

Corporate Social Responsibility and Shipping Supply Chain Risks

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This study aims to investigate whether Corporate Social Responsibility (CSR) activities reduce supply chain disruptions by examining the impact of the Suez Canal obstruction on the Ever Given container ship in March 2021. This study concludes that the more responsible companies have higher returns and are less affected by this event than the less responsible companies; the less responsible companies have lower returns. The companies with better CSR have a lower impact on their supply chains when faced with disruptions in the supply chain.

Keywords: Suez Canal obstruction, corporate social responsibility, supply chain risks, event study, Ever Given container ships

Introduction

On March 23, 2021, the Ever Given container ship was stranded in the Suez Canal in Egypt due to strong winds that deviated from its course, causing more than 300 vessels to wait in line. The Suez Canal, built in 1859 and completed in 1869, provides a link between the Indian Ocean and the North Atlantic Ocean and is one of the few non-gate canals in the world that has the capacity for large merchant ships. It takes 34 days to go around the Cape of Good Hope at an average speed of 16.43 knots, but only 25.5 days through the Suez Canal, greatly reducing the time for ships to transport goods between regions by about 9 days. The Suez Canal is currently the shortest route connecting Europe and Asia, and its location is of great strategic importance. The Suez Canal can be considered one of the most remarkable technological achievements of the 19th century, with heavy daily shipping traffic. The Suez Canal has become an important commercial sea route through which 12% of the world's trade passes. On March 23, 2021, Ever Given container ship was stranded in the Suez Canal and, fearing a longer blockage, crude oil prices rose 4% the next day until March 28, 2021, when 369 cargo ships lined up to pass through the canal, stranding an estimated \$9.6 billion of cargo daily. In the early days of the incident, there was a lot of uncertainty about the reopening of shipping, as well as a lot of debate about the progress of the settlement, and some predicted that it would take several weeks to lift the hold. 2021 Suez Canal blockage highlighted the fragility of the interlocking processes and the problem of unavailability of goods for delivery. Therefore, observing whether corporate compliance with environmental protection, social responsibility, and corporate governance (CSR) mitigates the risk of disruption to a company's supply chain, in addition to ethical and environmental factors, the risk of facing an external shock proves that CSR contributes to economic

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efficiency. Godfrey, Merrill, and Hansen (2009), Albuquerque, Koskinen and Zhang (2019) and Albuquerque, Koskinen, Yang, and Zhang (2020) all empirically examine whether there is a relationship between CSR activities and supply chain risk exposure. Godfrey et al. (2009) argue that CSR activities, which are more likely to be voluntary behaviors for social benefit, generate moral capital that “mitigates stakeholder punitive sanctions in the event of negative events” and that this insurance-type mechanism preserves value in difficult times. Albuquerque et al. (2019) developed a model in which a company investing in CSR differentiates itself from its competitors, thereby increasing customer loyalty to the company. According to Albuquerque et al. (2020), investors who favor CSR actively active firms are less sensitive to financial performance, a claim already made by Bollen (2007) and Renneboog, Ter Horst, and Zhang (2011). These different instruments provide shelter for companies in case of adverse events.

Supply Chain Risk

Since the 20th century, the pursuit of a specialized and segmented supply chain to improve production efficiency and low inventories in factories around the world led to a shortage of masks and semiconductor chips at the beginning of the COVID-19 pandemic, which hindered the activities of automobile manufacturers. The over-reliance on supply chain flaws caused a series of supply chain domino effects, including the shutdown of some regions due to the epidemic, the stranding of the “Ever Given”, the closure of the Suez Canal, the rise in freight costs, oil and natural gas, and the inability to employ employees. The DHL blog¹ quotes Shehrina Kamal, Head of Global Intelligence Solutions at Eversstream Analytics, as saying “Over the last 12 months, we have seen how supply chain resilience and flexibility can reduce the impact of global outbreaks.” The Economic Daily News editorial² titled “Facing up to the impact of the expanding global epidemic”, mentions that the epidemic brings uncontrollable risks to the industry, and technology is not the only factor in establishing a safe supply chain. A safe supply chain should be able to maintain no shortage of supply, no interruption of production, and sufficient safe stocks under any circumstances. Therefore, in addition to the original focus on high-end key technologies, countries are also included in the security supply chain for items that have been moved out of the country due to cost factors, have low domestic self-sufficiency and must rely on imports, or have a high concentration of import sources, as well as shortages that could harm to supply chain.

