The Role of Corporate Culture in Bad Times: Evidence from the COVID-19 Pandemic*

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Abstract

After fitting a topic model to 40,927 COVID-19-related paragraphs in 3,581 earnings calls over the period January 22 to April 30, 2020, we obtain firm-level measures of exposure and response related to COVID-19 for 2,894 U.S. firms. We show that despite the large negative impact of COVID-19 on their operations, firms with a strong corporate culture outperform their peers without a strong culture. Moreover, these firms are more likely to support their community, embrace digital transformation, and develop new products than those peers. We conclude that corporate culture is an intangible asset designed to meet unforeseen contingencies as they arise.

Keywords: corporate culture; COVID-19; pandemic; demand; supply chain; employees; community; digital transformation; new product development; human capital; machine learning; topic modeling; correlated topic model

JEL classification: M14 Corporate Culture; I18 Public Health; J24 Human Capital; J28 Safety

"… We are also in the early stages of understanding if and to what extent we may be temporarily impacted by the coronavirus. At this point, we're expecting a 1- to 1.5-week delay in the ramp of Shanghai-built Model 3 due to a government-required factory shutdown. This may slightly impact profitability for the quarter but is limited as the profit contribution from Model 3 Shanghai remains in the early stages."

Zachary Kirkhorn
Chief Financial Officer, Tesla, Inc., January 29, 2020

"… At this point, a broader and more meaningful slowdown in new bookings and an increase in cancellations began to develop for sailings outside of Asia. Since the outbreak began, we have taken several aggressive and proactive measures to assure the safety, security and well-being of our guests and crew by implementing strict embarkation and screening protocols…"

Frank J. Del Rio
President & Chief Executive Officer, Norwegian Cruise Line, February 20, 2020

"… We continue to waive cancellation fees for hotel stays through March 15 for guests with reservations at our hotels in Greater China and for guests from Greater China with reservations at Marriott destinations globally. We began to see the impact of the coronavirus on our business in mid-January with occupancy declines gradually spreading from Wuhan to other markets in the Asia Pacific region. In February, RevPAR at our hotels in Greater China declined almost 90% versus the same period last year. At the end of 2019, we had 375 properties with roughly 122,000 rooms across Greater China, representing 9% of our total global rooms. Around 90 of these properties are currently closed."

Arne M. Sorenson
President & Chief Executive Officer, Marriott International, Inc., February 27, 2020

"… We have prioritized the health and safety of our teammates, and we have closed our stores. Over the weekend, we drove a strong digital marketing campaign to engage consumers across Europe and across the U.S. to stay healthy and connected while they're at home. And our digital commerce remains open and in growth mode, supported by our teammates in our distribution centers."

John J. Donahoe
President, Chief Executive Officer & Director, NIKE, Inc., March 24, 2020

1. Introduction

Over the past two decades, the world has been hit by a number of outbreaks of epidemic diseases, including the severe acute respiratory syndrome (SARS) outbreak between 2002-2004, the swine flu pandemic between 2009-2010, and the Ebola virus epidemic between 2013-2016. By the end of April, 2021, the latest, the COVID-19 pandemic, had infected over 150 million people and caused over 3.2 million deaths, and is having a devastating impact on

the world economy. Given the extraordinary nature of the current public health crisis, it is imperative for financial economists to study how industries and firms are exposed to an epidemic disease, how they respond, and what makes some firms resilient in the face of heightened uncertainty as the pandemic spreads. In this paper, we examine how firms with a strong corporate culture fare amid the COVID-19 outbreak and identify the underlying mechanisms.

Corporate culture is a system of shared beliefs and values within an organization (Cremer 1993; Lazear 1995; Van den Steen 2010). In contrast to formal control mechanisms codified in the form of rules and procedures, corporate culture is regulated through peer influence and the social construction of reality (Berger and Luckmann 1967), and results in positive feelings of solidarity and a greater sense of autonomy among people within an organization (O'Reilly and Chatman 1996). According to Kreps (1990), corporate culture is an intangible asset designed to meet unforeseen contingencies as they arise. We posit that corporate culture matters even more in a challenging operational environment, such as the COVID-19 pandemic, because a strong culture empowers executives and rank-and-file employees to make consistent decisions and efforts based on long-term perspectives.

To test our hypothesis, we need firm-level measures of exposure and response related to COVID-19 as firms are hit in very different ways and to different degrees by the pandemic (e.g., their employees, customers, suppliers, and/or liquidity; see the first three quotes above from executives talking about COVID-19 during earnings calls) and also respond differently (e.g., cost cutting and embracing digital transformation; see the fourth quote above). In this paper, we develop new firm-level measures of exposure and response using earnings calls in which senior management discusses business operations and firm performance, and answers questions from call participants about firms' prospects, including comments on COVID-19 and its implications. To do so, we use the word embedding model (Mikolov et al. 2013; and

see Li, Mai, Shen, and Yan (2020) for an application in finance), to create a COVID-19 word list based on 3,581 earnings call transcripts from 2,894 firms over the period January 22 to April 30, 2020. We then tag paragraphs in which any COVID-19-related word appears as COVID-19-related paragraphs. To capture firm-level exposure/response related to COVID-19, we fit a correlated topic model (CTM, Blei and Lafferty 2007) to the 40,927 COVID-19-related paragraphs. The CTM uncovers underlying topics in a large set of documents (i.e., paragraphs) based on the statistical correlations among words and topics in these documents. The firm-level exposure/response related to COVID-19 is the proportion of text in its COVID-19-related paragraphs devoted to particular topics, and the firm-level overall exposure to COVID-19 is a simple sum of different types of exposure.

We show that there are six types of exposure to COVID-19, the top three being: 1) negative demand shocks; 2) supply chain disruption; and 3) employee safety and wellbeing. The remainder are lockdown, liquidity and financing, and delays in business operations. There are four types of responses to COVID-19: supporting community, cutting costs, embracing digital transformation, and developing new products. At the industry level, the top three industries with the greatest exposure to COVID-19 are chemicals and allied products, manufacturing, and consumer durables.

