



Has Firms' Emphasis on Environmental and Social Sustainability Impacted How They Have Been Affected by and Responded to COVID-19?

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OPEN ACCESS

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Specialty section:

This article was submitted to
Sustainable Organizations,
a section of the journal
Frontiers in Sustainability

Received: 05 April 2022

Accepted: 25 May 2022

Published: 16 June 2022

Citation:

Aarstad J, Jakobsen S-E and
Fløysand A (2022) Has Firms'
Emphasis on Environmental and
Social Sustainability Impacted How
They Have Been Affected by and
Responded to COVID-19?
Front. Sustain. 3:913337.
doi: 10.3389/frsus.2022.913337

This paper's major focus is to study if firms' emphasis on environmental and social sustainability has impacted how they have been affected by and responded to COVID-19. A survey of Norwegian firms across industries shows that those emphasizing environmental and social sustainability have had a relatively strong response to COVID-19, albeit not having been strongly affected. For firms in the aquaculture industry, the results are similar to those emphasizing environmental and social sustainability. Firms in the hospitality, tourism and culture industry and firms with international engagements have been strongly affected by COVID-19 and have also had a strong response. Firms with international ownership have been strongly affected but have not had a corresponding response. Overall, being strongly affected by COVID-19 does not always result in a corresponding response. Similarly, a strong response to COVID-19, being the case for firms emphasizing sustainability, is not always triggered by being strongly affected.

Keywords: environmental and social sustainability, COVID-19, affectedness, responsiveness, industries, firm characteristics

INTRODUCTION

COVID-19 has had a negative effect on many firms and industries (Shen et al., 2020), but we have limited knowledge about whether this exogenous shock has induced a response that corresponds to how they have been affected. Granted, COVID-19 has induced firms to respond through digitalization and product development (Guo et al., 2020; Martinez et al., 2021). Also, firms have emphasized improvements in communication and organization structures (Abuhussein et al., 2021), but we do not know whether those most affected have had the strongest response. For instance, we cannot rule out that strongly affected firms may have had a limited response due to the depletion of resources, industry peculiarities, or firm idiosyncratic issues. Conversely, we cannot rule out that those less affected may have had a strong response due to relatively abundant resources or simply seizing an opportunity to increase their competitiveness compared to those less able or willing to react similarly.

TABLE 1 | Factor analysis with orthogonal varimax rotation.

	COVID-19 affectedness	COVID-19 responsiveness
Reduced profitability	0.880	0.077
Reduced liquidity	0.846	0.106
More demanding sales processes	0.750	0.223
More demanding production processes	0.634	0.054
Development of new networks	0.106	0.804
Development of new distribution channels and markets	0.102	0.759
Maintenance of existing networks	0.136	0.727
Cost reductions	0.202	0.542
<i>Cronbach's alpha for items in bold</i>	<i>0.799</i>	<i>0.697</i>

Principal component analysis shows that the items load on two factors explaining 58.1% variance (the eigenvalue was 1.56 for the second factor and 0.832 for the third). N = 801.

Responding to these knowledge gaps, we investigate how Norwegian firms within and across industries have (1) been affected by and (2) responded to COVID-19. Our particular focus is to assess how the two concepts are a function of firms' emphasis on environmental and social sustainability. They relate to "obligations business has to society... [concerning] the economic, legal, ethical, and discretionary categories of... performance" (Carroll, 1979, p. 499), and we can associate them with how firms react to stakeholder interests or expectations (Gössling and Vocht, 2007; Saeidi et al., 2015). Environmental sustainability can more narrowly be defined as a firm's "proclivity to collaborate with stakeholders concerning environmental improvements, share information with competitors concerning environmental improvements, emphasize environmental improvements rather than short-term economic gains, and emphasize environmental improvements as a means of increasing earnings" (Aarstad and Jakobsen, 2020, p. 1). Social sustainability is a related concept that largely taps into how firms emphasize job creation, society's long-term gains, and local ripple effects. Referring to Dyllick and Hockerts (2002), Sarkis et al. (2010, p. 339) assert that "social sustainability means organizations [or firms] add value to their communities by increasing the human capital of individuals and furthering the societal capital of communities".

