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Corporate Resilience and Response During COVID-19

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Abstract

The coronavirus pandemic caused a sharp market decline while raising heterogeneous responses across companies related to their employees, supply chain, and repurposing of operations to provide needed products and services. We study whether during the 2020 COVID-19 induced market crash, investors differentiated across companies based on their human capital, supply chain, and products and service response. Using data derived from natural language processing applied to news coverage of corporate responses to the coronavirus crisis for 3,023 companies around the world, we find that more positive sentiment around a company's response is associated with less negative returns. This is especially true for companies with more salient responses and in industries that those responses are more likely to represent a credible commitment to their stakeholders.

Keywords: human capital; supply chain; crisis management; operations; ESG; COVID-19

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1. Introduction

The coronavirus pandemic of 2020 took the world by storm, impacting economies globally. For the first quarter of 2020, the countries struggled to keep up with the rapid spread and economic impact of the coronavirus. A month after the World Health Organization (WHO) fielded the first reports of pneumonia from an unknown cause in China, the coronavirus was declared a public health emergency by the end of January 2020, with 9,826 confirmed cases in 19 countries.[1] Quickly defined, the novel coronavirus (now referred to as COVID-19) is an acute infectious respiratory disease mainly transmitted through contact with respiratory droplets. By February 19th, the WHO reported 2,009 deaths, 75,204 confirmed cases in 25 countries and, noted a startling 1,872 new cases from the previous day.[2]

To prevent, or at least mitigate, the spread of COVID-19, many governments mandated social distancing and instituted severe travel restrictions including quarantines. This had an immediate impact on the labor force, supply chains and sales of products and services. After the S&P500 reached record highs on February 19th, the market observed the largest one-week declines since the 2008 financial crisis.[3]

We study the association between corporate responses we see as plausibly important during this crisis, specifically related to labor practices, supply chain, and repurposing of operations (products and services), to determine whether companies with more positive sentiment around their responses to the crisis experienced less negative returns during the market collapse. We define the analysis period from market (S&P500) high on February 20th compared to market low

[1] "Novel Coronavirus (2019-nCoV) Situation Report – 11," World Health Organization. January 31, 2020.
[2] "Coronavirus disease 2019 (COVID-19) Situation Report – 20," World Health Organization. February 19, 2020.
[3] We acknowledge that at the time of this paper, the coronavirus has not yet been contained globally and markets are still in flux. Nevertheless, we scoped our study to shed light on an active and evolving crisis.

on March 23rd, where the S&P500 experienced a close to 30% drawdown.[4] Given the impact on supply chains and labor, we focus on these characteristics as likely drivers of stock returns during this period, as well as the idiosyncratic firm responses to COVID-19 through changing operations, repurposing products and services to provide solutions.

We use, as measures for how companies responded to the crisis, big data from natural language processing that measures how positive versus negative public sentiment is regarding those corporate responses (Serafeim 2020). Our hypothesis is that firms with more positive public sentiment for the way they respond to the COVID-19 crisis and their effects on employees, suppliers, and customers will outperform their counterparts during the market collapse. This would be the case if a firm's commitment to its stakeholders, customers, suppliers, and employees, is understood as a strategic resource expected to lead to a competitive advantage (Freeman 2010). However, such a commitment is likely to generate strategic resources only if it is deemed as credible, leading to higher levels of trust with its stakeholders and the creation of relational contracts (Gibbons and Henderson 2012; Henderson 2020). The COVID-19 crisis represents a setting where a company's stakeholder response is more likely to be perceived as a credible commitment rather than "cheap talk", as it comes at a time when the world economy is experiencing a severe contraction, thereby making it costly and harder to imitate (Rivkin 2000; Van den Steen and Henderson 2015).[5]

Empirically, our setting does not provide a natural experiment which would allow us to attribute causality to our results. A competing alternative explanation is that our corporate response measures reflect how the COVID-19 crisis affects a company's business, with more positive

[4] Major international market indices also collapsed during the same period. For example, the FTSE 100 declined by 33%, the DAX Performance Index by 34%, the Hang Seng index by 22% and the TOPIX by 26%.
[5] Indeed, most of the firms in our sample received negative sentiment scores suggesting a minority of the firms made a commitment to its stakeholders according to the measures.

(negative) sentiment being associated with more positive (negative) business effect from COVID-19. We attempt to mitigate the probability that this alternative explanation might generate our results through a series of research design choices. We estimate all relations within the 69 GICS industries, as different industries have different exposures and effects from COVID-19 and we present results also controlling for 158 sub-industry effects as even within each industry, subindustries might be differentially affected. In addition, we control for the revision in analyst EPS forecast during the crisis period, which proxies for the expected short-term effects from COVID-19 on the company, and for a sentiment-based measure (*Economy*) that is constructed using the exact same process as the other sentiment measures, with the key difference that it uses keywords pertaining to the company's economic prospects rather than to a company's stakeholder response. We also complement and confirm our results implementing a matched sample analysis, while we control for other factors that might affect a company's crisis stock returns, such as firm size, profitability (ROE), dividend yield, valuation ratios, liquidity, institutional money holdings and flows, momentum, and leverage. In addition, we show that our results are robust to including controls for a measure of a firm's innovation capacity and intangible assets as well as ESG ratings that reflect a firm's policies, principles, and disclosures on ESG issues. Finally, we introduce a series of firm, industry, and country variables that we expect to moderate the relation between corporate responses and stock returns, further increasing our confidence that the relationship we document is not driven by a correlated omitted variable for how unfavorably exposed a firm is to COVID-19.

Our results documenting differential corporate stakeholder responses to the COVID-19 crisis, and that those responses are associated with stock returns during the crisis, contribute to the literature on stakeholder management and corporate social responsibility (Freeman 2010; Eccles,

Ioannou and Serafeim 2014) as well as to the literature on how firms might develop relational contracts with their stakeholders committing resources credibly during a time of crisis (Mayer 2013; Henderson 2020). Moreover, they contribute to the literature analyzing the redeployment of strategic resources following changes in the external environment (Capron, Dussauge, and Mitchell 1998; Lieberman, Lee, and Folta 2017). In addition, they contribute to a growing literature that examines corporate actions during sharp market declines, such as during the great financial crisis (Flammer and Ioannou 2018). Finally, our results documenting that organizations committing to their stakeholder relations during a crisis are perceived as more resilient thereby earning less negative stock returns relate to the concept of organizational adaptability, namely the capacity to adjust responses to changing external drivers, and thereby connect to the literature on dynamic capabilities (Stadler, Helfat and Verona 2013; Wang, Aggarwal and Wu 2020) and organizational routines (Feldman 2000; Helfat and Karim 2014).

2. Background, Motivation and Relevant Literature

The spread of COVID-19 and the associated health and economic pain saw governments take unprecedented measures to stabilize the economy. At the same time, company practices and efforts came into the spotlight. Significant emphasis was placed on labor practices, such as paid sick leave, lay-offs, or hiring of workers in large corporate employers such as Walmart, Home Depot and UPS. Another issue that was emphasized was repurposing operations and skills to create much needed products (e.g. masks and ventilators) by companies such as General Motors, Ford, GE, and 3M. A third topic of wide discussion became the exposure to global supply chains that were disrupted as economies were closing down and workers were at risk of getting infected due to a

lack of protective equipment and appropriate distancing policies, leading to production halts and shortages.[6]

Our hypothesis is that firms that commit to their stakeholder relations during the COVID-19 crisis provide a signal of resilience to investors, leading to less negative stock returns during the market collapse. Resilience is a concept that is not only applicable in a business setting, but a much-discussed concept in the health, psychology, and infrastructure literatures too. Consistent with the Oxford definition of resilience as "the capacity to recover quickly from difficulties," at the most basic level, resilience is about the ability to withstand negative effects from a negative event (Rutter 1993; Coutu 2002; Danes et al. 2009; Folke et al. 2010; Avery and Bergsteiner 2011; Amarapurkar et al. 2009). In this regard, resilience is related to the literature on dynamic capabilities (Stadler, Helfat and Verona 2013; Wang, Aggarwal and Wu 2020) and organizational routines (Feldman 2000; Helfat and Karim 2014) and specifically to the ability of organizations to adapt to changes in the external environment.

Of course, not all corporate responses are likely to be important within the context of COVID-19. As we discussed above, employment and supply chain practices are likely to be focal areas. In addition, the way that companies are repositioning their operations to provide products and services to customers will likely be important considerations. Collectively, those three responses shape a company's commitment to its relationships with three key stakeholders: employees, suppliers, and customers.