Using a sample of 2,394 U.S. firms with data on corporate culture, COVID-19 exposure/response, and stock returns for the period January 2019 to March 2020, we show that firms with a strong culture exhibit better stock market performance during the COVID-19 crisis than their counterparts with a weak culture. A firm is perceived to have a strong culture if its culture score is in the top quartile among all firms (Li et al. 2020). In terms of economic significance, we show that for a firm with a strong culture, a one-standard-deviation increase in a firm's overall exposure to COVID-19 (11.28%) reduces its monthly return drop by 0.96 percentage points (or 2.9 percentage points in quarterly returns).

We further show that despite the many different ways in which COVID-19 affects their operations, firms with a strong culture outperform their counterparts with a weak culture. Moreover, we find that firms with a strong culture are more likely to support their community, adopt digital technology, and develop new products, and are no more likely to engage in cost cutting than their peers without a strong culture. O'Reilly and Chatman (1996) argue that norms of creativity and innovation may be the most effective mechanisms for promoting organizational adaptability amid a major crisis. Our results provide support for their conjecture.

To explore the channels through which culture makes firms resilient to the pandemic, we find that firms with a strong culture have higher sales per employee, a higher return on assets, and a higher profit margin in 2020. Recall that our corporate culture measure is a sum of five cultural value scores in innovation, integrity, quality, respect, and teamwork, which can be grouped into a people-oriented cultural dimension comprising integrity, respect, and teamwork, and a technology-oriented cultural dimension comprising innovation and quality. We further show that firms strong in either dimension are associated with higher sales per employee, firms strong in the people-oriented cultural dimension is associated with a lower likelihood of employee layoff and a higher return on assets, and firms strong in the technology-oriented cultural dimension is associated with a higher profit margin. Edmans (2011) and Oswald, Proto, and Sgroi (2015) show that happy employees are better motivated and more productive. Luo and Bhattacharya (2006), Edmans (2011), and Albuquerque, Koskinen, and Zhang (2019) argue and show that customers are drawn to firms that treat their employees well. We show that happy employees are more productive, and that firms with a strong innovation culture are more agile in digital transformation and new product development that retain/draw customers compared to firms without a strong innovation

culture during the pandemic. Our results suggest that corporate culture works through the human capital and technology channels to make firms resilient during the pandemic.

Taken together, our evidence provides support for the hypothesis that corporate culture is an intangible asset designed to help firms prevail in unforeseen contingencies (Kreps 1990).

Firms with a strong culture are not the only firms that perform better in 2020. It is worth noting that our main finding remains after controlling for other characteristics known to make firms resilient during this public health crisis such as financial flexibility, prior epidemic experience, and minimum exposure to China.

Our paper contributes to the existing literature in the following ways. First, our paper is among the first in the literature, as far as we are aware, to measure firm-level exposure and response related to COVID-19 for a large sample of firms by employing the word embedding model and the CTM. Our paper thus makes an important methodological contribution by highlighting new applications of machine learning tools in finance.

Second, with more granular data on firm-level exposure/response related to COVID-19, we are able to delineate the channels through which corporate culture matters amid the pandemic. Our paper thus contributes to a better understanding of the importance of intangibles in general, and of the role of corporate culture in particular, in enhancing firm value.

Third and finally, given that the COVID-19 pandemic is exogenous to a firm's fundamentals, this unique setting allows us to establish a causal effect of bad times on the culture-value link.

2. Literature Review and Hypothesis Development

2.1 Literature review

Our paper is broadly related to one strand of the literature examining the relation between intangibles and firm value. Edmans (2011) shows that firms included in the "100 Best Companies to Work for" list produced annually by the Great Place to Work Institute tend to have higher future abnormal stock returns. Servaes and Tamayo (2013) find that corporate social responsibility (CSR) and firm value are positively related for firms with high customer awareness, as proxied by advertising expenditures. Using advertised values via firms' websites, Guiso, Sapienza, and Zingales (2015) show that proclaimed values are not significantly associated with firm performance; instead, values perceived by rank-and-file employees shown in the Great Place to Work Institute surveys have performance implications. Lins, Servaes, and Tamayo (2017) find that the trust between a firm and both its stakeholders and investors, built through investments in social capital as measured by CSR, pays off during the 2008-2009 financial crisis. Albuquerque, Koskinen, and Zhang (2019) present a model in which firms with credible ES policies have a more loyal customer base and face less price-elastic demands for their products, leading to higher firm value. In a recent survey of North American Chief Executive Officers (CEOs) and Chief Financial Officers (CFOs), Graham et al. (2019) note that a majority of senior executives view corporate culture as one of the top three factors that affect their firm's value, and over 90% of them believe that improving corporate culture will increase firm value. Li et al. (2020) show that corporate culture correlates with business outcomes, including operational efficiency, risk-taking, earnings management, and executive compensation design.

2.2 Hypothesis development

In a seminal paper, Kreps (1990, p. 93) takes the view that corporate culture is "how things are done, and how they are meant to be done in the organization." Kreps focuses on situations in which cooperation among employees and their superiors is crucial, and discusses

two ways to induce cooperation: contracts (e.g., paying efficiency wages[1] and repeated interaction. However, Kreps notes that both become too costly and/or infeasible when states or actions are not verifiable or are difficult to specify in advance, and that establishing a norm to do things (i.e., corporate culture) addresses those challenges.[2] Kreps concludes that corporate culture, as a coordination mechanism, can sustain desirable outcomes in a world with unforeseen contingencies.

