} stands for the firm i return at day t and r_{ft} for the risk-free rate. $HighCSR_i$ is an indicator variable that takes the value of one if the firm i is in the highest CSR score quintile (the treated group) and zero if the firm i is in the lowest one (the control group). $Event_t$ is an indicator variable that takes the value of one from March 23 to March 25. $\boldsymbol{Factors}_t$ are risk factors (bold notations are used for vectors). α_i and β_t are respectively firm and day fixed effects.

We report results with two sets of priced factors: the market excess return and the Fama and French (2015) five factors (the market excess return, the size, book-to-market, profitability and investment factors). The sample includes only firms that belong to the first (highest) and last (lowest) quintile of CSR scores.

Estimates are obtained by running these regressions on a time window that starts July 1, 2020 and that ends on June 30, 2021, a one year period. This allows us to measure the return

differences between high-CSR and low-CSR firms on two periods: the 3-day event period, and an outside-the-event period combining days before and after the event as in Lins, Servaes and Tamayo (2017). This approach isolates the specific effect of the supply chain disruption event on firm returns in relation with their CSR rating.

Equation 1 corresponds to the Karafiath (1988) regression-based approach to event studies, augmented with the $HighCSR_i$ and $HighCSR_i \times Event_t$ terms that are specific to our DiD approach. The similarity between regression-based event studies and DiD regressions has been recently acknowledged in the empirical econometric literature (see, for example, Cunningham 2021, p. 426, footnote 6). In the event study vernacular, the period from March 23 to March 25 corresponds to the event window, the period from July 1, 2020 to June 30, 2021, excluding the three days within the event window, to the estimation window and the set of risk factors $\boldsymbol{Factors_t}$ to the return generating process. The similarity between Equation 1 DiD regression and the regression-based approach to event studies makes apparent the strengths of our econometric specification. The Suez Canal disruption was unanticipated, as witnessed by the delay necessary for the WSJ to publish its first article reporting the accident (Section 3). Therefore, we do not have to deal with intricacies related to partially anticipated events (Malatesta and Thomson, 1985). The event date is well identified (the precise time of the Ever Given grounding on March 23 is 7:40 am UTC+2) and the event window precise (as argued in Section 2, uncertainty surrounding the delay to unlock the ship was at its peak from March 23 to March 25).

Equation 2 specification allows us to take profit from the flexibility of the DiD setup. The inclusion of firm fixed-effects controls for time-constant firm level latent factors. The presence of the $HighCSR_i \times \boldsymbol{Factors_t}$ interaction term accounts for risk factor coefficients to be potentially varying with CSR score levels.

Equation 1 provides also a natural statistical test of the parallel trends assumption, as notably emphasized by Albuquerque et al. (2020). The β coefficient is indeed an estimate of daily return average difference between high and low CSR firms during the July 1, 2020 to June 30, 2021 period (the estimation period in the event study vernacular). The existence of such systematic difference would represent a violation of the parallel trends assumption.

In both Equations 1 and 2, our inference is based on standard-errors clustered at the firm level. As robustness checks, we report results obtained with treatment intensity measures (the $HighCSR_i$ indicator variable is replaced by the CSR score itself), that allows us to include all firms in the estimation sample (not just high and low CSR firms), a placebo test, using a sample of Australian listed firms that do no hang on the Suez Canal for their supply sources thanks to their geographic location and a portfolio based approach, that controls for cross-sectional correlations of firm level contemporaneous returns.

4.3. Data Sources

CSR Score

We use the Refinitiv (formerly Asset4) ESG scores to measure CSR firm level activities or, more precisely, three Refinitiv scores: resource use, environmental score, and the overall ESG score, from the most specific to the most general one.

Refinitiv offers one of the most comprehensive CSR databases in the financial industry, reporting information for a firm universe that represents 80% of global market capitalization, starting from 2002. The database gives access to more than 450 different CSR metrics, among which a subset of 186 of comparable and material metrics are used for CSR scoring.[9] The CSR metrics are called datapoints in the Refinitiv terminology. These are broken down into eleven categories, grouped under four pillars: environment, social, governance and so-called controversies across the 10 other categories (see Figure 5). The building of the Refinitiv ESG score follows an aggregation procedure, going from the eleven categories to the ESG score itself.

Energy procurements (favoring non-fossil fuel) and the use of local alternatives to imported (agricultural and manufactured) products are measured in the "Environmental pillar", within the "Resource Use" category, notably under the items "total primary renewable energy purchased and produced in gigajoules" and "Environmental Supply Chain Management"[10] for instance.

[9] The metrics excluded from the scoring correspond to variables which are redundant with those included in the scores.

[10] This item is defined as a binary variable that assesses whether "*the company uses environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners*".

Refinitiv data collection relies on a network of 150 analysts who process publicly available information gathered from various sources such as annual reports, company websites, non-governmental organization websites, stock exchanges filings and published CSR reports. The database is updated continuously but most of the sources are themselves updated once a year. Refinitiv verifies consistency with automated quality checks (300 according to the Refinitiv database documentation) and human processes, with audits regularly conducted. The database coverage has expanded considerably over time (see Appendix 2 for the list of stock index constituents currently tracked by Refinitiv). It is also noteworthy that the Refinitiv ESG scoring method is designed to assess how firms perform with respect to their industry peers and therefore controls for cross-industry heterogeneity. The industry classification used is the Thomson Reuters Business Classification. As mentioned above, ESG datapoints are grouped into 11 categories. Category scores are the equally weighted sum of scores by indicators. Indicator scores are computed based on percentile rank method using three measures: the number of companies worse than the current one within the same industry, the number that post comparable performance, and the number for which the information is available. This procedure proves to be robust to outliers. Our focus being on supply chain management risk, we focus on the resource use score and its encompassing ones, the environmental and ESG scores[11]. We describe hereunder their contents in the corresponding order of aggregation, paralleling the Refinitiv computation procedure.

The resource use score is defined in the Refinitiv database documentation as a score that "reflects 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" and includes 20 datapoints (see Appendix 3). Out of these 20 datapoints, three target supply chain management specifically (environmental supply chain policy, environmental supply chain management, and environmental supply chain partnership termination) and four target the sourcing of energies (total energy use to revenue in USD, renewable energy use ratio, fossil fuel

[11] The "ESG combined" score is less relevant in our case as it incorporates the controversy category. Controversy metrics correspond to "negative" CSR actions which, according to the literature, are a different construct than positive CSR actions and should be considered separately (Mattingly and Berman, 2006). In the same vein, prior research also highlights that asymmetric reactions to ethical and unethical actions are observed (Creyer and Ross, 1996).

divestment policy, and total renewable energy). The presence of these datapoints in the resource use score motivates our selection.

The environmental score, one of the four pillars of the overall ESG scores, aggregates three categories: resource use, emissions, and innovation, for a total of 68 datapoints. Pillar scores are computed as the relative sum of category scores, using weights that sum to one across the four pillars. The weights are specific to each industry group to account for industry specificities.

Lastly, the ESG score is obtained by the aggregation of the environmental, social and governance scores, themselves aggregating 10 category scores. As for pillar scores, the weighting scheme used to compute the ESG score is industry specific.

Other data sources

We use Datastream to collect market and economic information (daily stock prices, MSCI European stock market index and oil prices) and Worldscope for financial information (total sales, total assets and book value of equity). Risk factors and risk-free rates are downloaded from the K. French data library[12]. Press publications are from the Wall Street Journal. We also conducted intensive Internet searches to collect more specific information on the Suez Canal, the Evergreen Marine corporation, the Ever Given ship and the March 23 Suez Canal obstruction.

4.4. Sample and Variables

The Suez Canal is a major route for energy and commercial goods shipments between Asian and western European countries (see Section 1). Western European countries were therefore the most exposed to supply chain disruptions due to the Suez Canal obstruction on March 23. This motivates our choice to focus on a sample of firms listed in these countries.

We built our sample starting from the constituents' list "Refinitiv Datastream Asset4 Europe" (Asset4 was the former name of the Refinitiv ESG Database). This list contains 1,159 European listed firms for the year 2020. We then applied the following filters:

- we checked whether the field "Nation" referred to a European country, thereby excluding firms listed outside Europe;

[12] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

- we retained firms listed in the Euro currency only;
- we excluded financial institutions (SIC codes 6,000 to 6,999);
- we retained firms for which the market value, sales and total assets were available;
- we retained firms for which the Refinitiv ESG, environmental and resource use scores were available.

This gave us a sample of 299 firms (nearly half of the 632 firms composing the Euro STOXX). Table 2, Panel A reports statistics on this filtering process and its corresponding effects on the sample size. Panel B of Table 2 reports the number of firms within each European country and the corresponding percentage. Unsurprisingly, Germany (77 listed firms), France (73 listed firms) and Spain (33 listed firms) are the countries most represented in our sample. Finally, Panel C of Table 2 displays the breakdown of our sample by industry, according to the FF5 industries classification. The Manufacturing, Energy and Utilities industry accounts for more than one-third of our sample (26.27% in the Euro STOXX). Next comes the Consumer Durables, Non-Durables and Wholesale industry (21.07% in our sample), the Business Equipment, Telephone and Television industry (18.06% in our sample) and Other industries (18.39% in our sample).