Stakeholder management theory suggests that better stakeholder relations could translate into better corporate business outcomes as these relations become strategic resources (Freeman

[6] Just Capital has been tracking corporate responses of the largest corporate employers here: https://justcapital.com/reports/the-covid-19-corporate-response-tracker-how-americas-largest-employers-are-treating-stakeholders-amid-the-coronavirus-crisis/ .

2010). For example, firms that can build and sustain relational contracts with their employees could experience improved employee engagement and productivity (Gibbons and Henderson 2012; Henderson and Van den Steen 2015). However, for stakeholder relations to become strategic resources, leading to better business outcomes, a credible commitment by the company is necessary (Gibbons and Henderson 2012; Mayer 2013). Credibility comes from making investments to the relationship when such investments might be more costly for an organization, such as during a market collapse (Henderson and Van den Steen 2015; Henderson 2020). Therefore, the COVID-19 crisis represents a setting that allows us to observe differential corporate responses and link those to stock returns.

Avoiding lay-offs, providing flexible work schedules, and offering paid sick leave could all allow the firm to be more resilient in the face of adversity as they might be able to maintain high employee productivity while mitigating costs by avoiding employee churn (Eccles, Ioannou and Serafeim 2014). Similarly, companies committed to their supply chain relations might be able to respond more quickly by adapting their supply chain to avoid costly production halts and secure the supply of important materials (Freeman 2010). Finally, companies that divert their operations to provide needed products and services show a customer focus that might allow them to forge stronger customer and brand loyalty. For the above reasons, we expect firms that exhibit more positive sentiment around their human capital, supply chain, and operational crisis response (in-demand products and services) might earn investor confidence and experience less negative returns during the crisis (Lins, Servaes and Tamayo 2017).

However, this hypothesis entails tension. In a time of crisis, most companies significantly cut investments to their stakeholders (Flammer and Ioannou 2018). Therefore, it could be that investors might see responses that harm stakeholders as necessary for corporate survival and the

absence of these efforts as detrimental to the long-term success of the organization in a competitive market (Shleifer 2004). In this scenario, firms with more positive sentiment around their response could see more negative returns.

3. Data and Sample

We combine multiple datasets to understand drivers of stock returns during the COVID-19 crisis. Detailed definitions of variables may be found in the Appendix.

3.1 Corporate Response Data

We use Truvalue Labs environmental, social, and governance (ESG) data, which applies machine learning and natural language processing in eleven languages to assess sentiment across thousands of news sources, such as traditional media, blogs, and industry publications. Truvalue Labs sources big data from a series of vetted outlets to improve the credibility and accuracy of processed information. Moreover, Truvalue Labs has avoided the approach of relying on corporate self-reported data to evaluate companies. Instead, they assess how society at large perceives and is impacted by corporate behavior by gathering data from over 100,000 data sources. For a longer discussion of the Truvalue Labs data we refer the interested reader to prior literature (Serafeim 2020).

For the purposes of this study, we focus on the sentiment scores that specifically identify when COVID-19 is being discussed in relation to companies within unstructured text.[7] Truvalue Labs scores how positive or negative the COVID-19 content tone is within each article and provides sentiment measures for each week starting beginning of January 2020. For example, news that speak about layoffs or absence of sick paid are usually accompanied by negative commentary

[7] For more information on Truvalue Labs COVID-19 dataset see here: https://coronavirus.truvaluelabs.com/.

and thereby receive negative sentiment scores. In contrast, news that pertain to avoiding layoffs or keeping workers safe tend to receive positive commentary and thereby receive positive sentiment scores.[8] Because of the lack of relevant data in the first few weeks, we use data for the period between February 12th and March 24th, when COVID-19 became an important topic of conversation. We construct a firm-level measure over the period of study by calculating separately the median value of Human Capital, Supply Chain, and Products and Services sentiment for a given firm across the six weeks.[9]

For an example on Human Capital, during our study period one article negatively discussed Emirates Group enforcing a temporary 25% to 50% reduction in base salary for the majority of employees as well as announcing that staff were to take unpaid leave.[10] The company's Human Capital response in this article was captured as -1.95. We observe a positive example of a company's Human Capital response during this period in an article quoting Husky Energy's announcement to keep employees and construction sites safe, where staff are working remotely and non-essential employees are asked to stay home.[11] The company's quotes spoke to protecting employees and TruValue Labs captured this positive sentiment with a score of 1.25. Moving on to a company's response to changes in Products and Services, during our study period one article negatively discussed Amazon not responding to the high demand for masks, as the global public began wearing masks daily.[12] The company's Products and Services response in this article was captured as -2.22. We observe a positive example of a company's Products and Services response

[8] Sentiment scores are scaled to vary from -20 to +20.
[9] Truvalue Labs provides two more measures labeled Economy and Social Impact. We have not included those metrics in our analysis because they are less tightly defined and therefore it is not clear what they are measuring exactly regarding companies' responses.
[10] "Germany makes two people the limit, Merkel forced into quarantine," ABC Online, March 22, 2020.
[11] "Husky Energy suspends West White Rose Project in Newfoundland" Cape Breton Post, March 22, 2020.
[12] "A store in Thailand repackaged and sold up to 200,000 used face masks for coronavirus, police chief says," Business Insider, March 10, 2020.

during this period in an article quoting 3M's announcement of a shipment of N95 masks to high risk-cities in the US and outlined the increase production of masks to an annual rate of 2 billion worldwide.[13] TruValue Labs captured this positive sentiment by assigning a score of 1.45.

In addition, we use as a control variable a sentiment measure, "Economy" as a proxy of how COVID-19 has affected the economic prospects of a company during this crisis period. For an example on a negative Economy trend linked to a company, during our study period one article negatively discussed Lyft's link to social distancing starting a counter-trend against ride-sharing.[14] The tone of the section is negative, since Lyft and its ride-sharing competitors are grappling with new norms from social distancing. The company's Economy score in this article was captured as -2.35. We observe a positive example of a company's Economy during this period in an article speaking to FedEx having anticipated positive earnings as they serve the a growing population of people living and working at home, ordering online and shipping packages.[15] The analysts' quotes covering FedEx were positively projecting earnings, and TruValue Labs scored this positive sentiment at 4.59.

3.2 Market Data

We use prices, security features, and (free-float) market capitalizations from the MSCI's ACWI IMI universe, and classify industries and sub-industries in line with the Global Industry Classification Standard (GICS). Returns are calculated in USD.

3.3 Sample

Our sample covers global listed equities with a market capitalization of at least $1 billion USD as of January 1, 2020. The sample includes the intersection of the datasets provided by Truvalue

[13] "Half a million N95 masks are on their way to New York and Seattle, manufacturer says" Washington Post, March 22, 2020.
[14] "Lyft to offer medical supply and meal delivery during coronavirus pandemic," Yahoo! Finance, March 22, 2020.
[15] "Insiders pull the trigger on these stocks on the cheap" Nasdaq, March 22, 2020.

Labs, MSCI, and State Street Corporation. We use twenty-day lagged flows[16], lagged returns and lagged holdings before and including February 19th, 2020 to study the period from February 20th, 2020 through March 23rd, 2020. On average, the 3,023 firms in our sample had a market cap of $18.9 billion US dollars on February 19th, ROE at 13.7%, price-to-earnings of 17.7, book-to-market of 0.62, and dividend yield at 2.5% (Table 1). Crisis Return is the country-adjusted return of a firm during this period, and as expected has a mean close to zero as expected. All response measures have a negative average value suggesting that most news coverage around these companies' responses and COVID-19 has a negative tone. The sample includes companies with $57 trillion USD in market value across 47 countries, suggesting that our analysis represents a sample representative of the global listed firm universe.[17]

4. Research Design

Given our sample is global, we subtract from each firm's stock returns during the period between February 20th and March 23rd the value-weighted return on the market index associated with the country that the firm has as its primary trading venue. Moreover, because the corporate response measures (Supply Chain "SC", Human Capital "HC", and Products and Services "PS"), as well as the return variable could systematically vary across industries, we include in all our models industry fixed effects using the six-digit GICS industry code.[18] Therefore, estimates are derived from within industry, rather than across industry, differences. Moreover, in different specifications we also

[16] State Street flow and holdings data have been anonymized and aggregated to preserve client confidentiality.
[17] All variables are winsorized at 1% and 99% except market cap, dummy variables such as B2C, Routine Tasks and Stalled, as well as country level variables including Customer and Talent. Not winsorizing stock returns produces very similar results to the tabulated results in the paper.
[18] We also estimated all our models including fixed effects for the 8-digit sub-industry code. In some industries there could be significant differences across sub-industries, not only how companies respond but also perform during this crisis period. All the results were very similar, suggesting variation across sub-industry membership within industries is unlikely to explain our results.

include country and subindustry fixed effects.[19] We then measure the relationship between these response measures and returns, which are cumulated from the day after the market peak on February 20th through the trough March 23rd, to determine if realized returns bear a systematic relationship to corporate responses.