Van den Steen (2005, 2010) shows that one way for firms to develop homogeneous beliefs (i.e., corporate culture) is screening—firms hire employees whose beliefs and work ethos match those of the firm. Henderson and Van den Steen (2015) further establish the linkage between firms having a strong culture and increased profitability because employees having a shared view of the right course of action select into firms with a strong culture, leading to higher effort and lower wages.

Based on the above discussion, we expect that the presence of a strong culture, in which a set of norms and values are widely shared and strongly held throughout an organization (O'Reilly 1989), will be associated with increased goal alignment and higher levels of motivation among employees, and will provide needed controls without resorting to paying above-the-market wages. The above effects are more salient in a challenging operational environment like the COVID-19 pandemic, when a strong culture empowers executives and rank-and-file employees to make consistent decisions and exert greater effort based on long-term perspectives. Our first hypothesis is thus as follows:

[1] The basic efficiency wage hypothesis states that workers' productivities depend positively on their wages (Stiglitz 1986; Katz 1986). The potential benefits to the firm of higher wages include increased effort level and reduced shirking by employees; lower turnover costs; a higher-quality labor force; and improved morale, more easily facilitated teamwork, and greater feelings of loyalty by workers to the firm (Dunlop 1985; Reynolds 1978, chapter 9).

[2] Relatedly, O'Reilly and Chatman (1996) and Bénabou and Tirole (2003) point out the dissonance between the short-run efficacy of explicit motivation (e.g., efficiency wage contracting) on the one hand and the long-run efficacy of implicit motivation (e.g., a strong culture) on the other.

H1: The positive culture-value link is stronger amid the COVID-19 pandemic.

There are large cross-sectional variations in firm-level exposure to COVID-19 (see, for example, the first three quotes above). In addition to the detrimental impact of the virus on employee safety and wellbeing, the lockdown and physical distancing policies reduce revenue and impose additional costs. Pagano, Wagner, and Zechner (2020) show that firms with jobs requiring human contact, for which work from home (WFH) policies would be difficult to implement are more exposed to the pandemic. In contrast, firms in the technology and communication sectors are less affected and even have the opportunity to expand their businesses. Considering this heterogeneity, we hypothesize that the positive association between firms with a strong corporate culture and returns during the pandemic is conditional on firm-level exposure to COVID-19:

H2: The positive culture-value link is stronger for firms with greater exposure to COVID-19.

In today's knowledge economy, increased competition worldwide has intensified the demand for process innovation and quality improvement, and elevated the significance of human capital in a modern corporation (Zingales 2000). We posit that one potential channel through which firms with a strong culture outperform their peers with a weak culture in the pandemic is the human capital channel, whereby a strong culture empowers employees to make consistent decisions and exert greater effort based on long-term perspectives, resulting in higher productivity.

Luo and Bhattacharya (2006) establish the link between "corporate abilities", as manifested in terms of innovation capability and product quality, and customer satisfaction, resulting in higher firm value. We posit that another potential channel through which firms with a strong culture outperform their peers with a weak culture in the pandemic is the technology channel, whereby a strong culture instills long-term orientation and makes firms

in the midst of a public health crisis more likely to adopt digital technology and/or introduce new products/services to achieve product differentiation, foster customer loyalty, and command more pricing power.

3. Methodology

In this section, we describe our approach to measuring firm-level exposure and response related to COVID-19 using earnings call transcripts.

3.1 Preprocessing the data

Table 1 lists the steps taken and filters applied to form our sample of 3,581 earnings calls made by 2,894 U.S. firms over the period January 22, 2020 to April 30, 2020.

Each call transcript is in a PDF format, which we convert to a text file using the Python package *pdfminer*.[3] Each file contains the body of a call transcript and the following meta-data that help us match the company to the Compustat database: the ticker symbol header, the company name, the title of the event, and the date of the call.

We use the Stanford CoreNLP package to preprocess and parse the text.[4] We segment text files into sentences and words, and lemmatize words to their base forms. We conduct Named Entity Recognition (NER) to replace named entities such as locations, times, persons, and company names with a predefined tag. Since phrases (collocations) play a crucial role in gathering information from corporate disclosures, we use a two-step approach to extract both general and corpus-specific phrases. In step one, we use the dependency parser in the CoreNLP package to identify fixed multi-word expressions (e.g., *open up, make sure*) and compound words (e.g., *market volatility* and *growth rate*). These phrases are usually part of

[3] https://github.com/pdfminer/pdfminer.six.
[4] The CoreNLP package is an open-source Natural Language Processing (NLP) toolkit for a variety of tasks (Manning et al. 2014). We use version 3.9.2, available at https://stanfordnlp.github.io/CoreNLP.

the general English vocabulary or can be inferred based on the grammatical relationships between words. We remove punctuation marks, stop words, and single-lettered words after identifying and concatenating multi-word expressions and compound words.[5] In the second step, we use the *phraser* module of the *gensim* library to find two- and three-word phrases that are more specific to the corpus (i.e., words that have statistically significant co-occurrences in the collection of call transcripts).[6] For example, the phrases learned in the second step include: *supply chain disruption* and *social distancing measure*. We concatenate all the phrases using the underscore symbol and treat them as a single word. Our results show that phrases constitute an essential part of how a firm's exposure and response related to COVID-19 are conveyed in calls.

3.2 The challenges

The earnings call examples shown above illustrate a number of challenges when using calls to measure firm-level exposure/response. First, the goal of earnings calls is to discuss business operations and firm performance. To reduce the number of topics in calls, we need to limit our attention to COVID-19-related paragraphs.

Second, there are many different ways to refer to the COVID-19 pandemic; very often the term COVID-19 or its variations (e.g., coronavirus) are not mentioned, but given the context, the discussion is clearly about COVID-19. For example, discussions of "travel restriction", "self-quarantine", and "shelter-in-place order" undoubtedly relate to the COVID-19 pandemic, but have no direct mention of the term. We therefore need an expanded word list to tag COVID-19-related paragraphs in calls.