Corporate Social Responsibility (CSR)

CSR emphasizes the need for companies to invest in environmental conservation technologies, so companies use renewable energy sources such as solar and wind power to replace fossil fuels, and seek local suppliers to reduce air pollution from transportation. The prediction that environmental protection in particular in ESG can reduce the risk of supply chain disruptions in companies is called the supply chain risk management hypothesis. The relationship between company stock returns and the intensity of CSR activities was studied in the case of supply chain disruptions, and Ever Given was considered an exceptional event in the Suez Canal blockage due to unfavorable weather conditions and human error. The last time such an obstruction lasted several days was in 2004 when the Russian tanker ran aground due to mechanical failure. This exogenous combination of unpredictability and infrequency has a large economic impact. To test the supply chain risk management hypothesis, CSR activity indicators need to be collected for a representative sample of listed companies that may be affected by supply chain disruptions. Therefore, the Taiwan Corporate Governance Index score was used to

¹ Taiwan, D. H. L. E., Top 5 risk trends in the global supply chain in 2021.

² Editorial, T., Facing up to the impact of the expanding global epidemic, in Economic Times.

measure the level of corporate engagement in CSR activities.

Negative Events, Corporate Social Responsibility, and Financial Performance Relationships

Liao (2020) concludes as follows (1) An enterprise’s size has a positive impact on CSR and financial performance. (2) When enterprises implement CSR, they must pay substantial costs, which will affect their current net profit and eventually affect their financial performance. (3) CSR’s inter-term impact on financial performance cannot be seen immediately in the short run. CSR has a deferred positive effect on financial performance from the long-term perspective of sustainable development as it influences public perception and establishes a good image in the minds of consumers. (4) Enterprises implement social welfare to help disadvantaged groups and solve social problems, resulting in a harmonious and stable society; enterprises implement environmental sustainability, so that the public and residents recognize them as good and honest businesses, resulting in a sustainable and complex environment. Godfrey et al. (2009) Some types of corporate social responsibility activities can generate moral capital. This insurance-like mechanism retains its economic value in times of economic downturn. Studies have also found that voluntary behavior by participating organizations to increase social good directed at the company’s secondary stakeholders does help companies face adverse conditions.

Method

This study examines the impact of the Suez Canal obstruction event on shipping stocks in 2021 using an event study method. The simple return rate of Taiwan-listed shipping stocks is used to observe whether the Suez Canal obstruction event has an abnormal return rate on shipping stocks. An event study is a statistical method that examines whether stock prices fluctuate when an event occurs in the market and whether abnormal returns are generated, to understand whether stock price fluctuations are related to the event. (Shen, & Li, 2000)

Estimation Model

The event date as defined by the event study method is the point at which the market receives information rather than the point at which it occurs. Therefore, the date of the announcement date is set as the event date in this study. We also set the event period to 5 days after the event date to make the study results more credible. Further, the market model in the risk-adjusted approach is commonly used in the stock return expectation model literature. In this study, the market model is used. Under the assumption of market efficiency, we estimate the relationship between stock return and market return for the company i using 250 transactions from 250 trading days before the first event date to the previous trading day.

$$R_{j,t} = \alpha_j - \beta_j R_{m,t} + \varepsilon_{j,t} \quad R_{j,t} = \alpha_j + \beta_j R_{m,t} + \varepsilon_{j,t} \quad j = 1, 2 \dots N \quad (1)$$

The subscript m represents the market index, which is represented by the TAIEX (Taiwan Stock Exchange Issue Weighted Index); the subscript t represents the time of the estimation period, and ε is the margin of error. Next, we use the above estimation results to calculate the difference between the current return during the event period and the expected return if the event did not occur, which is called abnormal returns (AR).

$$AR_{j,t} = R_{j,t} - \hat{\alpha}_j + \hat{\beta}_j R_{m,t}$$

$$AR_{j,t} = R_{j,t} - \hat{\alpha}_j + \hat{\beta}_j R_{m,t} \quad (2)$$

where the actual return rate of the jth sample company in day t and the abnormal return rate of the jth sample

company in day t . After calculating the single-day abnormal return, the cumulative abnormal return (Cumulative abnormal return, CAR) is further summed up to understand the cumulative effect of abnormal return during the event declaration period, which is calculated as (3).

$$CAR_{0,5} = \sum_{t=0}^5 AR_{j,t} \quad (3)$$

The $CAR_{0,5}$ is the cumulative abnormal rate of return for the five days following the event. Finally, we can use equation (3) to calculate the average CAR of each event and use the appropriate statistics to verify whether each event has a significant impact on the company's stock return. Using these results, we can determine whether and to what extent the event of a corporate illegal announcement has an impact on the stock price of a listed company in Taiwan with or without CSR.