Each ordinary least squares regression is conducted with a set of control variables including: dividend yield, earnings-to-price ratio, book-to-market, market capitalization, return on equity and leverage alongside lagged flows, lagged returns, and lagged holdings.[20] We control for lagged returns, institutional money holdings and flows as they have been found to correlate with future returns (Froot, O'Connell and Seasholes, 2001). We expect larger, more profitable, less leveraged, and higher dividend yield stocks to have higher returns during a market collapse as investors might view them as less risky. The two valuation ratios, earnings-to-price ratio and book-to-market, control for differences in the duration of cash flows as 'value' firms might experience more negative returns given more of the firm value is coming from more immediate cash flows that are now being impaired due to the COVID-19 crisis. We also control for liquidity, measured as share turnover. More liquid stocks might experience larger price declines as they are the ones that investors can sell more easily to meet redemptions during a market collapse. In addition, we control for analyst EPS forecast revisions during the crisis, a variable that proxies for the immediate business effects that COVID-19 has on different organizations. All variable definitions can be found in the Appendix.

[19] Including subindustry effects leaves few firms within each subindustry for some subindustries forcing most of the estimation to be derived from a smaller number of subindustries with a large number of firms. For that reason, we report results both using industry and subindustry effects.

[20] Standard errors are robust to heteroscedasticity. Clustering standard errors at the industry or country level leaves all inferences around statistical significance unchanged.

At a company level we average Human Capital, Supply Chain, and Products and Services thus creating a composite "Crisis Response" measure. The coefficient of interest in the model below is β_1.

$$
\begin{aligned}
&Crisis\ Return_i \\
&= \alpha + \beta_1 Crisis\ Response(HC + SC + PS)_i + \beta_2 Lagged\ flow_i \\
&+ \beta_3 Lagged\ return_i + \beta_4 Lagged\ holding_i + \beta_5 ROE_i + \beta_6 E/P_i + \beta_7 BTM_i \\
&+ \beta_8 Momentum_i + \beta_9 Dividend\ yield_i + \beta_{10} Market\ Cap_i \\
&+ \beta_{11} Leverage_i + \beta_{12} EPS\ Forecast\ revision_i + \beta_{13} Liquidity_i \\
&+ Country, Industry\ or\ Subindustry\ Fixed\ Effects + \varepsilon_i
\end{aligned}
$$

5. Results

5.1. Regression Results

Table 1 presents univariate correlations. We observe significant positive correlation between Supply Chain and Human Capital (0.34) indicating that companies with positive public sentiment on supply chain issues have positive public sentiment on employee treatment (paid sick leave, commitments to no or limited layoffs, etc.). Products and Services also exhibits significant positive correlations with Supply Chain (0.28) and Human Capital (0.29). These positive correlations suggest that firms might undertake responses that are consistent across the different themes. But the moderate correlations also suggest significant variation across companies in how they respond and allow us to model all three variables simultaneously. We observe significant negative correlation between both Supply Chain and Human Capital to our Salience measure, -0.35 and -0.32 respectively, as well as with Products and Services (-0.29). This suggests that news articles

on firms' supply chain, human capital, and operational crisis response issues generally had a negative tone and garnered more attention during this period. In addition, in the correlation table we observe crisis return is negatively correlated with the two valuation ratios BTM (-0.19) and E/P (-0.15) with a level of significance less than 1%, which suggests value stocks underperformed during the recent market crash, consistent with observed returns from a variety of value indices (for example, MSCI Value vs. Growth indices, and the performance of the Fama-French HML factor).

Table 1: Summary Statistics and Correlations Across Variables

	Summary Statistics				Correlations									
Variables	Mean	Std Dev	Min	Max	Crisis return	Crisis Response	Supply Chain	Human Capital	Products & Services	Economy	Lagged flow	Lagged return	Lagged holding	Market cap
Crisis return	-0.037	0.147	-0.421	0.339	1.00	**0.11**	**0.10**	**0.09**	**0.07**	**0.14**	0.00	**0.08**	0.03	**0.14**
Crisis Response	-0.492	0.666	-4.548	2.055	**0.11**	1.00	**0.75**	**0.72**	**0.71**	**0.33**	0.01	**0.05**	**0.05**	**-0.23**
Supply Chain	-0.608	0.898	-3.546	1.530	**0.10**	**0.75**	1.00	**0.34**	**0.28**	**0.29**	0.00	0.02	0.02	**-0.17**
Human Capital	-0.498	0.830	-3.548	1.353	**0.09**	**0.72**	**0.34**	1.00	**0.29**	**0.24**	0.01	**0.04**	**0.04**	**-0.22**
Products & Services	-0.368	0.848	-3.584	1.617	**0.07**	**0.71**	**0.28**	**0.29**	1.00	**0.21**	0.02	0.03	**0.05**	**-0.15**
Economy	-0.230	1.079	-2.974	3.475	**0.14**	**0.33**	**0.29**	**0.24**	**0.21**	1.00	0.02	**0.09**	**0.07**	**-0.11**
Lagged flow	-0.002	0.072	-0.304	0.269	0.00	0.01	0.00	0.01	0.02	0.02	1.00	**0.10**	**0.04**	-0.02
Lagged return	-0.009	0.076	-0.210	0.231	**0.08**	**0.05**	0.02	**0.04**	0.03	**0.09**	**0.10**	1.00	**0.25**	**0.13**
Lagged holding	-0.005	0.042	-0.172	0.120	0.03	**0.05**	0.02	**0.04**	**0.05**	**0.07**	**0.04**	**0.25**	1.00	**0.05**
Market cap	22.746	1.190	20.472	27.997	**0.14**	**-0.23**	**-0.17**	**-0.22**	**-0.15**	**-0.11**	-0.02	**0.13**	**0.05**	1.00
ROE	0.137	0.168	-0.459	0.944	0.03	**-0.06**	**-0.05**	**-0.05**	**-0.04**	-0.01	-0.03	-0.04	0.01	**0.20**
E/P	0.056	0.052	-0.122	0.243	**-0.15**	**-0.06**	**-0.06**	-0.03	**-0.05**	**-0.15**	-0.01	**-0.14**	-0.02	0.00
BTM	0.616	0.557	0.027	3.055	**-0.19**	**-0.04**	**-0.05**	-0.01	-0.03	**-0.19**	0.00	**-0.14**	**-0.10**	**-0.18**
Momentum	0.138	0.277	-0.451	1.123	**0.08**	0.02	0.00	0.03	0.01	**0.12**	-0.02	**0.24**	**0.35**	**0.17**
Dividend yield	0.025	0.023	0.000	0.215	**-0.12**	**-0.08**	**-0.05**	**-0.05**	**-0.07**	**-0.11**	0.00	**-0.11**	**-0.07**	0.01
Liquidity	0.749	0.041	0.601	0.841	**-0.14**	**-0.12**	**-0.09**	**-0.11**	**-0.07**	-0.01	-0.02	-0.03	**-0.14**	**0.21**
Leverage	0.228	0.218	0.000	0.944	**-0.06**	-0.01	-0.01	-0.02	0.02	-0.01	-0.01	0.01	**0.07**	**-0.05**
Forecast revision	-0.053	0.170	-1.000	0.405	**0.20**	**0.08**	**0.08**	**0.08**	0.03	**0.09**	0.02	**0.22**	**0.17**	**0.11**
Salience	1.297	1.038	0.012	4.639	**-0.18**	**-0.42**	**-0.35**	**-0.32**	**-0.29**	**-0.23**	0.01	**-0.10**	**-0.08**	**-0.10**
Routine Tasks	0.678	0.467	0.000	1.000	**-0.05**	-0.03	0.00	-0.03	-0.02	**-0.07**	0.00	**-0.05**	-0.02	-0.02
B2C	0.461	0.499	0.000	1.000	**0.11**	**-0.07**	-0.01	**-0.08**	**-0.07**	**-0.05**	0.02	0.01	-0.03	**0.08**
Stalled	0.082	0.274	0.000	1.000	**-0.13**	**-0.09**	-0.03	**-0.07**	**-0.11**	**-0.05**	0.01	-0.03	0.02	**-0.06**
Customer	0.366	0.577	-1.075	1.534	**0.04**	**0.11**	**0.10**	**0.08**	**0.07**	**0.04**	-0.01	**-0.05**	-0.03	-0.02
Talent	0.280	0.449	-1.185	1.600	0.02	**0.07**	**0.06**	**0.04**	**0.05**	**0.05**	-0.01	0.00	0.00	-0.03

Table 1 presents the summary statistics and the univariate correlations across all variables for our sample of global equities. Variables are defined in the Appendix. Correlations in bold are significant at the 5% level.