[5] Our stop words list is a combination of the stopwords-iso list (available at https://github.com/stopwords-iso/stopwords-iso) and words that are often used for facilitating conversations and carry little meaning (see the full list in Table IA1 in the Internet Appendix).
[6] The *gensim* library is an open-sourced NLP Python package that we use for training the *word2vec* model. We use version 3.7.2, available at https://github.com/RaRe-Technologies/gensim.

Third, different firms may face different challenges and respond differently amid the pandemic, which could potentially shed light on how a strong culture leads to firm resilience. For example, Tesla's January call discusses potential disruption to its supply chain; Norwegian Cruise Line's February call covers the safety of their employees and guests, declines in new bookings, and increases in cancellations; and Marriott's February call is concerned with drastic declines in its Asia Pacific market. In contrast, Nike's March call discusses adopting a digital marketing campaign as a response to the negative demand shock to its stores. We therefore need to develop firm-level measures of exposure and response related to COVID-19.

In this paper, we offer a machine learning alternative to address these challenges. Our approach starts with the word embedding model (specifically, *word2vec*, Mikolov et al. 2013) to obtain a COVID-19 word list based on each word's proximity to the word COVID-19 in calls; note that COVID-19 is the official name for the pandemic from the World Health Organization. Using the word list, we can tag COVID-19-related paragraphs in calls. We then fit a topic model to these paragraphs, and the output is our firm-level measure of exposure and response related to COVID-19. Figure 1 presents the flow chart of our machine learning approach.[7]

3.3 Word embedding and the COVID-19 word list

The word embedding model is based on a simple, time-tested concept in linguistics: Words that co-occur with the same neighboring words have similar meanings (Harris 1954). The model thus converts the neighboring word counts of a word to a numerical vector, which captures the meaning of the word and supports a synonym search using vector arithmetic. While there are different variants of the word embedding model, we use a popular neural

[7] Code for text processing and model training can be downloaded from our GitHub repository at https://github.com/ssrn3632395/The-Role-of-Corporate-Culture-in-Bad-Times.

network model, *word2vec* (Mikolov et al. 2013), to efficiently learn dense and low-dimensional word vectors. In essence, *word2vec* "learns" the meaning of a specific word via a neural network that "reads" through the textual documents and thereby learns to predict all its neighboring words. The output from the process is a vector representation of the word once learning has been completed after a number of iterations through the documents. The vector has a fixed dimension and captures the properties of the original co-occurrence relationship between the word and its neighbors.[8]

We use the *gensim* library in Python to train the *word2vec* model. We set the dimension of word vectors to 300, define two words as neighbors if they are no farther apart than five words in a sentence, and omit words that appear fewer than five times in the corpus. After training, the model converts each of the 73,193 words in the call corpus to a 300-dimensional vector that represents the meaning of that word; we can then compute the cosine similarity between any two word vectors to quantify their association.

Using this capability, we construct the COVID-19 word list by associating a set of words gleaned from calls to the word COVID-19. We then select the top 1,000 words with the closest associations (i.e., the highest cosine similarity between their word vectors) to the word vector for COVID-19. We do not consider named entities that are recognized automatically by the CoreNLP package. We manually inspect all the words in the auto-generated list and exclude words that do not fit. Most of the excluded words are either too general in meaning (e.g., *unexpected* and *uncertainty*), or too specific in terms of industry context (e.g., *oil demand* and *elective procedure*). Table IA2 in the Internet Appendix provides the word list for COVID-19 ordered by descending similarity to the word COVID-19. There are 419 words in the final word list.

[8] See Li et al. (2020) and its Internet Appendix for a more detailed and technical discussion of the word embedding model and *word2vec*.

With the COVID-19 word list in hand, we tag paragraphs in which any word on the word list appears (i.e., the COVID-19-related paragraphs). There are in total 40,927 COVID-19-related paragraphs in 3,581 calls (representing about 11% of all paragraphs) over the period January 22 to April 30, 2020, which form the corpus for topic modeling.

3.4 Correlated topic modeling

To measure firm-level exposure/response related to COVID-19, we first need to identify the topics of discussion in relation to COVID-19, and then to quantify the amount of discussion devoted to each topic. We employ the CTM developed by Blei and Lafferty (2007) and Roberts, Stewart, and Airoldi (2016) for this task.

The CTM represents a substantial improvement to the more rudimentary topic modeling method, Latent Dirichlet Allocation (LDA), pioneered by Blei, Ng, and Jordan (2003). Topic modeling has gained increasing popularity for quantifying the content of firms' textual disclosures, such as earnings calls (Huang, Lehavy, Zhang, and Zheng 2018). LDA uses a statistical generative model to imitate the process of how a human (e.g., a speaker) composes a document (e.g., a paragraph in a call). Specifically, LDA assumes that each word in a document is generated in two steps. First, assuming the speaker decides that document m is about a specific set of topics that can be described by a distribution θ_m, a topic is randomly drawn based on this topic distribution. Next, assuming the drawn topic k has its own word distribution β_k, a word is randomly drawn from this topic's word distribution. Repeating these two steps word by word generates a document. An inference algorithm for LDA discovers the topic distribution for each document and the word distribution for each topic iteratively, by fitting this two-step generative model to the observed words in a collection of documents (i.e., a corpus) until it finds the best set of parameters that describe the topic and word distributions. The fitted model provides (i) the topical proportion (i.e., topic prevalence), which tells us how much of a document is devoted to a topic; and (ii) the word

distribution (i.e., topic content), which provides a list of the words most likely to be related to a given topic.