Statistical Testing for Event Studies

There is still considerable debate in the literature on how to determine AR or CAR, as the power of each statistic may vary depending on the characteristics of the securities market. In this study, the traditional method is used to determine whether there are significant abnormal returns. Assuming that the variance of individual security abnormal returns in the event period is the variance of the estimated period residuals and the security residuals between cross-sections are uncorrelated, the average abnormal return variance in period t is defined as

$$\hat{\sigma}_{AAR_t}^2 = \frac{1}{N^2} \sum_{j=1}^N \frac{1}{T-p} \sum_{t=1}^T (AR_{jt} - \overline{AR}_j)^2 \quad (4)$$

where T is the length of the estimation period, p is the number of unknown parameters in the model, and N is the total number of securities. Under the null hypothesis, the average abnormal return statistics for event period t is

$$t_{AAR} = \frac{AAR_t}{\sqrt{\hat{\sigma}_{AAR_t}^2}} \quad (5)$$

Test statistics for the cumulative average abnormal return rate are as follows:

$$t_{CAAR} = \frac{CAAR_t}{\sqrt{\hat{\sigma}_{CAAR_t}^2}} \quad (6)$$

Research Data

Event Day

In this study, ten shipping companies with European shipping routes, listed and listed in Taiwan, are selected as a single Ever Given container ship stranding event, the Suez Canal blockage event, which occurred on March 23, 2021, at 7:40 a.m. Egypt Standard Time. Therefore, the canal blockage occurred on March 23, 2021, at 1:40 p.m. Taiwan time, and the Taiwan stock market had already closed, the event date refers to the point when the market received the relevant information.

On the first day of the incident, March 23, 2021, there was no news release, and the obstruction of the Suez Canal was an unexpected event. The first news article followed on 2021 March 24, the Central News Agency, "container ship grounding in the Suez Canal Evergreen: suspected of being attacked by strong winds deviated from the channel", this message was found in the incident and mentioned Evergreen as soon as possible to get out of difficult.² Therefore, the defined event date is March 24, 2021.

Estimation Period and Event Period

In this study, we estimate the period from -250 to -10, and the event period from 0 to 30, and observe the

changes in shipping stocks before and after the event date through the market model risk adjustment model to investigate whether abnormal return rates are generated due to abnormal changes in shipping stock prices as a result of the Suez Canal blockage.

Research Companies

In this study, there are 28 shipping companies in the shipping industry listed on the Taiwan Stock Exchange, and 28 companies in the shipping industry under Industry Classification Code 15, and Evergreen, the first company to bear the brunt of this incident, and ten companies operating European shipping routes, have been selected to provide information on each company's website, as summarized below.

1. Evergreen Marine Corp. (Taiwan) Ltd.³ is a domestic container shipping service provider with a network of services on five continents, mainly on ocean shipping routes.

2. Sincere Navigation Corporation⁴, which is mainly engaged in crude oil and bulk cargo transportation business, mainly transports bulk materials such as ore and coal. By September 2021, revenue from bulk carriers accounted for 67% and tankers for 33%.

3. U-Ming Marine Transport Corp.⁵ is one of the largest and most comprehensive fleets of Capesize, Panama Extreme, light bulk carrier, cement tanker, and VLCC vessels in China.

4. Yang Ming Marine Transport Corp.⁶ has developed into a world-renowned provider of container transport services, ranking among the top ten in the world and the second largest container carrier in Taiwan.

5. Chinese Maritime Transport Ltd.⁷ and its subsidiaries are engaged in the operation of international bulk carriers, inland container shipments, and container terminals. The company is the largest container freight forwarder in Taiwan in terms of land transportation.