Appendix 4 provides definitions of variables used in our analyses and Table 3 gives the corresponding descriptive statistics (Panel A) and correlation matrix (Panel B). In our sample of 299 firms, the average market value is 14 billion euros (11 billion for Euro STOXX), with asset size of 24 billion (51 billion for Euro STOXX) and sales of 13 billion (10 billion for Euro STOXX). Average market-to-book value is 2.41 (2.44 for Euro STOXX) and the daily return volatility is 2% (2.5% for Euro STOXX). The main difference can be explained by the exclusion of financial firms from our sample and the focus of the Refinitiv ESG database on large listed firms. The correlation matrix reported in Panel B indicates a high level of correlation between the three Refinitiv scores that we use, which is a mechanical consequence of their computation by successive aggregation. The resource use, environmental and ESG scores are also all positively correlated with measures of firm size (market value, sales and total assets), consistently with Fernández-Kranz and Santaló (2010) results: larger firms are more likely to have greater public visibility and therefore to invest more actively in CSR best practices. We also note that the three CSR scores are negatively correlated with the market-to-book ratio. This could appear to be a byproduct of valuation

heterogeneity across industries but it should be remembered that Refinitiv scores are relative to industry peers. These negative correlations therefore seem to indicate that firms with higher growth opportunities are less active in promoting CSR compliant behaviors (bearing in mind that these are univariate results that potentially are driven by many latent factors).

5. Results

5.1. Differences-in-differences

Our baseline results are reported in Table 4. DiD estimates correspond to Equation 1 in columns 1, 3 and 5 and to Equation 2 in columns 2, 4 and 6. In the first two columns, the independent variable is the ESG score, in the next two, the environmental score and in the last two, the resource use score. In Panel A, the market excess return is used as risk factor, while in Panel B, the Fama and French (2015) 5 factors are included in the regressions. $HighCSR$ is the indicator variable that takes the value of one for firms belonging to the highest quintile of the respective CSR score (the treated group) and zero for firms belonging to the lowest one (the control group)[13]. $Event$ is the indicator variable that take the value of one from March 23, 2021 to March 25, 2025, the period during which uncertainty about the Suez Canal obstruction duration peaked. *Firm FE* and *Day FE* indicate the presence of firm and day fixed effects in the regression specification.

The $HighCSR \times Event$ interaction term coefficient is positive and statistically significant in all specifications, in Panels A and B, except for the resource use score, in Column 6 corresponding to Equation 2. Point estimates are sizeable: $HighCSR$ firms returns are around 105 to 126 basis points higher than low ones during the March 23 to March 25, 2021 three days, after adjusting for risk factors. These results strongly support our main hypothesis according to which CSR compliant procurement activities reduce firm exposure to supply chain disruptions[14].

As explained in Section 4.2, testing whether the $HighCSR$ indicator variable coefficient is statistically significantly different from zero is equivalent to a test of the parallel trends assumption (Albuquerque et al., 2020, page 607). The $HighCSR$ coefficient is insignificant in all

[13] Only firms in the two extreme quintiles are included into the sample.

[14] Note that we can not infer from Table 4 results the average effect of the Suez Canal obstruction on our sample of firms because only firms from the first and fifth quintile are included here.

six specifications of Table 4, Panels A and B. These results bring therefore support to the parallel trends assumption.

If active CSR policies impact exposure to supply chain disruptions, this should be especially true for industries that are more dependent on fossil energies and international trade flows of commercial goods. The FF5 industry classification is coarse but, among the 5 identified groups, it seems reasonable to postulate that the Manufacturing, Energy and Utilities industry is the most relevant to test our supply chain risk management hypothesis. Not only does it explicitly include the energy related industrial activities, but a close examination of included Standard Industrial Classification (SIC) codes also confirms this conjecture.[15]

Table 5 reports the results obtained for the sub-sample of 107 firms belonging to the Manufacturing, Energy and Utilities industry, paralleling the structure of Table 4 Panel A. While coefficients of the $HighCSR \times Event$ interaction term obtained estimating Equation 1 DiD specification are all positive but not statistically significant (columns 1, 3 and 5), they are positive and statistically significant using Equation 2 specification (columns 2, 4 and 6), despite a sample size divided by almost three. These results are consistent with CSR compliant procurement policy diversification effects being important for firms belonging to the Manufacturing, Energy and Utilities industry, as it should be the case.

Tables 4 and 5 results rest on the $HighCSR$ indicator variable that identifies high (highest quintile) and low (lowest quintile) CSR firms. In estimates reported in Table 6 Panel A, we replace the $HighCSR$ variable with a measure of CSR compliant activities intensity, the Refinitiv ESG score itself. This allows us to include in our estimation sample all the 299 European listed firms initially selected. Table 6 Panel A reports results comparable to Table 4 Panel A, with Equation 1 and Equation 2 DiD specifications respectively in columns 1, 3 and 5 and columns 2, 4 and 6. The $CSRScore \times Event$ interaction term coefficient is positive and statistically significant in all six specifications, crossing the 1% p-value threshold in four cases, consistently with Table 4 Panel A. Interestingly, the $CSRScore$ variable coefficient itself is indistinguishable from zero in all three

[15] The list if SIC codes are included is 2520-2589, 2600-2699, 2750-2769, 2800-2829, 2840-2899, 3000-3099, 3200-3569, 3580-3621, 3623-3629, 3700-3709, 3712-3713, 3715-3715, 3717-3749, 3752-3791, 3793-3799, 3860-3899, 1200-1399, 2900-2999, and 4900-4949 and includes industries such as office furniture, chemicals, glass, rubber and plastic products, engines and turbines, construction and mining machinery and equipment, etc, that are clearly depending on supply of goods that transit, among others, through the Suez Canal.

specification in which it appears, a result that supports the parallel trends assumption. We note finally that the $Event$ indicator variable coefficients are negative in all three specifications in which this variable is included (and significant in two regressions out of three) consistently with the Ever Green grounding being a negative news.

In Panel B of Table 6, we perform similar regressions with the ESG score and the environmental score as proxies for CSR, but we control for the effect of resource use by adding two control variables: the resource use variable itself and its interaction with the *Event* dummy. Interestingly, we observe that the coefficients for the interaction term between ESG score and *Event* on the one hand, and between environmental score and *Event* on the other hand, are no longer significant in this specification, while the interaction between resource use and the *Event* dummy is significant. This result indicates that the resource use indicator is the main driver of the CSR effect on stock market reaction to the event.

We finally report the results of a placebo test in Table 7 with a focus on the resource use variable, which is the main driver. To this end, we collect a sample of 89 Australian listed firms using the same set of criteria as for our sample of European listed firms (see Section 4.4). Australian firms present the attractive feature to be located south and far away from the Suez Canal. Their supply chains are therefore likely to be (significantly) less disrupted by the Ever Green grounding. Thus, if the results reported in table 4 to 6 are really driven by the differential exposure of high and low CSR firms to supply chain disruptions, we should observe no effect, or at least a less pronounced effect, for this sample of Australian firms. Results reported in Table 7 are clearly consistent with this conjecture: the $HighCSR \times Event$ interaction term never reaches statistical significance at the usually admitted thresholds in all four reported specifications.

5.2. Portfolio Level Analyses

Daily returns are known to be only weakly serially correlated (due to infrequent trading and other microstructure intricacies) but significantly contemporaneously cross-sectionally correlated (Fama and MacBeth, 1973). Risk factors are primary drivers of these cross-sectional correlations and controlled for in equations 1 and 2. But one may still worry about the presence of residual

cross-sectional correlations that lead to underestimate standard errors and to over-rejection in our statistical tests. A definitive cure to this issue is to adopt a portfolio approach (Mandelker, 1974; Jaffee, 1974). To this end, we follow Eckbo et al. (2021) because the empirical setup is comparable. We group firms by CSR ratings in five equally sized portfolios, portfolio one containing the lowest CSR-rated firms and portfolio five the highest ones. For each portfolio, we run the following regression over the period from March 23, 2020 to March 25, 2021:

$$r_{pt} = \alpha_p + \beta_p \, r_{wt} + AR_p \, d_t + \, \epsilon_{pt} \tag{3}$$

where r_{pt} is the daily equally weighted return of portfolio p, d_t is an indicator variable equal to one during the event window (from March 23 to March 25) and r_{wt} is the daily return of the MSCI European stock market index. The coefficient of d_t, denoted AR_p, is our measure of average daily abnormal returns (AR) for portfolio p. Firms' returns are winsorized at the 1st and 99th percentiles. Cumulative abnormal returns (CARs) over the event window are obtained simply by multiplying AR_p by three. Standard errors are robust to heteroskedasticity. CAR_p for portfolios one to five provides the value effects of the Suez Canal obstruction conditionally on CSR intensiveness over the event window. We then proceed to a standard test of difference in means between portfolio five (the highest CSR rated firms) and portfolio one (the lowest CSR rated ones) to evaluate whether CSR intensity acts as a mitigating factor with respect to the supply chain disruption risk.

Our portfolio analysis results are reported in Table 8. The first column provides results for the full sample of firms under consideration. Next, from Column 2 to Column 6, the results for each CSR rating quintile portfolio are displayed (lowest quintile in Column 2 and highest in Column 6). Finally, Column 7 contains the results of a test of difference in means between Columns 6 and 2. Panel A focuses on the ESG score and panels B and C, on its environmental and resource use sub-scores respectively.