The CTM is similar to LDA, except that it allows for correlation between topics.[9] The CTM is thus a more realistic generative model than LDA and provides a better model fit (Blei and Lafferty 2007). Conceptually, the interpretation of estimated parameters of interest from the CTM is nearly identical to that of those parameters from LDA. We can decompose a document into a mixture of topics with their proportions summed to one, and we can also label those topics by inspecting the word distribution of each topic. We fit a CTM using the *stm* package in R based on the variational expectation-maximization algorithm developed by Roberts, Stewart, and Airoldi (2016).[10]

Choosing the number of topics remains a challenge in topic modeling as no ground truth is available. Chang, Gerrish, Wang, Boyd-Graber, and Blei (2009) note a trade-off between the interpretability of model outcomes and statistical goodness-of-fit. While interpretability usually favors fewer topics, statistical fitness in general favors more. Given that the purpose of our application is to use the CTM to generate interpretable topic clusters (rather than as a predictive model), we choose the number of topics based on the most meaningful topic clustering. We vary the number of topics from 5 to 40 and inspect the results, and find that 35 topics perform the best in terms of interpretability. As pointed out by Blei (2012), interpretability is a key objective in selecting the best topic model, and careful human inspection is the most common approach.

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[9] To generate document m's topic distribution θ_m under the CTM, a vector is first drawn from a multivariate Normal distribution that allows correlations among dimensions, and then the vector is mapped to the parameters of a Dirichlet distribution, which produces θ_m. Under LDA, the topic distribution θ_m is drawn from a Dirichlet distribution directly and correlations among topics are not modeled (and hence not allowed).

[10] The *stm* package in R is written for structural topic models (STM), another extension to LDA that allows correlations among topics and covariates that can explain the prevalence of topics. In the case of no covariates, the *stm* package reduces to a (fast) implementation of the CTM, which is what we employ in this paper. Importantly, while other topic model methods such as LDA may use a randomized algorithm (e.g., Gibbs sampling) for estimation, the CTM model is estimated using a variational expectation-maximization algorithm with a deterministic initialization, thereby producing stable results.

3.5 Estimating firm-level exposure and response related to COVID-19

Since our goal is to estimate firm-level exposure/response related to COVID-19, we exclude general discussions of earnings and performance and fit a topic model only to a set of COVID-19-related paragraphs; we ultimately fit a CTM with 35 topics.

We take a two-pronged approach to interpret the 35 topics and assign them meaningful labels. First, we rely on the topic-word distributions (i.e., the topic content) from the model output. We look at not only the high probability words in the vocabulary under a given topic, but also the important keywords indicated by three alternative measures: FREX, Lift, and Score.[11] All these measures facilitate interpretation because they highlight keywords that are more exclusive to each topic, and discount common words that appear across all topics. Second, for each topic, we inspect representative paragraphs by selecting ten paragraphs with the highest proportions of discussion on that topic.

To label the economic meanings of those identified topics, and hence different exposures/responses to COVID-19, we make two adjustments in the labeling/interpretation process. First, we drop 20 of the 35 topics because they are either boilerplate comments (e.g., greetings and concluding remarks), or not about a specific aspect of COVID-19 (e.g., uncertainty and performance). Second, we find that some identified topics share a common theme and can be naturally consolidated (such as disruptions to supply chains). This consolidation is expected, as the CTM allows topics to be correlated.

We consolidate the remaining 15 topics into ten broad topics, six of which are about firms' exposures to COVID-19, including business operations, demand, employees, liquidity, lockdown, operation, and supply chain, and four of which are about firms' responses, including community engagement, cost cutting, digital transformation, and new product

[11] We refer readers to Roberts, Stewart, and Tingley (2019) for formal definitions of these measures.

development. Figure 2 presents the word cloud for each topic, and Table IA3 in the Internet Appendix presents the representative paragraphs for each topic.

Our firm-level measure of exposure/response is the average proportion of a firm's discussion on a particular topic in its COVID-19-related paragraphs over the period January 22 to March 31, 2020. For a specific firm, we first sum up the product of the proportion of a topic at the paragraph level and the paragraph length, then standardize (divide) by the total length of all COVID-19-related paragraphs, and, finally, take an average of the above ratio across calls if a firm has multiple calls over the three-month period.[12] Thus, the measure is computed as:

$$Topic_{i,k} = \frac{1}{I_i}\sum_{n=1}^{I_i}\frac{\sum_{m=1}^{J_{i,n}}(P_{i,n,m,k}\times L_{i,n,m})}{\sum_{m=1}^{J_{i,n}} L_{i,n,m}} \quad (1)$$

where $Topic_{i,k}$ is the intensity of topic *k* for firm *i*. $P_{i,n,m,k}$ is the proportion of topic *k* in COVID-related paragraph *m* call *n* of firm *i*. $L_{i,n,m}$ is the paragraph length, i.e., the total number of words (a phrase is treated as a single word) in COVID-19-related paragraph *m* call *n* of firm *i*; $J_{i,n}$ is the number of COVID-19-related paragraphs in call *n* of firm *i*; and I_i is the number of calls of firm *i* in the first quarter of 2020. This measure satisfies the constraint that $\sum_{k=1}^{35} Topic_{i,k} = 1$. Throughout the paper, we multiply our firm-level measure of COVID-19 exposure/response by 100; thus the unit of each measure is in percentage points.

Our measure of overall exposure to COVID-19 is the sum of the proportions of discussion on the six exposure-related topics. In contrast to prior literature that employs a normalized count of COVID-19-related words as COVID-19 exposure (e.g., Hassan et al. 2020), our measure has two advantages in terms of accuracy and cross-sectional comparability. First, as we noted above, not all topics in COVID-19-related discussion are

[12] There are three firms (FuelCell Energy Inc, H.B. Fuller Co., and McCormick & Co Inc) with two calls over the period January 22 to March 31, 2020, because they each held their second calls ahead of the regular schedule.

about types of exposure; some are concerned with other matters, while others are simply standard conversational courtesies. Using the word count overstates COVID-19 exposure if firms mainly discuss topics unrelated to exposure. Our measure addresses this concern by only scoring exposure-related discussion. Second, we use the length of COVID-19-related paragraphs to normalize exposure-related discussion, which is cleaner than using the call length, since an earnings call contains other discussions unrelated to COVID-19.[13]

Figure 3 presents an overview of firm-level COVID-19 exposure/response based on 40,927 COVID-19-related paragraphs over the period January 22 to April 30, 2020. The top three types of exposure are demand, supply chain, and employees. The remainder are lockdown, liquidity and financing, and delays in business operations. The types of response (in descending order of importance) are digital transformation, new product development, community engagement, and cost cutting.