Table 1: Summary Statistics and Correlations Across Variables (continued)

Correlations(continued)

Variables	ROE	E/P	BTM	Momentum	Dividend yield	Liquidity	Leverage	Forecast revision	Salience	Routine task	B2C	Stalled	Customer	Talent
Crisis return	0.03	**-0.15**	**-0.19**	**0.08**	**-0.12**	**-0.14**	**-0.06**	**0.20**	**-0.18**	**-0.05**	**0.11**	**-0.13**	**0.04**	0.02
Crisis Response	**-0.06**	**-0.06**	**-0.04**	0.02	**-0.08**	**-0.12**	-0.01	**0.08**	**-0.42**	-0.03	**-0.07**	**-0.09**	**0.11**	**0.07**
Supply Chain	**-0.05**	**-0.06**	**-0.05**	0.00	**-0.05**	**-0.09**	-0.01	**0.08**	**-0.35**	0.00	-0.01	-0.03	**0.10**	**0.06**
Human Capital	**-0.05**	-0.03	-0.01	0.03	**-0.05**	**-0.11**	-0.02	**0.08**	**-0.32**	-0.03	**-0.08**	**-0.07**	**0.08**	**0.04**
Products & Serv.	**-0.04**	**-0.05**	-0.03	0.01	**-0.07**	**-0.07**	0.02	0.03	**-0.29**	-0.02	**-0.07**	**-0.11**	**0.07**	**0.05**
Economy	-0.01	**-0.15**	**-0.19**	**0.12**	**-0.11**	-0.01	-0.01	**0.09**	**-0.23**	**-0.07**	**-0.05**	**-0.05**	**0.04**	**0.05**
Lagged flow	-0.03	-0.01	0.00	-0.02	0.00	-0.02	-0.01	0.02	0.01	0.00	0.02	0.01	-0.01	-0.01
Lagged return	-0.04	**-0.14**	**-0.14**	**0.24**	**-0.11**	-0.03	0.01	**0.22**	**-0.10**	**-0.05**	0.01	-0.03	**-0.05**	0.00
Lagged holding	0.01	-0.02	**-0.10**	**0.35**	**-0.07**	**-0.14**	**0.07**	**0.17**	**-0.08**	-0.02	-0.03	0.02	-0.03	0.00
Market cap	**0.20**	0.00	**-0.18**	**0.17**	0.01	**0.21**	**-0.05**	**0.11**	**-0.10**	-0.02	**0.08**	**-0.06**	-0.02	-0.03
ROE	1.00	**0.34**	**-0.30**	**0.08**	**0.10**	-0.01	0.01	**0.10**	0.01	0.01	0.03	**0.05**	**-0.10**	**-0.08**
E/P	**0.34**	1.00	**0.43**	**-0.24**	**0.44**	**-0.14**	**0.05**	-0.02	**0.09**	**0.14**	**0.06**	-0.01	0.00	0.01
BTM	**-0.30**	**0.43**	1.00	**-0.39**	**0.30**	**-0.11**	0.03	**-0.16**	**0.15**	**0.12**	0.01	**-0.06**	**0.13**	**0.07**
Momentum	**0.08**	**-0.24**	**-0.39**	1.00	**-0.25**	0.00	-0.02	**0.23**	**-0.15**	**-0.11**	-0.03	-0.01	**-0.05**	0.00
Dividend yield	**0.10**	**0.44**	**0.30**	**-0.25**	1.00	**-0.20**	**0.07**	**-0.07**	**0.07**	**0.04**	0.01	-0.03	**-0.16**	**-0.14**
Liquidity	-0.01	**-0.14**	**-0.11**	0.00	**-0.20**	1.00	-0.02	**-0.14**	**0.12**	**-0.08**	**-0.04**	-0.02	**0.26**	**0.11**
Leverage	0.01	**0.05**	0.03	-0.02	**0.07**	-0.02	1.00	-0.02	-0.01	**-0.06**	-0.01	**0.09**	-0.03	0.00
Forecast revision	**0.10**	-0.02	**-0.16**	**0.23**	**-0.07**	**-0.14**	-0.02	1.00	**-0.17**	**-0.09**	**0.06**	**-0.09**	0.00	-0.01
Salience	0.01	**0.09**	**0.15**	**-0.15**	**0.07**	**0.12**	-0.01	**-0.17**	1.00	0.01	**0.12**	**0.22**	**-0.16**	**-0.08**
Routine Tasks	0.01	**0.14**	**0.12**	**-0.11**	**0.04**	**-0.08**	**-0.06**	**-0.09**	0.01	1.00	**0.17**	**0.08**	0.00	**0.04**
B2C	0.03	**0.06**	0.01	-0.03	0.01	**-0.04**	-0.01	**0.06**	**0.12**	**0.17**	1.00	**0.19**	**0.04**	0.00
Stalled	**0.05**	-0.01	**-0.06**	-0.01	-0.03	-0.02	**0.09**	**-0.09**	**0.22**	**0.08**	**0.19**	1.00	-0.02	-0.01
Customer	**-0.10**	0.00	**0.13**	**-0.05**	**-0.16**	**0.26**	-0.03	0.00	**-0.16**	0.00	**0.04**	-0.02	1.00	**0.63**
Talent	**-0.08**	0.01	**0.07**	0.00	**-0.14**	**0.11**	0.00	-0.01	**-0.08**	**0.04**	0.00	-0.01	**0.63**	1.00

Table 2 (continued from previous page) presents the univariate correlations across all variables. Variables are defined in the Appendix. Correlations in bold are significant at the 5% level.

Table 2 presents the results for country-adjusted stock returns during the crisis including in the model as explanatory variables a company's crisis response (the average of HC, SC, PS), as well as other control variables. Regardless of country, industry, or subindustry fixed effects, we observe significant and positive relationships between Crisis Response and firm returns in models 1-4. An increase of two standard deviations in the Crisis Response measure is equivalent to approximately 2.2% higher stock returns in the global sample. Adding the Economy control in models 5 and 6, somewhat lowers the estimated coefficient on Crisis Response but it remains still positive and significant. Models 7-9 and 10-12 estimate the relationship between Crisis Response and stock returns separately for the North America and Global ex North America samples. For both the estimated coefficient on Crisis Response is positive and significant and the estimated increase in stock returns is 2.7% and 1.4% respectively. As expected, the estimated coefficients on both the Economy variable and on Forecast Revision are positive and significant. Larger, growth, less liquid, and more profitable firms had less negative returns.