From March 23 to March 25, our 299 firms' portfolio CARs are negative (-0.75% CAR, reaching 5% statistical significance level). In Panel A, comparison of Column 2 to Column 6 reveals that weak CSR firms (the first CSR portfolio quintile) display negative CARs (-1.47%, reaching 1% statistical significance level), 12 times higher than strong CSR firms (the fifth CSR portfolio

quintile: -0.12%, not statistically significant). Consistently, the difference of means test in Column 7 is positive and highly statistically significant. Similar results are obtained in panels B and C, even if the fifth quintile portfolio displays more negative CARs than in the case of Panel A. In the eyes of investors, CSR active firms were largely shielded from potential supply chain disruption due to the Suez Canal obstruction, a conclusion consistent with results obtained using our DiD specification. Our results are clearly not biased by contemporaneous cross-sectional correlations of stock returns.

5.3. Cross-sectional Analyses

As additional analyses, we proceed to firm-level cross-sectional analyses of CAR determinants. Firm-level CARs are obtained running the same regression specification as for the portfolio level analyses (Equation 3). Firm level CAR determinants are then investigated running the following cross-sectional regression specification:

$$CAR_i = \alpha_s + \beta\, Score_i + \boldsymbol{Controls_i'\gamma} + \eta_i \quad (4)$$

where α_s are industry fixed effects, defined at FF5 industry classification level, $Score_i$ refers to firm i's CSR score at the end of year 2020 and $\boldsymbol{Controls_i}$ is a vector of firm level determinants (bold notations are used for vectors) that includes firm size, risk, and valuation proxies. Standard errors are robust to heteroskedasticity. Under our main hypothesis (CSR compliant procurement policy reduces firm exposure to supply chain disruption), we expect β to be positive.

Our cross-sectional regression results are summarized in Table 9. In all specifications, the dependent variable is the three-days event window's CAR (March 23 to March 25). Panel A displays the baseline results and Panel B tests whether oil prices sensitive firms were more exposed to the Suez Canal disruption using a measure of firm level oil prices sensitivity[16]. In both panels, odd numbered column specifications are without control variables and industry fixed-effects and even numbered ones control for firm size (the natural logarithm of sales), firm

[16] This measure is obtained by regressing a firm's returns on the MSCI index and the contemporaneous variation of oil prices estimated during the 03/23/2020 to 03/22/2021 period.

valuation (the market-to-book ratio), the firm's daily stock return volatility (the standard deviation of firm returns, denoted $Risk$) and industry fixed-effects[17] at the FF5 industry classification. Again, in both panels, columns 1 and 2 use the ESG score (*ESG score*) as a firm level measure of CSR involvement, columns 3 and 4 the environmental score and columns 5 and 6 the resource use score.

Results presented in Panel A of Table 6 confirm those obtained using either of DiD or our portfolio approach. Coefficients for CSR measures are all positive and statistically significant at the 1% level of confidence (5% in Column 4). Noteworthy also is that the coefficients for our control variables are themselves not significant, except the *Risk* variable, which measures the firm's stock return volatility. It appears that firm size and valuation are uncorrelated with the impact of the Ever Given grounding on firm stock returns.

In Panel B of Table 6, we add the stock's oil prices sensitivity to our regression specification as an additional control variable. The inclusion of this variable is meant to partial out the direct impact of oil prices variation on firm stock prices during the event window in order to isolate the supply chain effect from that of oil prices increase. The coefficients of CSR measures are still significant at the same level as in Panel A, and their point estimates do not change. Interestingly, the coefficients on oil prices sensitivity are statistically significant without any control variable but insignificant once controls and industry fixed-effects are included. The inclusion of industry fixed-effects probably explains this loss of statistical significance because sensitivity to oil prices is clearly industry dependent.

6. Conclusion

This research investigates whether socially responsible sourcing activities shelter firms, at least partially, from supply chain disruptions. This hypothesis is rooted in the convergence between supply chain management academic literature optimal response to supply disruptions risks and CSR compliant procurement policies. Our research design is based on a differences-in-differences test around the Suez Canal obstruction caused by the Ever Given grounding in March 2021. The

[17] We lost 10 observations in the even numbered column specifications because we restrict our sample to firms with positive market-to-book.

Refinitiv ESG database provides measures of CSR activities at the firm level for a large sample of 299 European listed firms potentially hit by this exceptional event. Estimates focus on March 23 to March 25, 2001, a three-day period during which uncertainty about the time needed to free the Suez Canal was at its peak, identified thanks to in-depth analyses of Wall Street Journal publications.

Our results strongly confirm that CSR compliant procurement activities mitigate firm exposure to supply chain disruptions, identifying a new channel through which CSR involvement contributes to firm value creation. This conclusion is robust to many specifications that control, among others, for CSR dependent firm sensitivities to risk factors. A placebo test built using a sample of Australian firms unlikely to be affected by the Ever Green grounding thanks to their geographical location strengthens the causal interpretation of these results.

In additional to our differences-in-differences tests, we report results obtained thanks to a portfolio approach, as in Eckbo et al. (2021), that controls for contemporaneous cross-sectional correlations of returns. We obtain again similar results. From March 23 to March 25, 2021, the portfolio of firms in the lowest quintile of CSR scores experienced negative Cumulative Abnormal Returns (CAR) 12 times greater than firms in the highest quintile.

Finally, a cross-sectional analysis of CAR determinants confirms that this CSR sheltering effect is driven neither by confounding factors such as firm size, firm valuation, stock return volatility or industry fixed effects, nor by systematic unobservable time constant differences between strong CSR and weak CSR firms.

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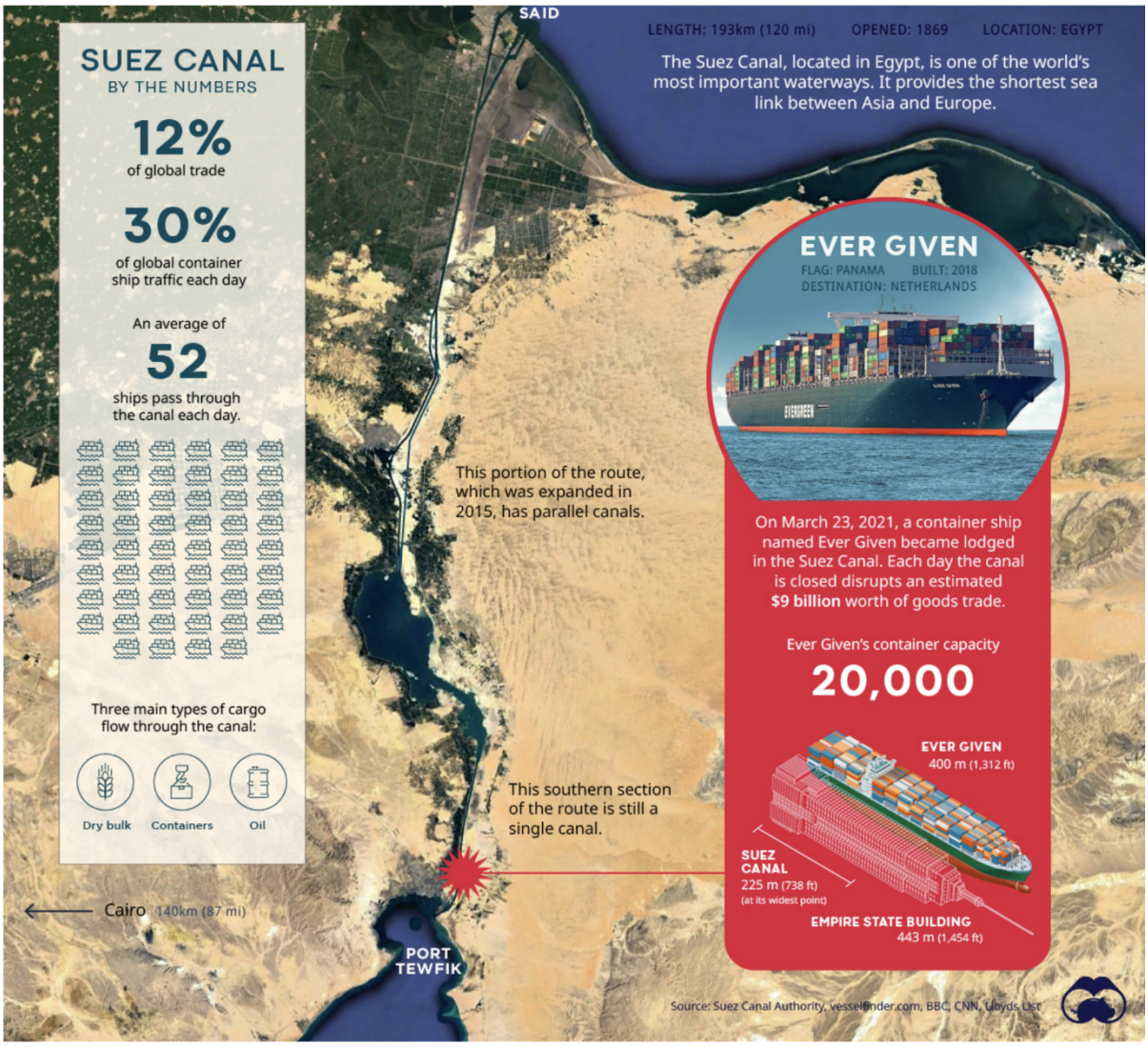
Figure 1 –Importance of Suez Canal in global trade flows

Figure 1 reports statistics highlighting the importance of the Suez Canal in global trade traffic as well as the precise location of the Suez Canal obstruction caused by the Ever Given grounding on March 23, 2021.