3.6 Validating our measures of exposure and response related to COVID-19

Given that our method for measuring exposure and response related to COVID-19 is new, it is important to validate our measure using firm (state) characteristics known to make firms (firms in these states) vulnerable to a pandemic. To that end, we employ a number of markers for firms' differential exposure to COVID-19: geographic dispersion in exposure to COVID-19, labor intensity, flexibility for employees to work-from-home, and exposure to China.

Following Bernile, Kumar, and Sulaeman (2015), we measure a firm's geographic dispersion with the number of unique U.S. states mentioned in its 2019 10-K filing. The

[13] Given that we only employ textual data for the early phase of the pandemic (between January to April, 2020), i.e., a relatively limited corpus for textual analysis, our measure is subject to noise in the data. Future research might consider applying similar methods to an expanded sample of earnings calls or other corporate disclosures.

relative importance of a particular state for a given firm, the firm-state citation share, is the number of times the state is mentioned in the firm's 10-K divided by the total number of mentions of all U.S. states in the same report. We obtain state-level COVID-19 new (cumulative) cases per 100,000 people from Chetty et al. (2020). The firm-level exposure to COVID-19, *New (Cumulative) COVID cases*, is the weighted average of state-level COVID-19 new (cumulative) cases measured right before a firm's quarterly earnings call, with the weight being the firm-state citation share.

Using data from Google's COVID-19 Community Mobility Reports, Chetty et al. (2020) construct a measure of daily time spent at residential locations as changes relative to the median value for the corresponding day of the week during the five-week period from January 3 to February 6, 2020. The variable, *GPS_residential*, is the weighted average of state-level change in the amount of time spent at home measured right before a firm's quarterly earnings call, with the weight being the firm-state citation share.

Fahlenbrach, Rageth, and Stulz (2020) show that more labor-intensive firms have high exposure to the pandemic, whereas firms in industries with the flexibility to work-from-home have less exposure. Following Fahlenbrach et al. (2020), *Labor intensity* is the ratio of number of employees to sales, and *WFH* is a firm's industry's fraction of jobs that can be performed at home (Dingel and Neiman 2020). Ramilli and Wagner (2020) show that firms with exposure to China are more affected by the pandemic. The variable, *China*, is a firm-level exposure-to-China measure based on 10-K filings from Hoberg and Moon (2017).

Table 2 presents the results from our validation tests. We show that our measure of *Overall exposure* is positively and significantly associated with *New COVID cases*, *Cumulative COVID cases*, *GPS_residential*, *Labor intensity*, and *China*, and negatively and significantly associated with *WFH*, after controlling for firm characteristics and industry fixed effects.

In additional analysis, we employ a measure of the overall tone in COVID-19 related discussions to validate our measures of exposure (and response). *A priori*, we expect our measure of exposure to be negatively correlated with the tone, and our measures of response to be mostly positively correlated with the tone. We compute the overall tone of each COVID-19-related paragraph as the difference between the share of positive words and the share of negative words using the positive/negative word lists developed by Loughran and McDonald (2011). The firm-level variable, *Tone*, is obtained by taking the average of the above measure across all COVID-19-related paragraphs in a call. Table IA 4 in the Internet Appendix presents the results. We show that firms' overall exposure is negatively and significantly associated with *Tone*, whereas three of the four responses – community engagement, digital transformation, and new product development – are positively and significantly, and one response – cost cutting – is negatively and significantly, associated with *Tone*. We interpret the above results as suggestive evidence that our measures capture what they are intended to capture.

4. Sample Overview

4.1 Key variables

Our firm-level measure of corporate culture, from Li et al. (2020), covers innovation, integrity, quality, respect, and teamwork (Guiso, Sapienza, and Zingales 2015); the year 2017 is the most recent year with available data. The indicator variable, *Strong culture*, takes a value of one if the sum of a firm's five cultural value scores is in the top quartile across all firms in a year, and zero otherwise.

We obtain stock returns from the Compustat Security Daily Database and accounting information from the Compustat Fundamentals Annual/Quarterly Database. We require a firm's return data to be available from January through March 2020. On March 23, 2020, the

Federal Reserve Board announced two new facilities to support credit to large corporations, and on March 27 the US government approved a US$ 2 trillion relief bill into law (The Coronavirus Aid, Relief, and Economic Security Act (CARES Act)). *A priori*, it is not clear whether firms with a strong culture benefit more or less from government bailouts. Given that one goal of our paper is to assess the stock market performance of firms with a strong culture, we do not want stock returns contaminated by government interventions. Therefore, *Crisis period return* is computed as a buy-and-hold return (in percentage points) from January 2 to March 20, 2020. After merging with firms in the culture data set, we obtain a final sample of 2,394 firms for our baseline regressions.

4.2 Sample overview

Table 3 provides the summary statistics of stock and operating performance variables, strong culture, key firm control variables, and measures of COVID-19 exposure and response.

Figure 4 plots our exposure and response measures related to COVID-19 across 12 Fama-French industries for our final sample of 2,394 firms. In Panel A, we show that in terms of overall exposure, the top three industries are chemicals and allied products, manufacturing, and consumer durables. In Panel B, we show that there are large cross-industry variations in terms of the six different exposures. In Panel C, we present different responses across industries. In terms of community engagement, the top three industries are utilities, telephone and television transmission, and wholesale, retail, and some services (e.g., laundries and repair shops). In terms of cost cutting, the top three industries are oil, gas, and coal extraction and products, consumer durables, and utilities. In terms of digital transformation, the top three industries are business equipment, utilities, and consumer durables. In terms of new product development, the top three industries are consumer non-durables, wholesale, retail, and some services, and business equipment.