Table 2: Regression Results for Stock Crisis Return on Corporate Crisis Response

Variables	Global						North America			Global ex North America		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Crisis Response	0.0160	0.0137	0.0156	0.0137	0.0112	0.0100	0.0222	0.0194	0.0197	0.0147	0.0099	0.0099
	3.90	3.42	3.76	3.36	2.59	2.37	3.12	2.72	2.63	3.12	2.16	2.03
Economy					0.0085	0.0072			0.0047			0.0094
					3.83	3.37			1.20			3.53
Lagged flow	-0.0252	-0.0333	-0.0220	-0.0295	-0.0224	-0.0294	-0.0039	0.0073	-0.0034	-0.0556	-0.0852	-0.0585
	-0.86	-1.19	-0.75	-1.06	-0.76	-1.05	-0.10	0.21	-0.09	-1.41	-2.26	-1.49
Lagged return	-0.0053	-0.0395	-0.0205	-0.0579	-0.0243	-0.0606	0.0230	-0.0096	0.0212	-0.0623	-0.0990	-0.0689
	-0.14	-1.08	-0.54	-1.54	-0.64	-1.62	0.37	-0.16	0.35	-1.30	-2.08	-1.43
Lagged holding	0.0076	-0.0071	0.0014	-0.0107	-0.0002	-0.0115	0.0355	0.0386	0.0348	-0.0666	0.0117	-0.0631
	0.11	-0.10	0.02	-0.16	0.00	-0.18	0.41	0.47	0.40	-0.63	0.12	-0.60
Market cap	0.0173	0.0169	0.0160	0.0161	0.0164	0.0164	0.0152	0.0119	0.0153	0.0149	0.0187	0.0156
	7.81	7.66	7.18	7.30	7.32	7.38	4.28	3.34	4.31	5.07	6.49	5.25
ROE	0.0200	0.0345	0.0367	0.0498	0.0363	0.0497	0.0543	0.0830	0.0548	0.0550	0.0460	0.0531
	0.97	1.73	1.76	2.49	1.74	2.49	1.64	2.58	1.65	1.83	1.60	1.78
E/P	-0.1048	-0.0817	-0.1309	-0.1080	-0.1245	-0.1051	-0.2547	-0.2146	-0.2542	-0.0505	-0.0492	-0.0414
	-1.34	-1.00	-1.65	-1.32	-1.56	-1.28	-1.61	-1.28	-1.60	-0.66	-0.65	-0.54
BTM	-0.0109	0.0005	-0.0218	-0.0095	-0.0207	-0.0087	-0.0143	0.0011	-0.0126	-0.0283	-0.0245	-0.0278
	-1.39	0.06	-2.55	-1.08	-2.42	-0.98	-0.58	0.05	-0.51	-3.67	-3.12	-3.61
Momentum	-0.0223	-0.0193	-0.0261	-0.0247	-0.0277	-0.0261	-0.0117	-0.0150	-0.0140	-0.0350	-0.0307	-0.0350
	-1.97	-1.77	-2.28	-2.22	-2.41	-2.34	-0.60	-0.80	-0.71	-2.52	-2.20	-2.52
Dividend yield	-0.2793	-0.2144	-0.2491	-0.2084	-0.2604	-0.2132	-0.1526	0.1027	-0.1617	-0.3391	-0.2166	-0.3375
	-2.03	-1.61	-1.71	-1.51	-1.80	-1.56	-0.56	0.36	-0.59	-2.15	-1.46	-2.15
Liquidity	-0.6200	-0.6234	-0.5952	-0.5748	-0.5906	-0.5719	-0.2254	-0.2842	-0.2397	-0.6061	-0.5694	-0.5938
	-8.72	-8.86	-6.04	-5.88	-5.99	-5.84	-1.03	-1.35	-1.09	-5.64	-5.26	-5.52
Leverage	-0.0184	-0.0142	-0.0171	-0.0130	-0.0173	-0.0133	-0.0366	-0.0187	-0.0365	-0.0061	0.0004	-0.0065
	-1.57	-1.24	-1.46	-1.13	-1.49	-1.16	-1.88	-0.99	-1.88	-0.42	0.03	-0.45
Forecast revision	0.0856	0.0755	0.0850	0.0753	0.0839	0.0752	0.0625	0.0767	0.0623	0.1044	0.0609	0.1025
	4.29	3.96	4.24	3.91	4.19	3.90	2.47	2.93	2.46	3.53	2.11	3.48
N	3023	3023	3023	3023	3023	3023	1136	1136	1136	1887	1887	1887

Adjusted R-squared	0.29	0.35	0.33	0.38	0.33	0.38	0.35	0.42	0.35	0.33	0.39	0.34
Country Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes	No	Yes
Subindustry Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes	No	No	Yes	No

Table 3 presents estimated coefficients and below those t-statistics. Dependent variable is the firm level stock returns minus the country level market returns cumulated between February 20th 2020 and March 23rd 2020. All variables are defined in the Appendix.

In Table 3 we observe significant and positive relationship with stock level returns for a company's response to Human Capital (HC), Supply Chain (SC), and Products and Services (PS) issues during the crisis. When testing these sentiment characteristics all at once, we observe HC and SC to be significant but not PS in focusing on model 4. In untabulated results we find that in the Global sample excluding North America, SC is insignificant but PS is significant, which suggests North America potentially has relatively higher concern for supply chain issues during this period but that in the global sample a company's repurposing of products and services was evaluated as more important.

Table 3: Regression Results for Stock Crisis Return on Human Capital, Supply Chain and Products & Services Responses

Variables	Model 1	Model 2	Model 3	Model 4
Human Capital	0.0098			0.0076
	3.30			2.49
Supply Chain		0.0083		0.0060
		3.06		2.18
Products & Services			0.0050	0.0020
			1.88	0.75
Lagged flow	-0.0217	-0.0200	-0.0221	-0.0214
	-0.74	-0.68	-0.76	-0.73
Lagged return	-0.0199	-0.0169	-0.0149	-0.0215
	-0.52	-0.44	-0.39	-0.56
Lagged holding	0.0065	0.0070	0.0020	0.0045
	0.10	0.10	0.03	0.07
Market cap	0.0155	0.0150	0.0145	0.0162
	6.94	6.77	6.60	7.20
ROE	0.0370	0.0380	0.0369	0.0371
	1.77	1.81	1.76	1.77
E/P	-0.1343	-0.1303	-0.1305	-0.1322
	-1.69	-1.62	-1.62	-1.66
BTM	-0.0230	-0.0223	-0.0231	-0.0219
	-2.68	-2.60	-2.68	-2.56
Momentum	-0.0273	-0.0257	-0.0261	-0.0265
	-2.37	-2.23	-2.26	-2.31
Dividend yield	-0.2480	-0.2592	-0.2475	-0.2518
	-1.69	-1.77	-1.69	-1.72
Liquidity	-0.6114	-0.6027	-0.6243	-0.5922

	-6.22	-6.11	-6.34	-6.01
Leverage	-0.0165	-0.0174	-0.0183	-0.0165
	-1.41	-1.48	-1.56	-1.41
Forecast revision	0.0855	0.0856	0.0875	0.0844
	4.25	4.24	4.32	4.21
N	3023	3023	3023	3023
Adjusted R-squared	0.33	0.33	0.33	0.33
Country Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes

Table 3 presents estimated coefficients and below those t-statistics. Dependent variable is the firm level stock returns minus the country level market returns cumulated between February 20th 2020 and March 23rd 2020. All variables are defined in the Appendix.

Table 4 adds controls for a firm's innovation capacity through the accumulation of intangible assets and ESG ratings. We follow Demers et al. (2020) and calculate innovation-related assets as the accumulation of R&D investments and investments in SG&A over the past five years (RD&SGA).[21] Demers et al. (2020) hypothesize that this variable explains stock returns during the first quarter of 2020. Moreover, we include controls for ESG ratings that research hypothesizes to be associated with returns during the COVID-19 induced market collapse (Albuquerque et al. 2020). These ratings do not reflect how companies reacted during the crisis but primarily an accumulation of policies, principles, disclosures, and strategies around ESG issues (Kotsantonis and Serafeim 2019, Christensen, Sikochi and Serafeim 2019). We use MSCI and Sustainalytics ESG ratings, as of the end of 2019, two of the most widely used such ratings. We use multiple ESG ratings because of the well documented relatively low correlation between different ESG ratings (Berg, Kolbel, Rigobon 2019; Christensen et al. 2019). Within our sample the two ratings are correlated at 0.48.

[21] We set R&D expenditures to zero if they are missing. We do not set to zero SG&A expenditures to zero if missing as they are unlikely to be zero for any organization.

The sample decreases by about 600 firms when requiring ESG ratings and the RD&SGA variables. Including these controls leaves our results unchanged. The Crisis Response variable is still highly significant, and the estimated economic effect remains practically unchanged compared to Table 3. This is because Crisis Response exhibits very low correlation with these additional control variables. The RD&SGA variable is significant as is the ESG rating by MSCI. A two standard deviation increase in the ESG rating by MSCI is associated with about 1.2% higher stock returns, close to half the economic effect of a two standard deviation increase in the Corporate Response variable. The ESG rating from Sustainalytics is not significant. We conclude that the importance of a company's response towards its stakeholders is important even in the presence of controls for intangible assets and ESG ratings.

Table 4: Additional Controls

Variables	Model 1	Model 2
Crisis Response	0.0154	0.0154
	3.33	3.30
MSCI ESG rating	0.0030	
	2.35	
Sustainalytics ESG rating		-0.0031
		-1.01
RD&SGA	0.0068	0.0078
	1.94	2.26
Lagged flow	-0.0290	-0.0355
	-0.98	-1.16
Lagged return	-0.0930	-0.0739
	-2.34	-1.76
Lagged holding	-0.0388	-0.0298
	-0.56	-0.42
Market cap	0.0155	0.0170
	6.30	6.56
ROE	0.0370	0.0386
	1.74	1.78
E/P	0.0035	-0.0241
	0.04	-0.27
BTM	-0.0091	-0.0088
	-0.79	-0.79
Momentum	-0.0144	-0.0156
	-1.22	-1.27

Dividend yield	-0.3238	-0.2529
	-2.02	-1.56
Liquidity	-0.5486	-0.5246
	-4.97	-4.63
Leverage	-0.0128	-0.0089
	-0.99	-0.70
Forecast revision	0.0896	0.0718
	4.55	3.54
N	2417	2392
Adjusted R-squared	0.40	0.40
Country Fixed Effects	Yes	Yes
Subindustry Fixed Effects	Yes	Yes

Table 4 presents estimated coefficients and below those t-statistics. Dependent variable is the firm level stock returns minus the country level market returns cumulated between February 20th 2020 and March 23rd 2020. All variables are defined in the Appendix.