In the scholarly literature, there is an increasing body of knowledge on the intersection of sustainability and the challenges many stakeholders have faced in the wake of COVID-19 (Bella et al., 2021; Bezzina et al., 2021; Meyer et al., 2021; Muncinelli et al., 2021; Witmer, 2021; Tortato et al., 2022). As we study how firms' emphasis on environmental and social sustainability has impacted their affectedness by and responsiveness to COVID-19, our contribution adds to this body of knowledge. In addition, we assess whether responsiveness to COVID-19 is a function of environmental and social sustainability when accounting for

how firms have been affected. Hence, we identify if firms' environmental and social sustainability are genuine carriers of their responsiveness to COVID-19 independent of the extent to which they have been strongly affected or not. Gaining such knowledge is crucial, we argue, as it illuminates how firms potentially emphasizing environmental and social sustainability have seized opportunities in the wake of a challenge that connotatively has mostly been labeled in negative terms.

Also, we study the potential effects of firm size, innovation performance, major ownership nationally or internationally, and whether a firm has international engagements or not. Our motive for including size and innovation performance is that firms are inherently different along these dimensions (Aarstad et al., 2016; Aarstad and Jakobsen, 2020), but we have limited knowledge about their impact on COVID-19 affectedness and responsiveness. Due to travel restrictions and logistic challenges during the pandemic, location of ownership and international engagements may also have impacted COVID-19 affectedness and responsiveness, which motivates our inclusion of these variables.

Finally, we study the potential effects of operating in the aquaculture industry, the manufacturing industry, the consulting, finance and insurance industry, and the hospitality, tourism and culture industry. Our motive for including these four industries is that they are heterogeneous in input factors, products and services provided, and the market they operate. According to previous research, the hospitality, tourism and culture industry was, furthermore, hit particularly hard by COVID-19 (Kaushal and Srivastava, 2021), but still, we do not know if responsiveness corresponds to affectedness neither in this nor in the other industries we study.

Taken together, including the firm and industry variables mentioned above, are of value as they partake in controlling for heterogeneity in the data and isolate the potentially genuine effects of environmental and social sustainability. In addition, they provide substantial information about a variety of characteristics, beyond sustainability, that may be carriers of how firms have been affected by or responded to COVID-19.

MATERIALS AND METHODS

We merged two surveys gathered in the spring of 2021 of enterprises as the legal entity, labeled as firms. The first covers the Norwegian aquaculture industry and includes firms having at least 20% of their operations affiliated with the industry. It includes 201 firms, which represents a response rate of 15%. The second was carried out about 2 months later, covering the (1) manufacturing industry, (2) the consulting, financial and insurance industry, and (3) the hospitality, tourism and culture industry. It includes data from 600 firms, 200 in each industry, and the response rate is 25%. Altogether, we have data from about 800 firms in four different industries.

To measure affectedness by COVID-19, we asked "to what extent COVID-19 is affecting your enterprise today concerning..." issues reflected in the four first items in **Table 1** (our translations from Norwegian). The four last items reflect

TABLE 2 | Factor analysis with orthogonal varimax rotation.

	Environmental sustainability	Social sustainability
We consult collaboration partners, authorities, or interest groups about environmental improvements	0.786	0.151
We collaborate with other actors about environmental improvements	0.770	0.168
We carry out development and innovation efforts to reduce our environmental footprint	0.770	0.147
We apply R&D-based knowledge to reduce our environmental footprint	0.734	0.075
Environmental improvements strengthen our earnings	0.673	0.152
We are more concerned about environmental challenges than other enterprises in the industry	0.653	0.223
Environmental improvements have greater importance than short-term economic gains	0.543	0.182
We are concerned about local ripple effects of our business (jobs, purchase of goods and services, tax revenues)	0.225	0.724
Local jobs have greater importance than short-term economic gains	0.111	0.701
We are concerned about dialogue with those who are affected by our business (for instance the local community, environmental organizations)	0.309	0.599
We give economic support to voluntary activities in the local community (sports organizations, cultural events etc.)	0.006	0.591
We are more concerned about creating jobs than other firms in the industry	0.217	0.574
<i>Cronbach's alpha for items in bold</i>	<i>0.850</i>	<i>0.661</i>

Principal component analysis shows that the items load on two factors explaining 49.7% variance (the eigenvalue was 1.47 for the second factor and 0.884 for the third). $N = 801$.

how firms have responded to COVID-19. The items were developed for the surveys that we analyzed for this study. Each item is measured on a five-point Likert scale varying between “to a very little extent” (coded 1) and to a very large extent (coded 5). A few absent or “do not know” responses were coded 3 (“neither-nor”). Items reflecting COVID-19 affectedness and responsiveness, respectively, load on two distinct factors. Hence, the convergent and divergent construct validity and Cronbach's alpha reliability coefficients are satisfactory. We take the average for items loading on each factor to model the respective variable. Altogether, COVID-19 affectedness and responsiveness are two distinct vectors or constructs, which we model as dependent variables.