6. Wan Hai Lines Ltd.⁸ was initially engaged in the transportation of logs between Southeast Asia, Taiwan, and Japan, and then purchased container vessels in 1976 to provide container transportation services from Taiwan to Japan. The company's business includes ship transportation, shipping agency, ship and container trading, port container terminal operation, and ship and container leasing.

7. T3EX Global Holdings Corp.⁹ is a freight forwarding service provider, specializing in sea freight import and export, air freight import and export, customs clearance, warehousing, and land transportation services.

8. Wisdom Marine Lines Co.¹⁰, Limited owns a fleet of bulk carriers, log carriers, double deck carriers, multipurpose carriers, and container carriers, and is small to medium-sized vessel operator. The company is actively expanding its fleet on one hand and eliminating fuel-consuming vessels on the other to improve the overall competitiveness of its fleet, making it one of the largest bulk carrier fleet owners in Taiwan.

9. Franbo Lines Corp.¹¹ is a domestic bulk carrier with a focus on small and medium-sized vessels. It started as a regional shipping agency and has since become a professional and international shipping company.

10. Shih Wei Navigation Co., Ltd.¹² specializes in ship transportation, shipping agency, ship chartering,

³ Evergreen Marine Corp. Available from: <https://www.evergreen-marine.com/>

⁴ Sincere Navigation Corporation—Credibility, Decisiveness, Diligence, Discretion, Improvements.

⁵ Marine, U.M. U-Ming Marine. Available from: <https://www.uming.com.tw/index.aspx>

⁶ Yang Ming Marine Transport Corp. Available from: <https://www.yangming.com/>

⁷ CMT. 2022/7/29. Available from: <http://www.cmt.tw/>

⁸ Wan Hai Lines Ltd. Available from: <https://www.wanhai.com/views/Main.xhtml>

⁹ T3EX Global Holdings Corp. Available from: <http://www.t3ex-group.com/html/index.php>

¹⁰ Wisdom Marine Group. Available from: http://www.wisdomlines.com.tw/wisdom/php/home_e.php

¹¹ Franbo Lines Corp. Available from: <http://www.franbo.com.tw/>

¹² Shih Wei Navigation Co. Ltd. Available from: <http://www.swnav.com.tw/eng/company2.htm>

and trading, and is a domestic shipping company with a diversified portfolio of large, medium, and small bulk and general cargo vessels.

Corporate Social Responsibility (CSR)

These CSR ratings are based on the annual corporate governance evaluation conducted by the Securities and Futures Market Development Foundation, which was jointly commissioned by the consortium's Taiwan Over-the-Counter Securities Trading Center. In this article, the derivative grades are compared to the following: A+: top 5%, A: 6% to 20%, B: 21% to 35%, C: 36% to 50%, C-: 51% to 65%, D: 66% to 80%, and D-: 81% to 100%. Table 1 below shows the number of companies in the shipping industry with CSR ratings in 2020.

Table 1

The Number of Companies in Each CSR Rating

CSR rating	A+	A	B	C	C-	D	D-
	Top 5%	6% to 20%	21%~35 %	36%~50%	50%~66%	66% to 80%	81% to 100%
Count	3	8	6	2	2	4	3

Table 2 Research Companies' Profile from The Taiwan Stock Exchange Inc.¹³ provides a comparison of Evergreen Marine Corp., the primary company affected by this event, and ten companies operating European shipping routes at the same time.

Column Code is a stock code in the stock market. This study examines 28 companies in the shipping industry with industry classification code 15. Two columns are annotated: one for the Event Causer Flag and the other for the operating European Routes.

Table 2

Research Companies' Profile

Seq	Code	Main Businesses	Company name	Company abbreviation	CSR Rating 2020	Event Causer Flag	European Routes flag
01	2208	Ship construction and maintenance	CSBC Corporation, Taiwan	CSBC	B		
02	2603	G301011 ship transportation industry, G401011 shipping agency industry	Evergreen Marine Corp. (Taiwan) Ltd.	Evergreen Marine	A	V	V
03	2605	Ship transportation industry	Sincere Navigation Corporation	Sincere Navigation	D		V
04	2606	Ship transportation	U-Ming Marine Transport Corp.	U-Ming Marine	A		V
05	2607	Vessel transportation and chartering industry	Evergreen International Storage & Transp	EITC	A		
06	2608	Automobile freight industry, automobile route freight industry,	Kerry TJ Logistics Company Limited	Kerry TJ	D		
07	2609	automobile container freight industry	Yang Ming Marine Transport Corp.	Yang Ming Marine	A		V
08	2610	Domestic and foreign water freight, Operation of the passenger transportation business	China Airlines Ltd.	China Airlines	A		
09	2611	Passenger, freight, postal transport	Tze Shin International Co., Ltd.	Tze Shin	C-		
10	2612	Transportation	Chinese Maritime Transport Ltd.	CMT	B		V
11	2613	Bulk cargo ship transportation industry (100% reinvestment in overseas subsidiaries)	China Container Terminal Corp.	China Container	A		