5.2. Matched Sample Analysis

In this section, we performed a propensity score matching analysis to produce a group of control firms that looks as similar as possible to high Crisis Response firms. A firm is defined as High Response (H) if the firm has greater than median Crisis Response value; otherwise, it is defined as Low Response (L). By generating and comparing matched pairs of firms, we aim to reduce the bias due to confounding variables that could be found in the crisis return estimate of the High Response group, such that we have more confidence to conclude that the difference between the matched firms is a result of different corporate crisis responses.

We match each High Response firm with a control firm that is in the same subindustry classification by requiring the exact matching for the subindustry membership. Within the same subindustry, we use nearest neighbor matching based on propensity scores, which are generated based on a logit regression on the variables that might affect a company's crisis stock returns, such as firm size, ROE, dividend yield, valuation ratios, liquidity, leverage, analyst earnings forecast, lagged returns as well as institutional money holdings and flows and the Economy variable. The

propensity score matching is produced with replacement and a standard caliper.[22] In the untabulated results for the logit regression, we find economy, E/P, and forecast revision load with a positive and significant coefficient, while size, ROE and liquidity loadings are significant but negative.

Table 5 shows the statistics for matching quality and results. For most of the confounding variables used in the propensity score matching process, the matched low response group (M) look much more similar to the High Response group (H) than the unmatched group (L), as reflected in the mean estimates. To assess the matching quality, we present both the statistical paired t-test and the standardized bias. Statistical significance testing, although straightforward, has the shortcoming that it is sensitive to sample size (Austin, 2011; Imai, King, & Stuart, 2008), and often is discouraged from use (Pan and Bai, 2015). According to the t-tests, none of the differences in the mean estimates across the H and M groups are statistically significant, except E/P. A preferred approach is to evaluate the matching quality using the standardized bias for each covariate which is defined in (Rosenbaum & Rubin, 1985).[23] All covariates, including E/P, have standardized bias between H and M less than 0.1, indicating successful matching. In other words, the High Response group and the matched group are very similar in terms of their size, evaluation ratios, dividend yield, profitability, liquidity, leverage, forecast revisions, economic impact from COVID-19, pre-market crash performance as well as institutional investor ownership and flows.

[22] We use a caliper of 0.2 to ensure none of the matched pairs is materially different based on the propensity scores. The use of caliper reduces our matched sample size from 1511 to 957. Sensitivity analysis using different caliper values is performed, and results are similar.

[23] $Standardized\ bias = \frac{\bar{X}_{treatment} - \bar{X}_{control}}{\sqrt{\frac{s^2_{treatment} + s^2_{control}}{2}}}$.

With the matched samples, we now can compare the crisis returns for the High Response group and the matched group, having more confidence that the difference between the two groups are most likely due to firms' different crisis responses but not other covariates. As shown in Table 5, there is an economically meaningful and statistically significant difference in stock returns, about 2.47%, between the High Response group and the matched group during the market crash from February 20 to March 23 of 2020. The standardized bias between the two groups has a value of 0.17, also suggesting the two groups being very different.

Table 5: Propensity Score Matching Results

Variables	Unmatched Low Response firms (L) mean	High Response firms (H) mean	Matched Low Response firms (M) mean	Mean difference between H and M	P-value of paired t-test between H and M	Standardized bias between H and M
Crisis return	-5.11%	-1.74%	-4.21%	2.47%	0.0000	0.1746
Economy	-0.5364	-0.2365	-0.2298	-0.0066	0.8376	0.0074
Lagged flow	-0.0022	-0.0001	-0.0026	0.0024	0.3705	0.0409
Lagged return	-0.0136	-0.0092	-0.0091	-0.0001	0.9848	0.0008
Lagged holding	-0.0075	-0.0046	-0.0050	0.0004	0.8191	0.0099
Market cap	23.0662	22.5698	22.5984	-0.0287	0.4120	0.0289
ROE	0.1486	0.1295	0.1225	0.0070	0.3107	0.0445
E/P	0.0574	0.0566	0.0519	0.0047	0.0209	0.0910
BTM	0.6221	0.6206	0.5883	0.0323	0.1197	0.0591
Momentum	0.1320	0.1392	0.1421	-0.0029	0.8020	0.0108
Dividend yield	0.0262	0.0242	0.0243	-0.0001	0.8908	0.0054
Liquidity	0.7562	0.7455	0.7451	0.0004	0.7919	0.0101
Leverage	0.2285	0.2226	0.2294	-0.0068	0.4615	0.0314
Forecast revision	-0.0653	-0.0472	-0.0443	-0.0028	0.6832	0.0170
N	1512	957	957	957	957	957

Table 5 presents Propensity Score matching result. A firm is defined as High Response (H) if the firm has greater than median Crisis Response value; otherwise, it is defined as Low Response (L). All variables are defined in the Appendix.

5.3. *Moderating Effects*

We estimate models where we interact the response measure with several firm, industry, and country level characteristics.[24] Our goal is twofold. First, to understand the contingent nature of

[24] We mean adjust the Salience, and the country level variables so the base term of Crisis Response can be evaluated when the interaction term is set at the mean value of those variables, which is zero. The indicator variables for Routine Tasks, B2C and Stalled are kept as indicator variables as the Crisis Response base term if evaluated at zero for them.

the relationship between crisis corporate responses and stock returns and the context in which those responses might be more likely to be interpreted as signals of corporate resilience. Second, to increase confidence in the hypothesized mechanism driving the relationship rather than an alternative explanation, which would not only need to explain the on average relationship but also why the relationship varies according to these characteristics.

5.3.1 Firm-level characteristics

At the firm level we use as a moderating variable the salience of a company's response. We expect that the positive association between Crisis Response and returns will be stronger for companies where the response is more salient if the salience of the response is a measure of how important this response might be in enhancing or damaging relationships with stakeholders. We measure Salience as the natural logarithm of one plus the ratio of the number of COVID-19 specific documents that have been tagged divided by the company's market capitalization, measured in billions of USD, on February 19th (the day before we start measuring our dependent variables). We divide number of documents by market capitalization, as larger firms have more documents and receive more attention. We log transform the variable to mitigate skewness. Table 6, Model 1 confirms our prediction regarding Salience. The interaction term between Salience and Crisis Response is positive and significant in model 1. For salient news (increased by two standard deviations) a two standard deviation increase in Crisis Response now translates to 3.8% higher stock returns (relative to 2.2% in Table 3).

Moreover, we test whether these responses are a "luxury good." If these responses can be afforded only by the most profitable firms, we expect that firm profitability will moderate

positively the Crisis Response variable. We measure firm profitability as Return on Equity.[25] We fail to find evidence that profitability moderates Crisis Response in model 2. The coefficient on the interaction term is insignificant and in fact negative (the luxury good argument would suggest a positive coefficient).

5.3.2 Industry-level characteristics

At the industry level, we focus on two key characteristics of industries we expect those responses to be more likely to represent a credible commitment to stakeholders. In both cases, because the commitment to stakeholders might be more difficult and costly it is more likely to be both credible and hard to imitate thereby differentiating these firms. First, we analyze whether Crisis Response might be more strongly associated with returns as a function of an industry's type of jobs and, in particular, the extent to which the jobs require manual physical routine labor. We expect that a more positive Crisis Response might be more important in those industries, as efforts to protect labor will likely be more heavily scrutinized and as efforts to keep labor safe will also be a more important concern, given likely inability to work from home. Therefore, we introduce a variable (Routine Tasks) measured at the subindustry level. This variable is sourced from the literature in technology and jobs as tasks requiring more manual, physical, and routine labor are more likely to be automated in the future. It is constructed as the probability that job tasks might be automated in a subindustry given the tasks performed by workers within the subindustry across the different jobs (Frey and Osborne 2017; Kotsantonis and Serafeim 2020). We code this variable as an indicator variable taking the value of 1 for two-thirds of the subindustries in our sample (where probability>0.6) as the distribution of the probability is highly left skewed where a large number

[25] Using return-on-assets yields similar results.

of industries have a high probability of automation and only a small number of subindustries having a low probability. Examples where Routine Tasks takes a high value includes subindustries such as: automobile manufacturers, textiles, steel, insurance brokers, electrical components and equipment. Routine Tasks takes a low value for subindustries such as: systems software, advertising, electric utilities, cable and satellite. Model 3 shows that the interaction term is positive and significant.