Source: Visual Capitalist - [The Suez Canal: A Critical Waterway Comes to a Halt (visualcapitalist.com)]

Figure 2– Suez Canal shipments by product type

Figure 2 displays the annual tonnage percentage flowing northbound through the Suez Canal in 2019 by cargo type (data source: Suez Canal Authority website - https://www.suezcanal.gov.eg/).

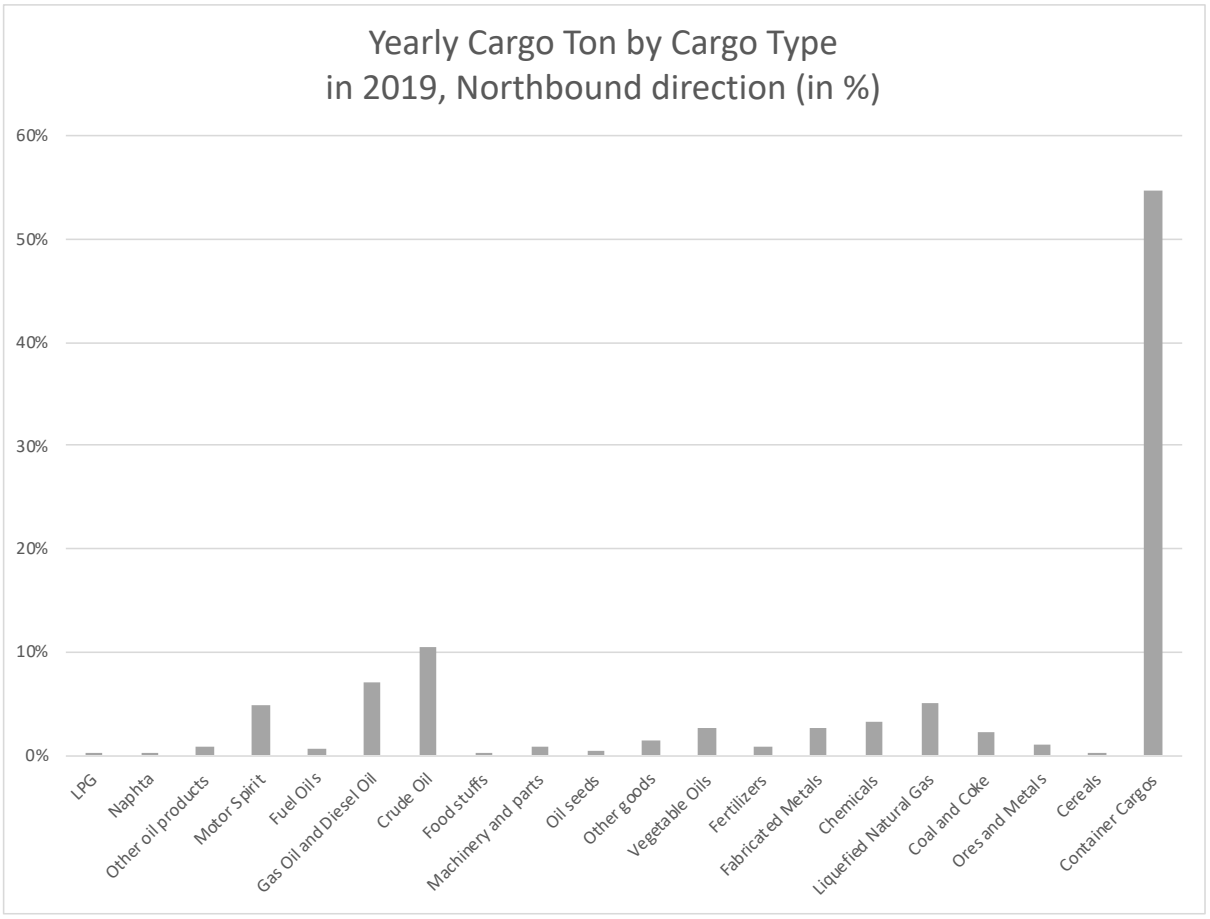


Figure 3 – Suez Canal shipments by destination region (northbound)

Figure 3 details the 2019 northbound Suez Canal shipments by destination in percentages (data source: the Suez Canal Authority website - https://www.suezcanal.gov.eg/).

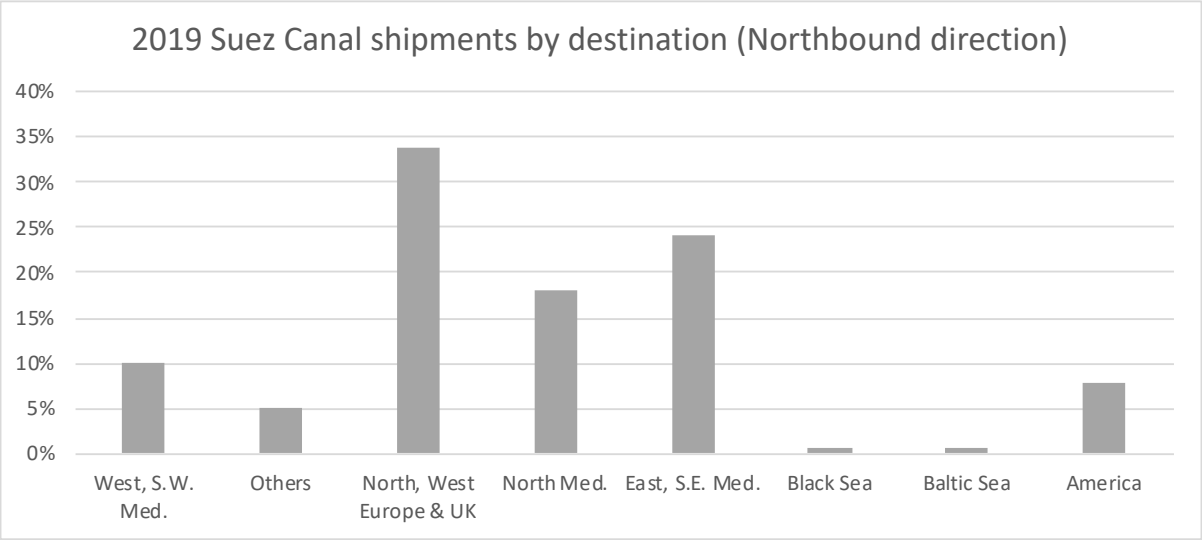


Figure 4 - The Ever Given accident timeline - daily number of Wall Street Journal articles

Figure 4 displays the number of articles published in the Wall Street Journal from March 23 to March 31, 2021, addressing the Ever Given accident (data source: Wall Street Journal archives - https://www.wsj.com/news/archive). Appendix 1 provides the corresponding list of articles.

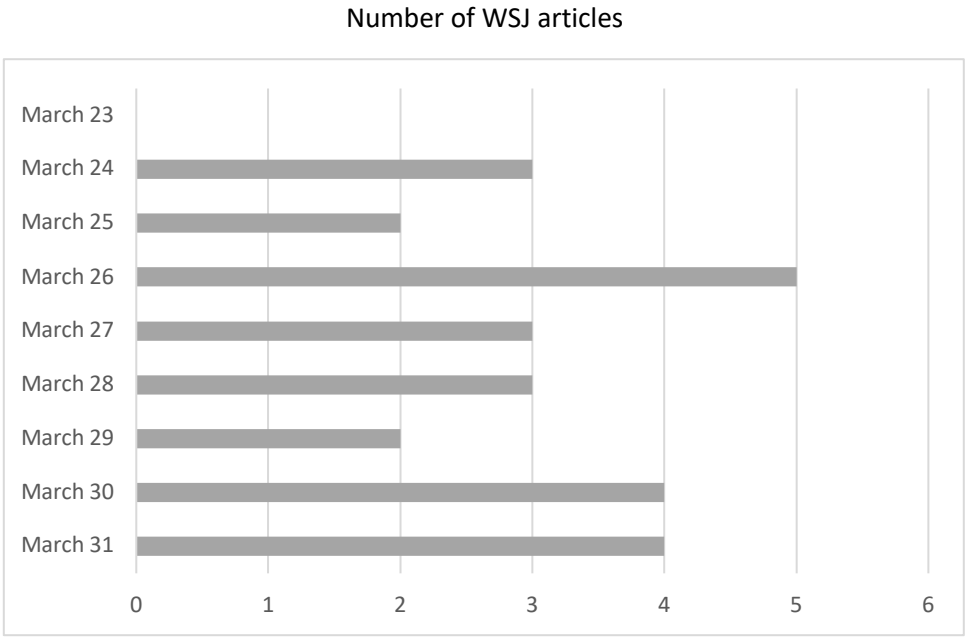


Figure 5 – Refinitiv ESG scores

Figure 5 displays the breakdown of the Refinitiv ESG scores, showing the different levels of aggregation and the corresponding number of metrics that are included in each score. The figure is based on documentation from the Refinitiv 2020 database (data source: Refinitiv. 2020. "Environmental, Social, and Governance (ESG) scores from Refinitiv").