In summary, Tables 3 and Figure 4 show wide variations across firms and industries in their exposure and response to COVID-19.

5. Main Results

5.1 Baseline results

We estimate regression models of stock returns over the period January 2 to March 20, 2020 (the crisis period) as a function of firms' pre-COVID-19 cultural ratings and a number of control variables. Table 4 presents our baseline regression results. In all models, we include industry fixed effects (defined at the Fama-French 48 industry-level) because different industries may promote their organizational culture with different foci (Li et al. 2020).

Column (1) presents the return regression without any other control except for industry fixed effects. We show that firms with a strong culture performed significantly better during the crisis period. In terms of economic significance, firms with a strong culture were associated with a 4.9 percentage point increase in returns during the first quarter of 2020. In column (2), we also control for a firm's factor loadings based on the Fama and French three-factor model plus the momentum factor (Fama and French 1993; Carhart 1997). We find that the coefficient on *Strong culture* remains positive and significant.

One concern with the specifications in columns (1) and (2) is that the performance of firms with a strong culture during the crisis period may be due to omitted variables that are correlated with corporate culture, rather than due to corporate culture itself. To address this concern, in columns (3) and (4), we control for firm operating performance in the year before the pandemic and other characteristics known to affect stock returns (e.g., Daniel and Titman 1997; Asness, Moskowitz, and Pedersen 2013). We again show that firms with a strong culture had higher stock returns during the crisis period of 2020. The magnitude of the

outperformance by firms with a strong culture is somewhat attenuated after we include additional control variables, but the effect is still economically important. In column (4), we show that firms with a strong culture were associated with a 3.9 percentage point increase in returns during the first quarter of 2020.

In terms of the control variables, we show that firms that entered the pandemic with higher market capitalization, lower leverage, higher cash holdings, and higher return on assets (ROA) are associated with higher first-quarter stock returns. In terms of economic significance, based on the specification in column (4), a one-standard-deviation increase in market capitalization (1.989), leverage (0.241), cash holdings (0.212), and ROA (0.210) is associated with a change in the crisis period return of 1.6, 2.7, 1.7, 1.3, and 0.9 percentage points, respectively. Thus, the economic impact of culture during the first quarter of 2020 is 105% of the impact of market capitalization, 64% of the impact of leverage, 99% of the impact of cash holdings, and 128% of the impact of ROA, indicating that corporate culture is important in explaining returns in the first quarter of 2020.

The above findings provide some direct evidence of our first hypothesis, i.e., there is a positive association between firms with a strong culture and stock returns during the first quarter of 2020. Next, we employ a time-series of returns to directly test our first hypothesis that the culture-value link is stronger during the pandemic.

5.2 Corporate culture, COVID-19 exposure, and returns

In this section, we investigate whether the positive culture-return link is unique to bad times or is common to most periods, perhaps due to some unobservable risk factors that are correlated with culture. Following Lins, Servaes, and Tamayo (2017), we utilize monthly return data before and during the onset of COVID-19 pandemic. More importantly, the topic model we employ allows us to explore whether this positive association is contingent on firms' differential exposure to COVID-19. To do so, we estimate a panel data regression

model interacting culture with a continuous COVID-19 exposure variable – *Overall exposure* – and include firm and month fixed effects:

$$Return_{i,t} = \alpha + \beta_1 Overall\ expoure_{i,t} + \beta_2 Overall\ exposure_{i,t} \times Strong\ culture_i + \beta_3 Firm\ characteristics_{i,t} + \beta_4 Factor\ loadings_{i,t} + Firm\ FE + Month\ FE + \varepsilon_{i,t} \quad (2)$$

where $Return_{i,t}$ is the monthly return over the period January 2019 to March 20, 2020. *Overall exposure* is the sum of the proportions of discussion on the six different exposures to COVID-19 from the output of a CTM for the first quarter in 2020, and zero for the entire year of 2019. Corporate culture is measured at the end of 2017, two years before the onset of the pandemic, to eliminate any concern that firms changed their culture in anticipation of a public health crisis. Firm fixed effects control for time-invariant omitted risk factors, and month fixed effects control for return seasonality. The coefficient on the interaction term *Overall exposure × Strong culture* captures the differential impact of corporate culture on monthly stock returns during the three-month period from January 2020 to March 20, 2020, for a given level of overall exposure to COVID-19.

Table 5 Panel A presents the results.[14] We first show that the coefficient on *Overall exposure* is negative and significant. In terms of economic significance, based on the specification in column (4), a one-standard-deviation increase in *Overall exposure* (11.28%) is associated with a drop in monthly returns of 1.1 percentage points. We further show that the coefficient on the interaction term *Overall exposure × Strong culture* is positive and significant, suggesting that firms with a strong culture are associated with a smaller drop in returns. In terms of economic significance, the coefficient of 0.085 on the interaction term indicates that a one-standard-deviation increase in *Overall exposure* of firms with a strong culture is associated with reducing the monthly return drop by 1.0 percentage points during

[14] To help interpret the economic magnitude, Table IA5 provides the summary statistics of the key variables in Table 5.

the crisis compared to firms without a strong culture. In combination with the economic effect from the standalone term *Overall exposure*, we show that in net, firms with a strong culture are associated with only a monthly return drop of 0.1 percentage points compared to 1.1 percentage points for firms without a strong culture when their exposure to COVID-19 is increased by one standard deviation. These results suggest that in the face of a major pandemic, firms with a strong culture experience a significantly smaller drop in returns than their peers without a strong culture.