¹³ The Taiwan Stock Exchange Inc. Market Observation Post system. Available from: <https://mops.twse.com.tw/mops/web/t05st03>

To be continued

12	2615	Operating port terminal container terminal	Wan Hai Lines Ltd.	Wan Hai Lines	B	
13	2617	Ship transportation industry, shipping agency industry, other wholesale and retail industry, wholesale of ships and their parts	Taiwan Navigation Co., Ltd.	Taiwan Navigation	C	V
14	2618	Ocean freight service	EVA Airways Corporation	EVA Airways	A+	
15	2630	Scheduled and unscheduled air cargo and passenger transportation on international routes	Air Asia Company Ltd	AACL	A	
16	2633	Maintenance and repair of aircraft and related equipment, lease and sale	Taiwan High Speed Rail Corporation	THSRC	A+	
17	2634	High Speed Rail Operation	Aerospace Industrial Development Corpora	AIDC	A+	
18	2636	Development, manufacture, decoration and sales of domestic and foreign military, civil aviation and related industrial products	T3EX Global Holdings Corp.	T3EX	B	V
19	2637	General investment	Wisdom Marine Lines Co., Limited	Wisdom	A	V
20	2641	International marine transportation business	Franbo Lines Corp.	Franbo Lines	B	
21	2642	Shipping Agency	Taiwan Pelican Express Co., Ltd.	Pelican	B	
22	2643	Car shipping & Home delivery	Soonest Express Co., Ltd.	Soonest	D-	
23	5601	Integrated logistics services	Taiwan Allied Container Terminal Corp.	Taiwan Allied	D-	
24	5603	Container terminal business	Sea & Land Integrated Co	Sea & Land	D-	
25	5607	Container transportation	Farglory FTZ Investment Holding Co.,Ltd.	Farglory FTZ Holding	D	
26	5608	General investment	Shih Wei Navigation Co., Ltd.	Shih Wei Navigation	D	V
27	5609	Shipping agency industry	Dimerco Express Corporation	Dimerco	C-	
28	8367	Air freight forwarding and ocean freight forwarding, import and export customs clearance	Chien Shing Harbour Service Co., Ltd.	CS	C	

Table 3 shows the statistics of European shipping routes and the number of shipping companies. The CSR rating is divided into three categories: Above A, B, and Below C.

Table 3

The Number of Companies in Each CSR Group

CSR rating	Above A	B	Below C
	Top 20%	21%~35 %	36%~100%
European shipping routes	4	4	2
Shipping companies.	11	6	11

Result

In this study, the shipping industry is discussed, especially the 10 companies operating European shipping routes are discussed as a group, and Evergreen Marine Corp. which triggered the incident is also independently examined the impact of the incident.

CAR Analysis of Event Study

Table 4 can be divided into three parts: Evergreen Marine, European shipping routes, and all shipping companies. Although the average cumulative abnormal rate of return (CAR) was negative four days after the incident, Evergreen Marine was not significantly affected, compared to European shipping lines and all shipping stocks, the average cumulative abnormal rate of return (CAR) was significant negative four days after the incident. The average cumulative abnormal return rate of European shipping routes suffered a relatively large impact because of the stranding event, and the average cumulative abnormal return rate fell more in the four days after the event. The rate of return of Evergreen Marine's event owners is higher than that of shipping companies operating European routes, and the rate of return of shipping companies operating European routes is higher than that of all shipping stocks; therefore, it is estimated that Evergreen is an A-rated CSR company, so the impact caused by the major Suez Canal grounding incident is smaller and the risk resistance is higher. Evergreen Marine's CAR (0,1) is -2.414, not significant, and less than European shipping routes' CAR (0,1) is -3.904 and the shipping industry's CAR (0,1) is -1.853. The CAR of all three groups was negative from the second day to the fourth day of the event. CAR analysis shows this event has a negative one-day effect. CAR (0,15) measures the long-term effects following this event, and CAR (0,15) for Evergreen Marine is 28.646 larger than CAR (0,15) for European shipping routes of 17.621 and CAR (0,15) for the shipping industry of 8.190.