The seven first items in **Table 2** are indicators of firms' emphasis on environmental sustainability, and they were largely developed by Aarstad and Jakobsen (2020). The five last items are indicators of firms' emphasis on social sustainability, and they were developed for the surveys that we analyzed for this study. Each item is measured similarly to those that we have described above. Items reflecting environmental and social sustainability, respectively, load on two distinct factors. Hence, the convergent and divergent construct validity and Cronbach's alpha reliability coefficients are satisfactory. We take the average for items loading on each factor to model the respective variable. Altogether, environmental and social sustainability are two distinct vectors or constructs, which we model as independent variables.

As another independent variable, we include firm size measured in the number of employees. Since it is skewed, we log-transformed it (a few firms had zero employees, so we added the constant one before log-transforming). Next, we

include innovation performance as an independent variable. It was modeled by summarizing scores indicating whether the firm during the last 3 years (1) had introduced a new or substantially improved product or service, (2) the product or service was also new for the market, during the last 3 years (3) had introduced a new or substantially improved process innovation, and during the last 3 years (4) has had collaboration with other companies or institutions related to the development and improvement of products or processes. The questions are similar to those used in the community innovation survey by Eurostat (OECD/Eurostat, 2005). Also, we include an independent variable indicating whether the firm had international engagements or not (if it the last year had exports, production, or ownership abroad). Finally, we include dummies indicating whether firms operate in the aquaculture industry, the manufacturing industry, the consulting, finance and insurance industry, and the hospitality, tourism and culture industry.

RESULTS

Regression results in **Table 3** illuminate that firms emphasizing environmental and social sustainability have had a relatively strong response to COVID-19, albeit not having been strongly affected. In particular, an emphasis on social sustainability has induced a robust effect on COVID-19 responsiveness. The effects of firm size and innovation performance are non-significant on both dependent variables. Firms with major ownership internationally have been strongly affected by COVID-19, despite not having a corresponding response. Firms

TABLE 3 | Bootstrapped ordinary least square regressions.

Dependent variable	COVID-19 affectedness		COVID-19 responsiveness	
	Model 1	Model 2A	Model 2B	
Environmental sustainability	0.027 (0.054)	0.097* [0.095] (0.044)	0.091* [0.090] (0.043)	
Social sustainability	0.071 (0.061)	0.169** [0.095] (0.050)	0.154** [0.120] (0.048)	
Firm size in number of employees (log)	-0.024 (0.036)	-0.021 (0.027)	-0.016 (0.026)	
Innovation performance	0.037 (0.033)	0.007 (0.026)	-2.94e-4 (0.025)	
Major ownership internationally ^a	0.395* [0.076] (0.164)	0.085 (0.158)	0.005 (0.156)	
Major ownership nationally beyond the region ^a	0.118 (0.157)	0.087 (0.109)	0.063 (0.108)	
International engagements	0.250* [0.096] (0.099)	0.201** [0.099] (0.074)	0.150* [0.074] (0.072)	
Aquaculture ^b	0.123 (0.119)	0.372*** [0.174] (0.086)	0.347*** [0.163] (0.085)	
Consulting, finance and insurance ^b	-0.018 (0.110)	0.178 [†] [0.083] (0.093)	0.182* [0.085] (0.086)	
Hospitality, tourism and culture ^b	1.25*** [0.453] (0.111)	0.664*** [0.310] (0.099)	0.410*** [0.192] (0.100)	
COVID-19 affectedness			0.203*** [0.261] (0.030)	
Wald χ^2	189.7***	104.8***	168.7***	
R-square	0.184	0.117	0.173	
R-square adjusted for the number of variables	0.173	0.106	0.161	
Maximum variance inflation factor (VIF)	1.74	1.74	1.89	
Average variance inflation factor (VIF)	1.37	1.37	1.38	
Harman's one-factor test ^c	0.225	0.230	0.199	

N = 800. Bootstrapped standard errors with 10,000 random replications in parentheses. Two-tailed tests of significance for regression coefficients. Beta values for significant regressors in brackets. [†]*p* < 0.10; **p* < 0.05; ***p* < 0.01; ****p* < 0.001. Intercepts omitted.

^aDefault is major ownership locally or regionally.

^bDefault is the manufacturing industry.