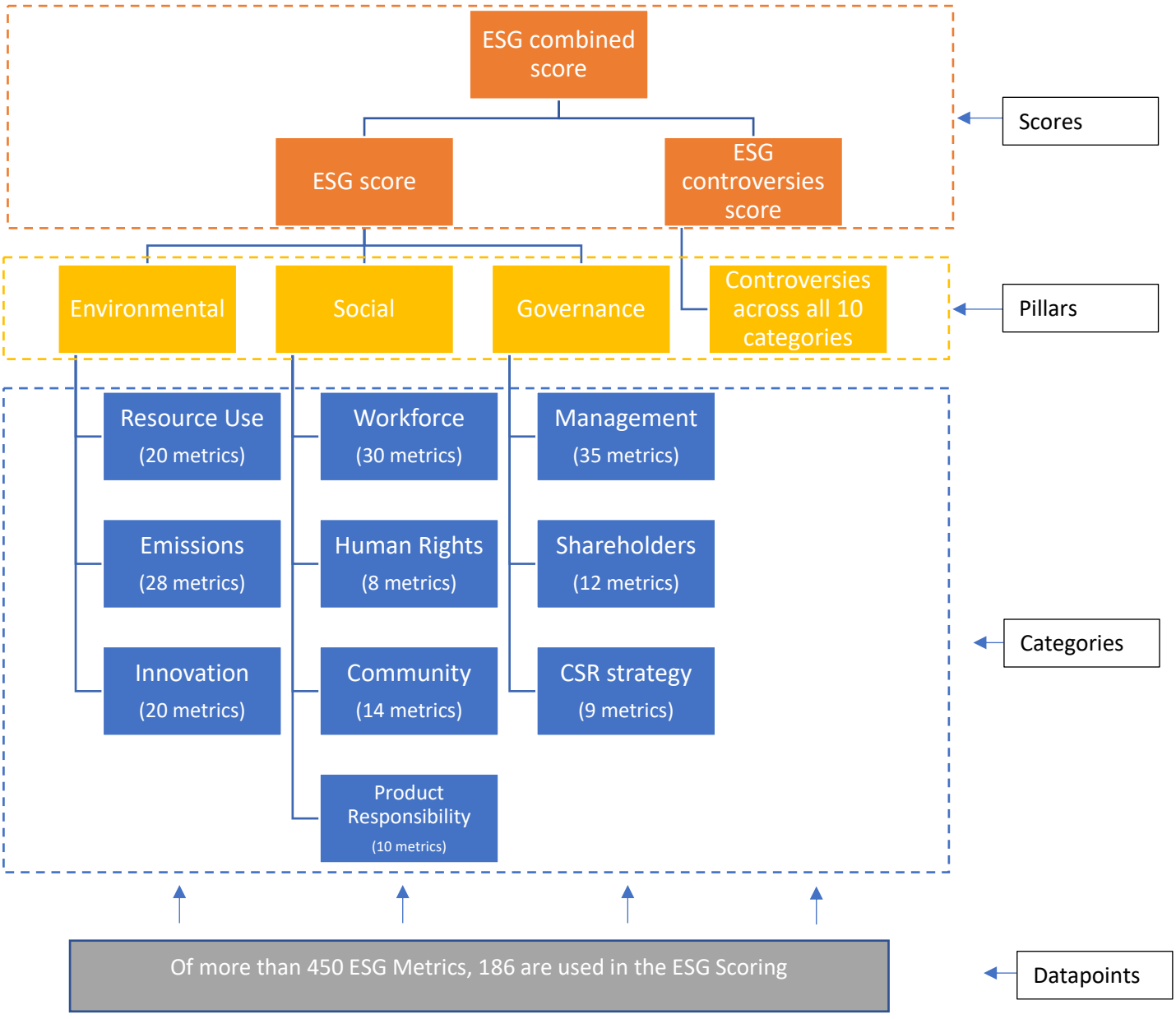


Table 1 – Suez Canal annual northbound cargo (in thousands of tons) by destination regions

Table 1 provides the yearly cargo shipments flowing northbound through the Suez Canal by destination regions. Numbers are expressed both in thousands of tons in Panel A and as a percentage of total northbound shipments in Panel B (data source: Suez Canal Authority website - https://www.suezcanal.gov.eg/).

Panel A: Numbers expressed in thousands of tons

	2011	2012	2013	2014	2015	2016	2017	2018	2019
America	29,282	30,424	32,261	39,430	43,338	38,831	30,142	36,982	35,299
Baltic Sea	828	1,147	985	487	430	1,106	1,749	3,242	2,705
Black Sea	4,453	5,016	4,801	3,639	5,042	3,974	3,353	3,699	3,039
East, S.E. Med.	73,187	70,264	85,376	103,498	107,354	109,564	111,649	110,600	110,480
North Med.	72,021	74,378	73,604	78,056	76,034	80,146	96,403	97,636	83,333
North, West Europe & UK	124,602	123,518	121,035	122,697	118,516	128,226	128,070	140,190	154,842
Others	14,423	10,245	10,703	11,205	9,352	16,238	21,992	25,186	22,958
West, S.W. Med.	38,395	38,549	37,796	47,261	45,633	40,426	37,263	41,292	46,191
Total	**357,191**	**353,541**	**366,561**	**406,273**	**405,699**	**418,511**	**430,621**	**458,827**	**458,847**

Panel B: Numbers expressed as percentages

	2011	2012	2013	2014	2015	2016	2017	2018	2019
America	8.2%	8.6%	8.8%	9.7%	10.7%	9.3%	7.0%	8.1%	7.7%
Baltic Sea	0.2%	0.3%	0.3%	0.1%	0.1%	0.3%	0.4%	0.7%	0.6%
Black Sea	1.2%	1.4%	1.3%	0.9%	1.2%	0.9%	0.8%	0.8%	0.7%
East, S.E. Med.	20.5%	19.9%	23.3%	25.5%	26.5%	26.2%	25.9%	24.1%	24.1%
North Med.	20.2%	21.0%	20.1%	19.2%	18.7%	19.2%	22.4%	21.3%	18.2%
North, West Europe & UK	34.9%	34.9%	33.0%	30.2%	29.2%	30.6%	29.7%	30.6%	33.7%
Others	4.0%	2.9%	2.9%	2.8%	2.3%	3.9%	5.1%	5.5%	5.0%
West, S.W. Med.	10.7%	10.9%	10.3%	11.6%	11.2%	9.7%	8.7%	9.0%	10.1%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 2 – Sample composition

Table 2 summarizes sample selection screens that we applied to obtain our final sample of 299 firms starting from the Refinitiv Datastream Asset4 Europe constituent list (Panel A), its composition by country, as defined by the "Nation" Datastream item (Panel B) and by industry using the Fama-French 5 industries classification (Panel C). In Panel C, the industry composition of the Euro STOXX Total Market index Datastream constituent list is also reported. “Freq.” stands for the number of observations, “Percent” for the corresponding percentage and “Cum.” for the cumulative percentage.

Panel A – Sample selection procedure

	Filter	Freq.
1	Firms in the constituent list of Refinitiv Datastream Asset4 Europe	1,159
2	Drop firm with "NATION" item outside Europe	1,120
3	Keep only firm with Euro currency	498
4	Drop financials firms (SIC codes 6,000 to 6,999)	399
5	Keep firms with available market value, sales and total assets	325
6	Keep firms with Refinitiv Score available at the end of 2019	299

Panel B – Sample composition by western European country

Nation	Freq.	Percent	Cum.
Austria	8	2.68	2.68
Belgium	20	6.69	9.36
Finland	22	7.36	16.72
France	73	24.41	41.14
Germany	77	25.75	66.89
Greece	3	1.00	67.89
Ireland	6	2.01	69.90
Italy	18	6.02	75.92
Luxembourg	3	1.00	76.92
Netherlands	29	9.70	86.62
Portugal	5	1.67	88.29
Spain	33	11.04	99.33
United Kingdom	2	0.67	100.00
Total	299	100.00	

Panel C – Sample composition by Fama-French 5 industry classification

	Our sample			Euro STOXX		
Fama-French industry code (5 industries)	Freq.	Percent	Cum.	Freq.	Percent	Cum.
Consumer Durables, Non-Durables, Wholesale	63	21.07	21.07	108	17.09	17.09
Manufacturing, Energy, and Utilities	107	35.79	56.86	166	26.27	43.35
Business Equipment, Telephone and Television	54	18.06	74.92	93	14.72	58.07
Healthcare, Medical Equipment, and Drug	20	6.69	81.61	37	5.85	63.92
Other -- Mines, Constr, BldMt, Trans, Health	55	18.39	100	228	36.08	100.00
Total	299	100.00		632	100.00	

Table 3 – Variables and descriptive statistics

Table 3 reports descriptive statistics (Panel A) and the correlation matrix (Panel B) for key variables. *Our sample* is described in Table 2 – Panel A, the *Euro STOXX* sample is made up of firms included in the corresponding Datastream constituent list (LDJTMESE). All variables are defined in Appendix 4. *Mean* stands for arithmetic average, *sd* for standard deviation, *min* for minimum, *max* for maximum and *N* for the number of observations. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