Table 4

Cumulate Average Abnormal Return of Evergreen Marine, European Shipping Routes, and All Shipping Companies

Event Period	Evergreen Marine		European shipping routes		shipping industry	
	Cumulate Average Abnormal Return	Prob.Value	Cumulate Average Abnormal Return	Prob.Value	Cumulate Average Abnormal Return	Prob.Value
(0,0)	2.727	0.398	-0.093	0.915	0.481	0.287
(0,1)	-2.414	0.597	-3.904	0.001***	-1.853	0.003***
(0,2)	-1.093	0.845	-1.385	0.362	-0.700	0.371
(0,3)	-0.782	0.903	-0.304	0.862	0.232	0.797
(0,4)	-1.650	0.819	-1.468	0.455	-0.743	0.461
(0,5)	2.584	0.743	2.438	0.257	1.188	0.283
(0,10)	7.885	0.461	2.890	0.321	0.498	0.739
(0,15)	28.646	0.026**	17.621	0.000***	8.190	0.000***

Notes: ***, ** and * respectively refer to 1%, 5% and 10% significance levels.

Table 5 shows the CSR data of 10 companies operating European routes for 2020. The companies in this list can be divided into four companies with a grade of A or higher, four companies with a grade of B, and two companies with a grade of C or lower. Therefore, we can conclude that more responsible companies have higher returns and are less affected by this event; less responsible companies have lower returns. Group Above A's CAR (0,1) is -3.239, which is not significant, but it is less than group B's CAR (0,1) which is -4.102, and the group Below C's CAR (0,1) which is -5.383. The CAR of all three groups was negative from the second day to the fourth day of the event. CAR analysis shows this event has a negative one-day effect. Following this event, CAR (0,15) measures the long-term effects, and CAR (0,15) for Group Above A is 24.893 larger than CAR (0,15) for Group B, which is 15.188, and CAR (0,15) for Group Below C, which is 15.692. In light of the CAR for the 10 companies that operate European routes by CSR Groups, we can conclude that the more responsible

companies have higher returns and are less affected by this event than the less responsible companies; the less responsible companies have lower returns.

Table 5

Cumulate Average Abnormal Return of European Shipping Routes by Their CSR Rating

European shipping routes	Above A		B		Below C	
	Cumulate Average Abnormal Return	Prob. Value	Cumulate Average Abnormal Return	Prob. Value	Cumulate Average Abnormal Return	Prob. Value
N	4		4		2	
(0,0)	1.041	0.463	-0.113	0.936	-1.660	0.430
(0,1)	-3.239	0.106	-4.102	0.041**	-5.383	0.070*
(0,2)	-1.298	0.597	-1.446	0.557	-1.402	0.700
(0,3)	0.384	0.892	-0.818	0.773	-0.752	0.858
(0,4)	-0.102	0.974	-1.939	0.542	-3.633	0.440
(0,5)	6.226	0.073*	0.352	0.919	-0.271	0.958
(0,10)	10.339	0.028**	-0.228	0.961	-2.457	0.725
(0,15)	24.893	0.000***	15.188	0.007***	15.672	0.063*

Notes: ***, **, and * respectively refer to 1%, 5%, and 10% significance levels.

Table 6

Cumulate Average Abnormal Return of the Shipping Industry by Their CSR Rating

shipping industry	Above A		B		Below C	
	Cumulate Average Abnormal Return	Prob. Value	Cumulate Average Abnormal Return	Prob. Value	Cumulate Average Abnormal Return	Prob. Value
N	11		6		11	
(0,0)	0.185	0.792	-0.190	0.847	1.158	0.117
(0,1)	-2.067	0.038**	-2.637	0.059*	-0.889	0.395
(0,2)	-1.135	0.351	-1.362	0.425	0.185	0.884
(0,3)	0.132	0.925	-0.933	0.636	0.602	0.683
(0,4)	-0.815	0.604	-1.807	0.413	-0.388	0.814
(0,5)	2.123	0.218	-0.995	0.680	0.895	0.621
(0,10)	2.929	0.210	-2.106	0.520	-0.507	0.836
(0,15)	11.178	0.000***	6.129	0.100*	4.903	0.097*

Notes: ***, **, and * respectively refer to 1%, 5%, and 10% significance levels.