^cIncludes indicators measuring all concepts except for firm size and the industry in which the firms operate (as they are measured by using register data and not self-reporting perceptual data).

with international engagements have been strongly affected by COVID-19 and have also had a correspondingly strong response. Firms in the aquaculture industry have had a strong positive response to COVID-19, although not having been strongly affected. The results are similar for firms in the consulting, finance and insurance industry, but to a lesser extent, and they are partially borderline significant. In addition, firms in the hospitality, tourism, and culture industry have both been strongly affected by COVID-19 and have also had a correspondingly strong response. Firms strongly affected by COVID-19 have also had a strong response. Interestingly, however, their response does not equal how they have been affected. COVID-19 responsiveness as a function of firm- and industry characteristics addressed above is, furthermore, substantially unaltered when accounting for firms' affectedness.

Strongly significant Wald χ^2 in all models informs that their explained variances (*R*-square and *R*-square adjusted for the number of variables) are robust. Maximum and average inflation factors (VIFs) taking relatively low numbers inform that multicollinearity is not a problem (cf. O'Brien, 2007). Harman's one-factor tests taking values far below 0.5 (50%) indicate that common method bias is not a problem.

DISCUSSION AND CONCLUSIONS

Our major focus has been to study if firms' emphasis on environmental and social sustainability has impacted how they have been affected by and responded to COVID-19. The strong effect of firms emphasizing environmental and social sustainability on COVID-19 responsiveness is interesting as they do not report to have been much affected. Also, we observe

		Affectedness	
		Weak	Strong
Responsiveness	Strong	<ul style="list-style-type: none"> • Environmental and social sustainability • Aquaculture • (Consulting, finance and insurance) 	<ul style="list-style-type: none"> • Hospitality, tourism and culture • International engagements
	Weak	<ul style="list-style-type: none"> • Manufacturing 	<ul style="list-style-type: none"> • Major ownership internationally

FIGURE 1 | A two-by-two matrix.

similar findings for firms in the aquaculture industry as they too report a strong positive response to COVID-19 despite not being particularly affected. These firms' strong response is possibly due to an inherent ability or willingness to leverage resources and seize opportunities in an environment that, for many others, is challenging.

Figure 1 summarizes the study's overall findings. The figure illuminates that being strongly affected by COVID-19 does not always result in a corresponding response. Similarly, a strong response to COVID-19, being the case for firms emphasizing environmental and social sustainability, is not always triggered by being strongly affected (We include firms in the consulting, finance and insurance industry in parenthesis as the effect on COVID-19 affectedness is partly borderline significant.).

The paper highlights that firms emphasizing environmental and social sustainability have had a relatively strong response to COVID-19, even though they report not to have been hit particularly hard by the pandemic. It indicates that they proactively can seize opportunities in situations that, for many firms, are turbulent and challenging. Thus, they appear to have an inherent ability to respond to challenges and from which other firms may learn. Environmental and social sustainability are positive firm attributes, and a practical implication of this study is that they further induce positive attributes or abilities of proactiveness in novel uncodified situations. This knowledge can be an important learning point for managers and other firm and industry stakeholders to improve sustainability and prepare for future challenges that undoubtedly will occur in one way or another.

Potential reverse causality and common method bias in a cross-sectional research context using self-reporting perceptual data may threaten the study's internal validity. However, we consider variables measuring industry effects, ownership, and

internationalization to be exogenous. Also, we have reported that Harman's one-factor tests take relatively low values in all models. COVID-19 responsiveness as a function of environmental and social sustainability may be spurious effects or induced by reverse causation. However, we believe that including numerous independent variables partly accounts for potential spuriousness. Secondly, we find it unlikely that responsiveness to COVID-19 should have a causal effect on environmental and social sustainability.

Nonetheless, we encourage future research to address the above limitations in a longitudinal research design or by using appropriate instrumental variables. Similarly, we encourage future research to apply variables that are not prone to the limitations of self-reporting perceptual data, e.g., overreporting environmental or social sustainability. One approach can be to apply objective emissions measures as an indicator of environmental sustainability, but such data can be hard to come by. Such data, if available, can also be difficult to compare across different firms and industries using very different technologies. As we study environmental sustainability while controlling for social sustainability and vice versa, we argue that our study partially accounts for the bias of perceptual self-reporting data, but at the same time, we encourage future research to develop novel measures that are not prone to the limitations we have described.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

JA participated in developing the instruments, conceptualized, developed, and wrote the paper. S-EJ participated in developing the instruments, was responsible for gathering the data, and assisted in editing the text. AF participated in developing the instruments and assisted in editing the text. All authors contributed to the article and approved the submitted version.

FUNDING

This paper was funded by the Research Council of Norway, grant number 316539.

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