Panel A – Univariate statistics

	Our sample					Euro STOXX				
variable	mean	sd	min	max	N	mean	sd	min	max	N
ESG score	67.09	15.25	10.34	94.39	299	61.92	18.24	5.91	93.56	570
ENV score	65.3	21.83	0	98.87	299	59.7	25.12	0	98.88	570
Resource Use	72.43	24.32	0	99.79	299	66.88	27.66	0	99.8	570
Market value	14,382	24,141	43	174,003	299	11,022	22,157	207	257,880	632
Sales (billion)	13.1	24.3	0	223	299	9.9	21.6	-0.2	223	631
Total assets (billion)	24.2	51.3	0.034	484	299	51	191	0.06	2,480	628
Market-to-book	2.41	2.17	0.22	15.58	290	2.44	3.16	-7.21	37.73	627
Risk	0.02	0.006	0.0046	0.0426	299	0.0252	0.0076	0.001	0.0604	633

Panel B – Correlation matrix

	ESG score	*ENV score*	*Resource Use*	*Market value*	*Sales*	*Total assets*	*Market-to-book*	*Risk*
ESG score	1							
ENV score	0.81***	1						
Resource Use	0.75***	0.83***	1					
Market value	0.34***	0.27***	0.30***	1				
Sales	0.38***	0.36***	0.28***	0.49***	1			
Total assets	0.34***	0.32***	0.25***	0.52***	0.92***	1		
Market-to-book	-0.12**	-0.14**	-0.04	0.20***	-0.16***	-0.15***	1	
Risk	-0.10	-0.12**	-0.18*	-0.32***	-0.18***	-0.16***	-0.08	1

Table 4 – Differences-in-differences level results – whole sample

Table 4 reports differences-in-differences estimates obtained running Equation 1 (columns 1, 3 and 5) and Equation 2 (columns 2, 4 and 6) regressions. In Panel A, the market excess return is used as risk factor, while in Panel B, the Fama and French (2015) 5 factors are included in the regressions (the market excess return, size, book-to-market, profitability and investment risk factors). *HighCSR* is an indicator variable that takes value one for firms belonging to the highest quintile of the respective CSR score distribution (the treated group) and zero for firms belonging to the lowest one (the control group). In columns 1 and 2, $HighCSR$ uses the *ESG score*, in columns 3 and 4, the *Environmental Score* and in columns 5 and 6, the *Resource Use Score* (see Section 4.3 for a description of the content of these CSR scores). Only firms in the two extreme quintiles are included into the sample. *Event* is an indicator variable that takes the value of one from March 23, 2021 to March 25, 2021, the period during which uncertainty about the Suez Canal obstruction duration peaked (see Section 3). *Mkt-Rf* stands for market excess return, *smb*, *hml*, *rmw* and *cma* for the size, book-to-market, profitability and investment risk factors. All variable definitions and data sources are provided in Appendix 4. The sample selection procedure is described in Section 4.4. Estimations are performed on a time period running from July 1, 2020 to June 30, 2021. *Firm FE* and *Day FE* indicate the presence of firm and day fixed effects in the regression specification. *adj-R^2* is the adjusted R-squared and *N* the number of observations. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

Panel A – Market excess return

	ESG score		**Environmental score**		**Resource use score**	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
HighCSR	0.0002		0.0002		0.0000	
	(1.15)		(0.82)		(-0.09)	
HighCSR X Event	0.0039**	0.0057***	0.0042**	0.0059***	0.0035*	0.0043**
	(2.14)	(3.35)	(2.23)	(3.28)	(1.96)	(2.47)
Event	0.0003		-0.0008		0.0000	
	(0.22)		(-0.62)		(0.01)	
Mkt-Rf	0.8508***		0.8336***		0.7935***	
	(26.05)		(24.32)		(24.93)	
HighCSR X Mkt-Rf		0.2385***		0.2177***		0.0939
		(3.86)		(3.31)		(1.48)
Firm FE	no	yes	no	yes	no	yes
Day FE	no	yes	no	yes	no	yes
adj. R^2	0.172	0.228	0.156	0.200	0.152	0.189
N	30,821	30,821	30,821	30,821	30,821	30,821

Panel B – Fama-French 5 factors model

	ESG score		Environmental score		Resource use score	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
HighCSR	0.0002		0.0002		0.0000	
	(1.15)		(0.82)		(-0.09)	
HighCSR X Event	0.0039**	0.0034**	0.0042**	0.0037**	0.0035*	0.0021
	(2.14)	(1.99)	(2.23)	(2.07)	(1.96)	(1.20)
Event	-0.0003		-0.0011		-0.0005	
	(-0.21)		(-0.88)		(-0.41)	
Mkt-Rf	0.7987***		0.7983***		0.7513***	
	(25.63)		(23.95)		(24.51)	
SMB	-0.0392		0.0031		-0.0995*	
	(-0.72)		(0.05)		(-1.71)	
HML	0.3949***		0.2651***		0.1746**	
	(5.09)		(3.32)		(2.15)	
RMW	0.1466*		-0.0139		-0.0185	
	(1.77)		(-0.16)		(-0.22)	
CMA	-0.0926		-0.0809		-0.1444*	
	(-1.36)		(-1.21)		(-1.93)	
HighCSR X Mkt-Rf		0.1321**		0.1157*		0.0075
		(2.15)		(1.75)		(0.12)
HighCSR X SMB		-0.532***		-0.425***		-0.601***
		(-5.45)		(-4.04)		(-5.85)
HighCSR X HML		0.3452**		0.4006**		0.0342
		(2.26)		(2.57)		(0.21)
HighCSR X RMW		0.0896		0.0202		0.0001
		(0.54)		(0.12)		(0.00)
HighCSR X CMA		0.0979		0.0629		0.0142
		(0.72)		(0.47)		(0.09)
Firm FE	no	yes	no	yes	no	yes
Day FE	no	yes	no	yes	no	yes
adj. R^2	0.187	0.236	0.163	0.208	0.154	0.192
N	30,821	30,821	30,821	30,821	30,821	30,821

Table 5 - Differences-in-differences results – manufacturing, energy and utilities industries

Table 5 replicates Table 4 Panel A with a sub-sample of 107 firms belonging to the manufacturing, energy and utilities industries (industry code 2 in the Fama-French 5 industry classification). Differences-in-differences estimates are obtained running Equation 1 (columns 1, 3 and 5) and Equation 2 (columns 2, 4 and 6) regressions. The market excess return is used as risk factor. *HighCSR* is an indicator variable that takes value one for firms belonging to the highest quintile of the respective CSR score (the treated group) and zero for firms belonging to the lowest one (the control group). In columns 1 and 2, $HighCSR$ uses the *ESG score*, in columns 3 and 4, the *Environmental Score* and in columns 5 and 6, the *Resource Use Score* (see Section 4.3 for a description of the content of these CSR scores). Only firms in the two extreme quintiles are included into the sample. *Event* is an indicator variable that takes the value of one from March 23, 2021 to March 25, 2021, the period during which uncertainty about the Suez Canal obstruction duration peaked (see Section 3). *Mkt-Rf* stands for market excess return. All variable definitions and data sources are provided in Appendix 4. The sample selection procedure is described in Section 4.4, restricted here to the manufacturing, energy and utilities industries. Estimations are performed on a time period running from July 1, 2020 to June 30, 2021. *Firm FE* and *Day FE* indicate the presence of firm and day fixed effects in the regression specification. *adj-R^2* is the adjusted R-squared and *N* the number of observations. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

	ESG score		**Environmental score**		**Resource use score**	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
HighCSR	0.0004		0.0001		-0.0002	
	(1.00)		(0.23)		(-0.49)	
HighCSR X Event	0.0030	0.0053**	0.0035	0.0055**	0.0049	0.0061*
	(1.08)	(2.19)	(1.35)	(2.32)	(1.46)	(2.00)
Event	0.0016		0.0024		0.0012	
	(0.72)		(1.24)		(0.43)	
Mkt-Rf	0.8870***		0.9113***		0.8029***	
	(15.79)		(17.18)		(13.79)	
HighCSR X Mkt-Rf		0.2997**		0.2528**		(0.16)
		(2.68)		(2.22)		(1.35)
Firm FE	no	yes	no	yes	no	yes
Day FE	no	yes	no	yes	no	yes
adj. R^2	0.202	0.280	0.199	0.262	0.169	0.209
N	10,878	10,878	11,655	11,655	9,583	9,583

Table 6 – Differences-in-differences – treatment intensity

Table 6 replicates Table 4 Panel A estimates, using the Refinitiv CSR score as measure of treatment intensity in place of an indicator variable identifying high CSR score firms. Differences-in-differences estimates are obtained running Equation 1 (columns 1, 3 and 5) and Equation 2 (columns 2, 4 and 6) regressions. The market excess return is used as risk factor. In columns 1 and 2, *CSRScore* is the *ESG Score*, in columns 3 and 4, the *Environmental Score* and in columns 5 and 6, the *Resource Use Score* (see Section 4.3 for a description of the content of these CSR scores). *Mkt-Rf* stands for market excess return. All variable definitions and data sources are provided in Appendix 4. In Panel B, similar regressions are performed using *ESG score* and *Environmental Score* as CSR proxies, with the addition of *Resource Use* and its interaction with the *Event* dummy as explanatory variables. The sample selection procedure is described in Section 4.4. Estimations are performed on a time period running from July 1, 2020 to June 30, 2021. *Firm FE* and *Day FE* indicate the presence of firm and day fixed effects in the regression specification. *adj-R^2* is the adjusted R-squared and *N* the number of observations. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