Second, we analyze if Crisis Response is more strongly associated with returns as a function of how impacted a subindustry was by major changes in the global economy (travel bans, social distancing, lockdowns, etc.). To study subindustries that had been more severely impacted by this crisis, we introduce an indicator variable (Stalled), which takes the value of one for subindustries with a drastic increase in unemployment over the crisis and subindustries directly and negatively impacted by travel bans.[26] Examples of Stalled subindustries are airlines, airport services, leisure facilities, hotels, resorts and cruise lines. Examples of subindustries that are not "Stalled" according to this indicator are food retailers and pharmaceuticals. Model 4 demonstrates that the interaction term is significantly positive.

In Table 6, we analyze if Crisis Response is more strongly associated with crisis returns as a function of the type of business. Some businesses have direct to consumer sales models, building brands that people feel emotionally tied to but which also entail making relatively quick and atomic decisions. Other types of businesses sell directly to other businesses, where the decision-making process around sales is stickier, more involved and longer-term. The business-to-business process involves many more stakeholders and typically operates based on stickier, longer-term contracts.

[26] To assess large increases in unemployment, we referred to the Bureau of Labor Statistics' change in unemployment rates from February to April 2020.

For example, online retailers, restaurants, are selling directly to consumers and those purchases in some instances are received within moments. On the other hand, a semiconductor company selling to a tech hardware company will be a relatively longer decision-making process. If an alternative explanation where the corporate response measure might reflect differences in how positive or negatively COVID-19 affects the economics of different business, then one might expect a stronger effect in business to consumer settings. To capture this characteristic, we introduce an indicator variable (B2C) assessed at the subindustry level. Examples of B2C subindustries are soft drinks, household products, and broadcasting. Examples of subindustries that are not B2C are chemicals and advertising. Model 5 shows show that the interaction term is not significant. Model 6 includes all the interaction terms together and reaches similar conclusions.

Table 6: Regression Results for Moderating Effects

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Crisis Response	0.0077	0.0145	-0.0043	0.0075	0.0126	-0.0028	-0.0028	-0.0026
	1.71	2.46	-0.58	1.69	2.26	-0.33	-0.33	-0.31
Crisis Response * Salience	0.0099					0.0085	0.0117	0.0104
	2.34					2.00	2.67	2.40
Salience	0.0014					0.0009	0.0023	0.0003
	0.30					0.20	0.51	0.06
Crisis Response * ROE		-0.0234				-0.0242	-0.0188	-0.0243
		-0.9439				-1.01	-0.78	-1.01
Crisis Response * Routine Tasks			0.0400			0.0235	0.0212	0.0213
			2.67			2.79	2.47	2.50
Routine Tasks			0.0144			-0.0077	-0.0118	-0.0119
			0.56			-0.62	-0.96	-0.98
Crisis Response * Stalled				0.0400		0.0313	0.0301	0.0298
				2.67		2.03	1.86	1.84
Stalled				0.0144		0.0037	-0.0061	-0.0087
				0.56		0.14	-0.23	-0.33
Crisis Response * B2C					-0.0040	-0.0121	-0.0122	-0.0108
					-0.53	-1.62	-1.58	-1.41
B2C					0.0352	0.0338	0.0355	0.0366
					2.83	2.62	2.69	2.76
Crisis Response * Customer							0.0146	
							2.34	
Customer							0.0174	
							3.22	

Crisis Response * Talent								0.0100
								1.33
Talent								0.0090
								1.47
Economy	0.0082	0.0084	0.0087	0.0085	0.0085	0.0083	0.0076	0.0077
	3.69	3.79	3.91	3.83	3.87	3.76	3.52	3.52
Lagged flow	-0.0202	-0.0217	-0.0203	-0.0210	-0.0209	-0.0150	-0.0173	-0.0174
	-0.69	-0.74	-0.69	-0.72	-0.71	-0.51	-0.59	-0.59
Lagged return	-0.0272	-0.0258	-0.0233	-0.0263	-0.0243	-0.0295	-0.0127	-0.0152
	-0.72	-0.68	-0.62	-0.69	-0.64	-0.78	-0.35	-0.42
Lagged holding	0.0030	0.0013	0.0036	0.0013	0.0041	0.0155	0.0176	0.0211
	0.04	0.02	0.05	0.02	0.06	0.23	0.26	0.30
Market cap	0.0155	0.0164	0.0165	0.0161	0.0162	0.0151	0.0164	0.0162
	6.96	7.34	7.37	7.19	7.23	6.85	7.52	7.47
ROE	0.0341	0.0233	0.0340	0.0354	0.0367	0.0182	0.0080	0.0033
	1.65	0.94	1.63	1.70	1.76	0.74	0.33	0.14
E/P	-0.1149	-0.1229	-0.1155	-0.1210	-0.1326	-0.1072	-0.0938	-0.0884
	-1.46	-1.55	-1.45	-1.52	-1.67	-1.37	-1.22	-1.14
BTM	-0.0189	-0.0207	-0.0211	-0.0207	-0.0202	-0.0189	-0.0103	-0.0082
	-2.20	-2.41	-2.47	-2.41	-2.36	-2.22	-1.30	-1.05
Momentum	-0.0281	-0.0280	-0.0284	-0.0276	-0.0269	-0.0281	-0.0235	-0.0246
	-2.42	-2.43	-2.48	-2.40	-2.34	-2.45	-2.08	-2.17
Dividend yield	-0.2467	-0.2585	-0.2760	-0.2592	-0.2415	-0.2507	-0.2278	-0.2470
	-1.72	-1.79	-1.92	-1.80	-1.67	-1.76	-1.67	-1.82
Liquidity	-0.5664	-0.5854	-0.5836	-0.5935	-0.5817	-0.5576	-0.6442	-0.6087
	-5.73	-5.94	-5.92	-6.03	-5.93	-5.68	-8.84	-8.60
Leverage	-0.0183	-0.0174	-0.0173	-0.0186	-0.0168	-0.0188	-0.0197	-0.0202
	-1.57	-1.49	-1.49	-1.60	-1.45	-1.63	-1.71	-1.75
Forecast revision	0.0825	0.0842	0.0823	0.0839	0.0843	0.0815	0.0810	0.0818
	4.16	4.23	4.13	4.17	4.22	4.15	4.17	4.21
N	3023	3023	3023	3023	3023	3023	3022	3022
Adjusted R-squared	0.34	0.33	0.34	0.34	0.34	0.34	0.31	0.31
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6 presents estimated coefficients and below those t-statistics. Dependent variable is the firm level stock returns minus the country level market returns cumulated between February 20th 2020 and March 23rd 2020. All variables are defined in the Appendix.

5.3.3 Country-level characteristics

At the country-level we include two characteristics. We expect that in countries where stakeholder relations might be more important for companies the relationship between crisis response and stock returns will be stronger. The country-level data are coming from the IMD World Competitiveness

report[27] that assesses each country's competitiveness. The assessment includes surveys of managers in each country. We measure importance of stakeholder relations through a variable that measures if companies in the country focus on customer satisfaction (Customer) and a variable that measures if companies in the country focus on attracting and retaining talent (Talent). This reflects two of the stakeholders included in our corporate response measures reflect since the third one, suppliers, there is no measure available in the dataset.[28]

In model 7 we find that the interaction term with customer is positive and significant. In countries where companies focus more on customer satisfaction (two standard deviation increase in these measures) a two standard deviation increase in the Crisis Response measure translates to 3.52% and 3.92% higher stock returns respectively. In model 8 we find that the interaction term between talent and crisis response is positive but insignificant. [29] We do not add the two country variables in the same model due to their high positive correlation.

6. Conclusion

During a market crisis, investors are looking for evidence that a company can be resilient. In this paper we ask the question if a company that invested in its stakeholder relations demonstrated stronger relative stock market performance during the COVID-19 market collapse.

Collectively, our evidence provides the first evidence on market response during the COVID-19 induced market collapse, as a function of corporate Crisis Responses. We have

[27] IMD World Competitiveness Yearbook. 2019

[28] Because survey participants are likely to respond more favorably across all measures for countries where it is easier to do business in and where the environment is more business friendly, we estimate country-level models to remove that 'halo' effect. This approach is consistent with prior literature that uses survey data and seeks to control for that halo effect (Guiso, Sapienza, and Zingales 2015). Therefore, the measures we use are the residuals after regressing on a measure in the same World Competitiveness Report around the 'ease of doing business' in the country.

[29] We do not include country fixed effects in Table 6 so the coefficients on the country level variables can be estimated.

attempted to mitigate alternative explanations through research design choices and by presenting alternative specifications: controlling for firm characteristics that are likely to be determinants of crisis stock returns, including a sentiment measure that directly proxies for the business effect from COVID-19 on each firm and parallels the methodological construction process for our key variables of interest and analyst earnings forecast revisions during the crisis, matched sample analysis, and introducing moderators that corroborate our inferences. That being said, we caveat our results by noting that we lack a natural experiment and therefore endogeneity concerns can still be present in our study.