Table 6 shows all 28 shipping companies, which are classified into 11 companies with Rating Above A, 6 companies with Rating B, and 11 companies with ratings Below C by CSR data in 2020. From the results in Table 5 and Table 6, we know that all shipping industries are less affected by the stranded event than the European shipping routes. Group Above A's CAR (0,1) is -2.067, which is significant, but less than European shipping routes' CAR (0,1) of -3.239, which is not significant. Group B's CAR (0,1) shows that the shipping industry is -2.637, which is less severe than the European shipping routes, which are -4.102. In Group Below C's CAR (0,1), the shipping industry is -0.889, which is not significant, but it is less than European shipping routes, which are -5.383. Group Above A's CAR (0,15) is 11.178 times greater than group B's CAR (0,15), which is 6.129 times greater than group Below C's CAR (0,15), which is 4.903. We can also conclude, based on the CAR for the shipping industry by CSR Groups, that the more responsible companies have higher returns and are less affected by this event than the less responsible companies, while the less responsible companies have lower returns; the

more responsible companies are less affected by this event.

Reasons for a Day Effect of the Event

According to Table 7 the Global schedule reliability of the Global Liner Performance (GLP) report¹⁴, the large volume of cargoes on Christmas Day, the on-time rate decreased to 44.5% in December 2020. The arrival rate of global vessels was 40.3% in March, up 5.6% from January 2021. This indicates that the Ever Given container ship stranded in the Suez Canal had no serious impact on the arrival rate.

Table 7

Global Schedule Reliability

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2018	66.6%	67.2%	65.6%	67.8%	71.7%	76.2%	75.3%	69.2%	67.0%	72.9%	75.5%	73.4%
2019	73.4%	73.6%	74.3%	76.6%	80.2%	83.5%	82.7%	78.7%	77.4%	79.1%	80.0%	76.3%
2020	68.5%	65.0%	70.3%	69.8%	74.8%	77.7%	75.3%	63.7%	56.0%	52.3%	50.0%	44.5%
2021	34.7%	34.7%	40.3%	39.1%	38.7%	39.5%	35.5%	33.4%	33.9%	34.2%	33.2%	32.0%

From Table 7, we can find that the arrival rate of vessels in 2018 was maintained at 65% to 70%, with the lowest being 65.6% in March 2018 and the highest being 76.2% in June 2018, while the arrival rate of vessels in 2019 was maintained at 70% to 80%, with the lowest being 73.4% in January 2019 and the highest being 83.5% in June 2019. It can be seen from the above graph that the arrival rate of vessels in 2020 is 77.7% from the highest point in June 2020 to 44.5% from the lowest point in December 2020, and it can be concluded from 2018 to 2020 that the highest arrival rate of vessels in each year is in June, 2019 is the highest arrival rate year, and 2020 is the most volatile year. Although the container ship stranded in March 2021, the highest arrival rate of vessels in 2021 was 40.3% in March, and the lowest was 32% in December 2021 after the incident in September, and the change in the whole year of 2021 was not much, and the global arrival rate was maintained at 32% to 40%.

Conclusion

This study investigates whether corporate social responsibility (CSR) activities help to reduce the risk of supply chain disruptions by examining the impact of the Ever Given container ship stranded in the Suez Canal for several days in March 2021, which caused a series of economic impacts. The study concludes that companies with better CSR have a lower impact when faced with supply chain disruptions. CAR analysis shows this event has a negative one-day effect. CAR (0,15) measures the long-term effects following this event, and CAR (0,15) for Evergreen Marine is 28.646 larger than CAR (0,15) for European shipping routes of 17.621 and CAR (0,15) for the shipping industry of 8.190. All shipping industries are less affected by the stranded event than the European shipping routes. This study conclude that the more responsible companies have higher returns and are less affected by this event than the less responsible companies; the less responsible companies have lower returns.

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¹⁴ Madsen, N.H., Sea-Intelligence-Schedule reliability remains between 30% and 40%.

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