Panel A - raw effect

	ESG score		**Environmental score**		**Resource use score**	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
CSRScore	0.0000		0.0000		0.0000	
	(0.71)		(1.26)		(0.23)	
CSRScore X Event	0.0001***	0.0001***	0.0001**	0.0001**	0.0001***	0.0001***
	(2.94)	(2.94)	(2.54)	(2.54)	(3.50)	(3.50)
Event	-0.0049*		-0.0021		-0.0034*	
	(-1.95)		(-1.12)		(-1.94)	
Mkt-Rf	0.8327***		0.8327***		0.8327***	
	(39.08)		(39.08)		(39.08)	
Firm FE	no	yes	no	yes	no	yes
Day FE	no	yes	no	yes	no	yes
adj. R^2	0.158	0.203	0.158	0.203	0.158	0.203
N	77,441	77,441	77,441	77,441	77,441	77,441

Panel B - neutralizing the resource use effect

	ESG score		Environmental score	
Variable	(1)	(2)	(3)	(4)
CSRScore	0.0000		0.0000**	
	(0.78)		(2.00)	
CSRScore X Event	0.0000	0.0000	0.0000	0.0000
	(0.60)	(0.60)	(-0.38)	(-0.38)
Res_use_score	0.0000		0.0000	
	(-0.37)		(-1.55)	
Res_use_score X Event	0.0001**	0.0001**	0.0001**	0.0001**
	(2.02)	(2.02)	(2.14)	(2.13)
Event	-0.0044*		-0.0032*	
	(-1.77)		(-1.71)	
Mkt-Rf	0.8327***		0.8327***	
	(39.08)		(39.08)	
Firm FE	no	yes	no	yes
Day FE	no	yes	no	yes
adj. R^2	0.158	0.203	0.158	0.203
N	77,441	77,441	77,441	77,441

Table 7 - Placebo test – the Australian case

Table 7 replicates the last two columns of Table 6 Panel A for a sample of 89 Australian listed firms. Differences-in-differences estimates are obtained running Equation 1 (columns 1 and 3) and Equation 2 (columns 2 and 4) regressions. The first two columns display the results for all firms while the last two columns focus on the Manufacturing sector. The market excess return is used as risk factor. The *Resource Use* score is used as the ESG score (see Section 4.3 for a description of the content of these CSR scores). *Event* is an indicator variable that takes the value of one from March 23, 2021 to March 25, 2021, the period during which uncertainty about the Suez Canal obstruction duration peaked (see Section 3). *Mkt-Rf* stands for market excess return. All variable definitions and data sources are provided in Appendix 4. The sample selection procedure is described in Section 4.4. Estimations are performed on a time period running from July 1, 2020 to June 30, 2021. *Firm FE* and *Day FE* indicate the presence of firm and day fixed-effects in the regression specification. *adj-R^2* is the adjusted R-squared and *N* the number of observations. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

	All firms		**Manufacturing**	
	Resource use score		**Resource use score**	
Variable	(1)	(2)	(3)	(4)
CSRScore	0.0000		0.0000	
	(-1.20)		(0.31)	
CSRScore X Event	0.0000	0.0000	0.0000	0.0000
	(1.35)	(1.35)	(-0.10)	(-0.10)
Event	0.0025*		0.0070*	
	(1.96)		(2.03)	
Mkt-Rf	0.7584***		0.7433***	
	(32.20)		(15.99)	
Firm FE	no	yes	no	yes
Day FE	no	yes	no	yes
adj. R^2	0.077	0.143	0.084	0.164
N	45,034	45,034	8,602	8,602

Table 8 - Portfolio level results

Table 8 reports cumulative abnormal returns (CARs) for portfolios of European listed firms, estimated using the model specified in Equation 3. The event window goes from March 23 to March 25, 2021. CAR are denoted $CAR(0,2)$ by reference to the event window. Portfolios are built by quintiles of ESG scores (Panel A), environmental scores (Panel B) and resource use scores (Panel C) obtained from the Refinitiv ESG database. Column 1 reports the results for the whole sample of firms. Columns 2 to 6 report the results for portfolios formed by quintiles of respective CSR scores. Column 7 reports the test of difference in means between Columns 6 and 2, robust to heteroskedasticity. Student statistics are reported between parentheses, below CAR estimates. N denotes the number of firms in each portfolio. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

	All firms	**1stQ**	**2ndQ**	**3rdQ**	**4thQ**	**5thQ**	**Q5-Q1**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A - ESG score							
CAR(0,2)	-0.0075**	-0.0147***	-0.0141***	-0.0063***	-0.0015	-0.0012	0.0135***
	(-2.45)	(-4.45)	(-5.49)	(-3.28)	(-0.18)	(-0.31)	(2.95)
Panel B - Environmental score							
CAR(0,2)	-0.0075**	-0.0177***	-0.0072***	-0.0078	-0.0015	-0.0033	0.0144***
	(-2.45)	(-6.54)	(-3.01)	(-0.94)	(-0.99)	(-0.97)	(3.36)
Panel C - Resource use score							
CAR(0,2)	-0.0075**	-0.0144***	-0.0174***	-0.0027	0.0000	-0.0033	0.0111**
	(-2.45)	(-4.99)	(-3.34)	(-0.40)	(0.01)	(-0.74)	(2.21)
N	299	60	60	60	60	59	

Table 9 – Cross-sectional regression results – whole sample

Table 9 reports coefficient estimates in cross-sectional regressions for the three-days cumulative abnormal returns (CARs) computed from March 23 to March 25, 2021 (Equation 4). For each firm, CARs are estimated using the same regression specification as in Equation 3 but at the firm level. All variables are defined in Appendix 4. Panel A provides the results for the baseline model, while Panel B adds oil prices sensitivity as an explanatory variable. Oil price sensitivity is estimated based on a market model with the addition of oil prices returns over the period from March 23, 2020 to March 23, 2021. Sector fixed-effects (FE) are defined according to the Fama-French 5 industry classification. Student statistics are reported between parentheses, below coefficient estimates. Standard errors are robust to heteroscedasticity. ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

Panel A - Baseline

	ESG score		**Environmental score**		**Resource use score**	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Score	0.0004***	0.0004***	0.0002***	0.0002**	0.0003***	0.0002**
	(3.36)	(3.06)	(2.95)	(2.11)	(3.86)	(2.54)
Ln_sale		0.0006		0.0011		0.0011
		(0.45)		(0.70)		(0.75)
Market-to-book		0.0006		0.0006		0.0004
		(0.88)		(0.83)		(0.62)
Risk		-1.6944***		-1.6319***		-1.5805***
		(-6.99)		(-6.61)		(-6.56)
Sector FE	no	yes	no	yes	no	yes
adj. R^2	0.034	0.213	0.028	0.199	0.044	0.203
N	299	289	299	289	299	289

Panel B – Adding oil prices sensitivity

	ESG score		Environmental score		Resource use score	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Score	0.0004***	0.0004***	0.0002***	0.0002**	0.0003***	0.0002**
	(3.57)	(3.11)	(3.12)	(2.13)	(3.90)	(2.56)
Oil prices sensitivity	-0.0754**	-0.0240	-0.0735**	-0.0221	-0.0664**	-0.0218
	(-2.52)	(-0.60)	(-2.37)	(-0.54)	(-2.14)	(-0.54)
Ln_sale		0.0007		0.0011		0.0011
		(0.46)		(0.71)		(0.76)
Market-to-book		0.0005		0.0005		0.0004
		(0.75)		(0.71)		(0.51)
Risk		-1.6511***		-1.5916***		-1.5407***
		(-6.38)		(-6.08)		(-5.99)
Sector FE	no	yes	no	yes	no	yes
adj. R^2	0.044	0.211	0.037	0.197	0.051	0.201
N	299	289	299	289	299	289

Appendix 1 - Press articles published in the Wall Street Journal from March 23 to March 31, 2021

March 23: none

March 24:

- Suez Canal Is Blocked by Container Ship Causing Huge Traffic Jam - WSJ
- Suez Canal, Symbol of Egyptian Pride and Source of Conflict, Regains Spotlight - WSJ
- Ship Stuck in Suez Canal Heightens Pressure on Global Supply Chain - WSJ

March 25:

- Suez Canal Backlog Grows as Efforts Resume to Free Trapped Ship - WSJ
- Companies Consider Alternative Routes, Assess Costs as Suez Canal Blockage Continues - WSJ

March 26:

- Suez Canal Efforts to Free Stuck Ship Make Fresh Progress Late Friday - WSJ
- Ship Stuck in Suez Canal and Chip Shortages: What Global Supply-Chain Problems Mean for You - WSJ
- Suez Canal Blockage Sends Asian, European Exporters Scrambling - WSJ
- Suez Canal Drama Delays the Arrival Date for Post-Pandemic Normal - WSJ
- Egypt Expanded the Suez Canal. It Wasn't Enough. - WSJ

March 27:

- 'Stuck Big Time' in Suez Canal: How Ship Caused Global Supply Traffic Jam - WSJ
- In the Suez Canal, Economics and Physics Make for Tough Sailing - WSJ
- Suez Canal Insurance Claims Loom as Ever Given Blocks Shipping - WSJ