We conclude with a few key insights and suggestions for future research. The evidence suggests that investments in stakeholder relations could be valued as strategic resources especially in a business context where those investments represent a credible and costly commitment to those stakeholders. Future research could examine the effects that those corporate responses had on employee morale or customer behavior. Moreover, our results suggest the application of machine learning to big data of unstructured text represents a promising technology to measure corporate responses and associated crisis management efforts. Understanding the interplay between corporate disclosure, media and social media activity and those corporate responses might provide a fuller understanding of how the application of these technologies can provide new frontiers for the measurement of organizational behavior.

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Appendix

Human Capital (HC) = sentiment measure capturing a company's action (inaction) regarding layoffs, working from home, unemployment, and related topics between February12th and March 24th, 2020.

Supply Chain (SC) = sentiment measure capturing a company's action (inaction) regarding operational stoppages, production issues, supply of goods, etc. between February12th and March 24th, 2020.

Products and Services (PS) = sentiment measure capturing a company's action (inaction) regarding any shift in a company's operations to produce in-demand products, materials and other crisis-specific products or services between February12thand March 24th, 2020.

Crisis Response = sentiment measure capturing a company's action (inaction) on HC, SC, and PS by averaging the three measures.

Economy = sentiment measure capturing market and product trends that effected a company between February 12th and March 24th, 2020.

Salience = natural logarithm of one plus the number of COVID-19-specific documents tagged to a company relative to the company's market capitalization between February12th and March 24th, 2020.

Routine Tasks = subindustry level assessment describing the type of tasks need to be performed by a company's typical employee where a higher value represents a subindustry jobs requiring primarily physical, manual and routine labor. Takes the value of one if the probability is greater than 0.6 which represents the top two terciles.

B2C = subindustry level assessment identifying subindustries where most of the products and services are sold to consumers rather than other businesses.

Stalled = assessment of subindustries most impacted by the crisis including the highest increases of unemployment and largest drop in year on year revenues.

Customer = the residual of a country's score in the 2019 assessment of the IMD World Competitiveness Report assessing whether "Customer satisfaction is emphasized in companies" after orthogonalizing with respect to a measure of "Ease of doing business."

Talent = the residual of a country's score in the 2019 assessment of the IMD World Competitiveness Report assessing whether "Attracting and retaining talents is a priority in companies" after orthogonalizing with respect to a measure of "Ease of doing business."

Dividend Yield = dividend per share over stock price as of February 19th, 2020.

Earnings-to-Price Ratio = earnings per share over stock price as of February 19th, 2020.

Book-to-Market = book over market value of equity as of February 19th, 2020.

Market Capitalization = natural logarithm of market capitalization as of February 19th, 2020.

Return on Equity = net income over shareholder's equity as of February 19th, 2020.

Leverage = total debt/total asset for a firm as of February 19th, 2020.

Momentum = 12-month minus 1-month stock returns (in USD) as of February 19th, 2020.

Liquidity = average of logarithm of daily trading volume to logarithm market cap value from the 20 trading days preceding the market crash on February 19th, 2020.

Forecast Revision = Analyst forecast revisions for EPS from IBES, calculated as forecasted EPS on March 31,2020 minus forecasted EPS on January 31, 2020, scaled by absolute value of the forecast on January 31, 2020.

Crisis Returns = cumulated firm stock returns (in USD) minus cumulated country stock returns between February 20th and March 23rd, 2020.

Lagged Returns = cumulative 20-day lagged stock returns (USD) minus cumulated country stock returns as of February 19th, 2020.

Lagged Flows = cumulative 20-day lagged active institutional investor money flows relative to total equity assets under management as of February 19th, 2020. We multiply this by 10000 for scale.

Lagged Holdings = excess institutional investor money holdings over market capitalization as of February 19th, 2020. We multiply this by 10^13 for scale.

RD&SGA = Stock-transformed R&D + 1/3*SG&A using a 5-year amortization period.

Appendix Table 1: Sample Universe Country Breakdown

Countries	Number of firms	Market Cap (in billion USD)
AE	1	13.1
AR	3	10.5
AT	14	80.8
AU	127	1,122.6
BE	17	270.3
BR	38	539.0
CA	150	1,861.4
CH	59	1,539.5
CL	11	75.8
CN	104	2,449.8
CO	4	55.1
CZ	3	20.1
DE	93	1,652.3
DK	27	392.4
EG	1	8.0
ES	38	654.2
FI	18	179.8
FR	92	2,412.3
GB	222	2,567.4
GR	6	21.5
HK	48	1,055.6
HU	3	25.0
ID	15	244.5
IE	7	48.5
IL	10	91.6
IN	78	1,334.7
IT	48	600.8
JP	339	4,354.3
KR	79	959.0
MX	22	250.6
MY	33	242.6
NL	32	606.4
NO	18	181.0
NZ	14	62.4
PE	3	48.6
PH	17	147.2
PL	10	61.1
PT	4	45.9
RU	12	465.1
SA	3	108.3
SE	48	423.5
SG	36	319.3
TH	28	255.7
TR	8	46.4
TW	58	767.8
US	986	28,214.6
ZA	36	324.2
Total	3023	57,210.5

Appendix Table 1 presents the universe of countries, number of firms per country and market capitalization per country in the study sample period.

Appendix Table 2: Sample Universe Industry Breakdown

GICS Industry Code	GICS Industry Names	No. of firms	Market Cap (in billion USD)
101010	Energy Equipment & Services	19	141.5
101020	Oil, Gas & Consumable Fuels	126	2,687.2
151010	Chemicals	103	1,298.1
151020	Construction Materials	25	194.7
151030	Containers & Packaging	19	147.6
151040	Metals & Mining	110	998.5
151050	Paper & Forest Products	14	84.7
201010	Aerospace & Defense	32	725.3
201020	Building Products	20	197.1
201030	Construction & Engineering	41	298.5
201040	Electrical Equipment	34	464.4
201050	Industrial Conglomerates	34	821.7
201060	Machinery	108	931.1
201070	Trading Companies & Distributors	28	295.7
202010	Commercial Services & Supplies	41	337.7
202020	Professional Services	33	434.4
203010	Air Freight & Logistics	16	236.9
203020	Airlines	22	211.2
203030	Marine	9	55.1
203040	Road & Rail	42	732.1
203050	Transportation Infrastructure	30	257.4
251010	Auto Components	42	316.6
251020	Automobiles	35	981.7
252010	Household Durables	41	369.5
252020	Leisure Products	11	73.3
252030	Textiles, Apparel & luxury goods	41	936.2
253010	Hotels, Restaurants & Leisure	81	758.6
253020	Diversified Consumer Services	10	72.2
255010	Distributors	4	27.0
255020	Internet & Direct Marketing Retail	27	2,037.3
255030	Multiline Retail	27	289.6
255040	Specialty Retail	53	675.2
301010	Food & Staples Retailing	50	1,109.7
302010	Beverages	37	1,206.2
302020	Food Products	96	1,252.4
302030	Tobacco	6	292.1
303010	Household Products	10	529.8
303020	Personal Products	22	421.8
351010	Health Care Equipment & Supplies	56	1,264.8
351020	Health Care Providers & Services	47	966.4
351030	Health Care Technology	8	104.6
352010	Biotechnology	57	803.3
352020	Pharmaceuticals	71	2,886.4
352030	Life Sciences Tools & Services	20	423.6
401010	Banks	200	4,791.4
401020	Thrifts & Mortgage Finance	13	93.3
402010	Diversified Financial Services	24	175.3
402020	Consumer Finance	14	258.2
402030	Capital Markets	93	1,600.9
403010	Insurance	93	1,736.4

451020	IT Services	76	2,208.1
451030	Software	90	2,947.6
452010	Communications Equipment	11	285.7
452020	Technology Hardware, Storage & Peripherals	31	2,000.3
452030	Electronic Equipment, Instruments & Components	65	632.3
453010	Semiconductors & Semiconductor Equipment	58	1,967.5
501010	Diversified Telecommunication Services	45	1,320.9
501020	Wireless Telecommunication Services	26	869.4
502010	Media	42	539.5
502020	Entertainment	32	778.3
502030	Interactive Media & Services	25	1,715.8
551010	Electric Utilities	62	1,324.7
551020	Gas Utilities	29	258.5
551030	Multi-Utilities	27	530.9
551040	Water Utilities	9	67.5
551050	Independent Power and Renewable Electricity Producers	19	115.5
601010	Equity Real Estate Investment Trusts (REITs)	99	832.2
601020	Real Estate Management & Development	82	811.1
Total		3023	57,210.5

Appendix Table 2 shows the GICS industry code, industry name and the number of firms per industry and market capitalization per industry in the study sample period.