March 28:

- Suez Canal Ship Had Another Accident in 2019, Colliding With a Ferry - WSJ
- High Tide in Suez Canal Raises Hopes of Freeing Cargo Ship - WSJ
- Suez Canal Crisis Sends Shipping Lines Scrambling for Alternatives - WSJ

March 29:

- Suez Canal Blockage Pressures Global Container Supply - WSJ
- Ship Stuck in the Suez Canal Is Freed - WSJ

March 30:

- Freight Companies Brace for Post-Suez Port Backups - WSJ
- Suez Canal Traffic Resumes Slowly as Some Ships Weigh Anchor, Others Wait - WSJ
- Suez Canal: How the Ship Blocking the Canal Was Freed and Why It Got Stuck in the First Place - WSJ
- How a Supermoon Helped Free the Giant Container Ship From the Suez Canal - WSJ

March 31:

- After the Suez Canal Jam, Hundreds of Ships Await Their Turn - WSJ
- Suez Canal Struggles to Clear Logjam as Stream of Arrivals Continues - WSJ
- Suez Canal Pilots Under Scrutiny Amid Effort to Clear Backlog - WSJ
- Suez Canal Opens, but Shipping Will Be Snarled for Months - WSJ

Appendix 2 - Refinitiv ESG scores: Stock index constituent lists

Source: Refinitiv. 2020. "Environmental, Social, and Governance (ESG) scores from Refinitiv".

Index name	Number of firms in the index	Country
SMI (*Swiss Market Index*)	20	Switzerland
DAX (*Deutscher AktienindeX*)	30	Germany
CAC40	40	France
FTSE 100 (*Financial Times Stock Exchange*)	100	U.K.
FTSE 250	250	U.K.
NASDAQ 100 (*National Association of Securities Dealers Automated Quotations*)	100	U.S.
Dow Jones STOXX	50	U.S.
MSCI WORLD (*Morgan Stanley Capital International*)	1585	International
S&P/TSX COMPOSITE (*Standard & Poor's/Toronto Stock Exchange*)	60	Canada
MSCI Emerging Markets	1400	International
Bovespa	50	Brazil
S&P ASX 300 (*Australian Securities Exchange*)	300	Australia
S&P NZX 50 (*New Zealand Exchange*)	50	New Zealand
Russell 3000 (*Frank Russell Company*)	3000	U.S.
IPC 35 (*Indice de Precios y Cotizaciones*)	35	Mexico
IPSA 40 (*Indice de Precios Selectivo de Acciones*)	40	Chile
MERVAL (*Mercado de Valores*)	17	Argentina
COLCAP (*Columbia market capitalization index*)	25	Colombia
PERU General Index	34	Peru
MSCI Emerging Markets - China	226	China
MSCI Europe Small & Mid Cap Index	964	Europe

Appendix 3 - Refinitiv ESG scores: resource use datapoints

Indicator	Description
Environment Management Team	Does the company have an environmental management team? - in scope are any team that performs the functions dedicated to environmental issues - an individual or team at any level composed of employees, even if the name of the team is different performing implementation of the environmental strategy - it is important to understand that the members of the team include employees of the company, who are operational on a day-to-day basis and are not the board committees (directors)
Water Efficiency Policy	Does the company have a policy to improve its water efficiency? - in scope are the various forms of processes/mechanisms/procedures to improve water use in operation efficiently - system or a set of formal documented processes for efficient use of water and driving continuous improvement
Energy Efficiency Policy	Does the company have a policy to improve its energy efficiency? - in scope are the various forms of processes/mechanisms/procedures to improve energy use in operation efficiently - system or a set of formal documented processes for efficient use of energy and driving continuous improvement
Sustainable Packaging Policy	Does the company have a policy to improve its use of sustainable packaging? - description of processes /procedures used as sustainable packaging or to reduce the use of packaging for products by the company - information on environmentally friendly (resource and energy efficient) packaging - green packaging, returnable containers, biodegradable packaging
Environmental Supply Chain Policy	Does the company have a policy to include its supply chain in the company's efforts to lessen its overall environmental impact? - legal compliance data on the supply chain to reduce environmental impact is in scope - data on collaboration with suppliers towards reducing their environmental impacts - data on the reduction of environmental impacts at the suppliers operations
Water Efficiency Targets	Has the company set targets or objectives to be achieved on water efficiency? - in scope are the short-term or long-term reduction targets to be achieved on efficiently using the water at business operations
Energy Efficiency Targets	Has the company set targets or objectives to be achieved on energy efficiency? - in scope are the short-term or long-term reduction targets to be achieved on efficiently using the energy from business operations
Environmental Materials Sourcing	Does the company claim to use environmental criteria (e.g., life cycle assessment) to source or eliminate materials?
Toxic Chemicals Reduction	Does the company report on initiatives to reduce, reuse, substitute or phase out toxic chemicals or substances? - in scope, the data includes chemicals, toxic materials, hazardous, PBT (persistent bio-accumulative toxic) and PVC (polyvinyl chloride)
Cement Energy Use	Total energy use in gigajoules per ton of clinker produced. - relevant to companies involved in the production of cement/clinker
Green Buildings	Does the company report about environmentally friendly or green sites or offices? - office/green site where the company engages in some operations - LEED/BREEAM certifications for its own building - major refurbishments to improve the environmental aspects of sites/buildings/offices - the building has to be operational at least at the end of the fiscal year - if building is under construction then grade as 'false'

Water Recycled	Amount of water recycled or reused in cubic meters. - recycled or reused water refers to water being sourced internally by recycling or reusing avoiding further withdrawals - treated water (not used again by the company) does not qualify as recycled water since countries/companies are required by regulations or environmental standards to treat wastewater before discharging it into the environment
Environmental Supply Chain Management	Does the company use environmental criteria (ISO 14000, energy consumption, etc.) in the selection process of its suppliers or sourcing partners? - data can also be on existing suppliers who were selected using some environmental criteria
Environmental Supply Chain Partnership Termination	Does the company report or show itself to be ready to end a partnership with a sourcing partner, if environmental criteria are not met?
Environmental Land Impact Reduction	Does the company report on initiatives to reduce the environmental impact on land owned, leased or managed for production activities or extractive use? - relevant to companies involved in agriculture, mining & oil and gas - in scope is the information on remediation, reclamation or remediation of disturbed land by operations
Environmental Supply Chain Monitoring	Does the company conduct surveys of the environmental performance of its suppliers? - any evidence that the company monitors its suppliers on environmental issues through surveys, audits, supplier site visits, and questionnaire
Total Energy Use To Revenues USD	Total direct and indirect energy consumption in gigajoules divided by net sales or revenue in U.S. dollars.
Renewable Energy Use Ratio	Total energy generated from primary renewable energy sources divided by total energy.
Water Use To Revenues USD	Total water withdrawal in cubic meters divided by net sales or revenue in U.S. dollars.
Total Renewable Energy	Total primary renewable energy purchased and produced in gigajoules.

Appendix 4 - Variable definitions

Our data sources are Refinitiv, Datastream, Worldscope and Kenneth French website.

Variable	Definition	Source
CSR Score		
ESG score	Refinitiv's ESG Score is an overall company score based on the information collected by Refinitiv in the environmental, social, and corporate governance pillars. The ESG score reported for year 2019 is used.	Refinitiv
Environmental score	Refinitiv's Environment Pillar Score is the weighted average relative rating of a company based on the reported environmental information and the resulting three environmental category scores. The environmental firm score reported for year 2019 is used.	Refinitiv
HighCSR	indicator variable that takes value one if the firm is in the highest CSR score quintile and zero if the firm is in the lowest one	Refinitiv
Resource Use score	The resource use category score reflects 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 resource use score reported for year 2019 is used.	Refinitiv
Firm characteristics		
Sales	Total revenue in 2020 (Worldscope item WC01001) Log transformation is used in regression	Worldscope
Total assets	Book value of total assets in 2020 (Worldscope item WC02999)	Worldscope
Market value	Market value of equity computed at the end of 2020	Datastream
Market-to-book	Ratio of price (Datastream item P) to book value of equity (Worldscope item WC05476) computed at the end of 2020	Datastream & Worldscope
Risk	Firm's daily stock return standard deviation computed between 03/23/2020 and 03/22/2021	Datastream
Oil Price Sensitivity	Firm's daily stock return sensitivity to oil price returns estimated through a market model with the addition of oil price returns, estimated during the period between 03/23/2020 and 03/22/2021	Datastream
Oil returns	price variation in % of the crude Oil-WTI spot in euro/BBL	Datastream
CAR	Cumulative abnormal returns computed from March 23 to March 25, 2021. For each firm, CARs are estimated using the same regression specification as in Equation 3 at the firm level	Datastream
Event	Indicator variable taking the value of 1 from March 23, 2021 to March 25, 2021	Datastream
Mkt-Rf	Excess return on the European market, value-weight return	K. French website
SMB	Fama/French 5 factors Size factor computed on European stocks	K. French website
HML	Fama/French 5 factors Book-to-market factor computed on European stocks	K. French website
RMW	Fama/French 5 factors operating profitability factor computed on European stocks	K. French website
CMA	Fama/French 5 factors investment factor computed on European stocks	K. French website
Rf	Fama/French 5 factors risk free rate measure	K. French website