Panel B presents the results when we decompose the overall exposure measure into its six components through topic modeling. We show large heterogeneity in terms of how a strong culture helps firms with different exposures to outperform their peers without a strong culture. *Lockdown* has the largest standalone effect on returns among different types of exposure. A one-standard-deviation increase in *Lockdown* is associated with a drop in monthly returns by 0.7 percentage points. Corporate culture is most effective in alleviating the negative impact of *Employees*. A one-standard-deviation increase in *Employees* of firms with a strong culture is associated with reducing the return drop by 0.9 percentage points compared to firms without a strong culture. In contrast, corporate culture is least effective in alleviating the negative impact of *Supply chain*. A one-standard-deviation increase in *Supply chain* of firms with a strong culture is associated with reducing the return drop by 0.6 percentage points compared to firms without a strong culture.

5.3 Channels

As discussed earlier, the topic model we employ not only identifies firms' exposure to COVID-19, but also their responses to and strategies for dealing with the pandemic. In this

paper, we provide one of the first investigations into the relation between firms with a strong culture and their different responses to a public health crisis. Table 6 presents the results.[15]

We first show that firms with a strong culture are more likely to support their community, embrace digital transformation, and develop new products (columns (1), (7), and (10)). Moreover, firms with greater exposures to COVID-19 are more likely to support their community, cut costs, embrace digital transformation, and develop new products (columns (2), (5), (8), and (11)). Importantly, we show that in the midst of a pandemic, firms with a strong culture are more likely to support their community, embrace digital transformation, and develop new products than their peers without a strong culture, while being no more likely than those peers to engage in cost cutting (as shown via the interaction term in columns (3), (6), (9), and (12)).

According to the human capital channel discussed earlier, firms with a strong culture invest more in their employees during calm times, and well-treated employees are better motivated and more productive. Our finding suggests that firms that have regularly treated their employees well can weather negative economic shocks better, hence there is no need to engage in aggressive cost-cutting. Our finding on cost-cutting is consistent with this channel.

According to the technology channel discussed earlier, highly innovative firms are more adaptable to changing environments. Our finding that firms with a strong culture, which includes innovation, are more likely to pivot towards digital technology and new product development amid a pandemic, supports this channel.

We next examine a number of performance and real outcome measures to shed light on the excess returns earned by firms with a strong culture during the crisis period. To gain a better understanding of how a strong culture helps firms in the midst of a pandemic, we group

[15] In Table 6, *Strong culture* takes the value of zero in 75% of the cases; accordingly, the interaction term (*Overall exposure* × *Strong culture*) also takes the value of zero in those same cases, resulting in the correlation between *Strong culture* and the interaction term to be 0.84. In columns (3), (6), (9), and (12) when including the interaction term, we do not include the standalone term *Strong culture* to avoid the multicollinearity problem.

the five cultural values underlying a strong culture into *Strong people culture* comprising integrity, respect, and teamwork, and *Strong technology culture* comprising innovation and quality. The model specification is similar to Equation (2). The sample consists of 2,032 firms whose accounting data is available for at least three fiscal quarters since the onset of the pandemic and four quarters prior from Compustat.

Table 7 Panel A presents the summary statistics of key variables examined.[16] Panel B presents the panel data regression results relating strong culture and strong people/technology culture to different performance and real outcome measures.

We first show that the coefficient on the standalone term *Overall exposure* is not significant when the dependent variable is *Sales per employee* (column (1)). We further show that the coefficient on the interaction term *Overall exposure × Strong culture* is positive and significant, indicating that firms with a strong culture exhibit higher employee productivity relative to their peers with a weak culture after the onset of the pandemic. In terms of economic significance, a one-standard-deviation increase in *Overall exposure* of firms with a strong culture is associated with an increase in quarterly sales by about $5,734 per employee compared to firms without a strong culture. For an average-sized firm in our sample (with 16,163 employees), this translates into an increase in quarterly sales by about $93 million, which is about 6% of the average quarterly sales ($1,588 million) over the estimation period. The size of these effects appears to be economically meaningful. In columns (2) and (3), we show that both *Strong people culture* and *Strong technology culture* help raise employee productivity.

[16] Due to the pandemic, there are wide variations in sales among the population of Compustat firms as well as among our sample firms. We opted to winsorize sales at the 5th and 95th percentiles instead. It is worth noting that our main findings remain if we use winsorization at the 1st and 99th percentiles (but resulting in much larger economic effects). For comparability, we multiple the layoff likelihood by 100 when running the linear probability model in Panel B.

Next, we examine whether strong culture helps mitigate the likelihood of employee layoff. We first show that the coefficient on the standalone term *Overall exposure* is positive and significant across columns (4)-(6), indicating that firms with greater exposure to COVID-19 are more likely to experience employee layoffs. We then show that the coefficient on the interaction term *Overall exposure* × *Strong people culture* is negative and significant in column (5), indicating that firms with a strong people culture avoid laying off employees. In terms of economic significance, a one-standard-deviation increase in *Overall exposure* of firms with a strong culture is associated with a drop in the likelihood of employee layoff by about two percentage points compared to firms without a strong culture.

We then show that the effect of *Overall exposure* on *Market share* is insignificant (columns (7)-(9)), indicating that there is no significant change of market structure during the pandemic. Moreover, we do not find any evidence showing that a strong culture could contribute to a firm's strengthening its market position.

Lastly, we examine whether a strong culture could mitigate the effect of COVID-19 on operating performance. We show that firms with a strong culture have a higher ROA and a profit margin (ROS) than their peers without a strong culture during the pandemic (columns (10) and (13)). In terms of economic significance, a one-standard-deviation increase in *Overall exposure* of firms with a strong culture is associated with an increase of ROA by 0.1 percentage points and an increase of ROS by 0.9 percentage points compared to firms without a strong culture. Inspecting the two dimensions of corporate culture, we find that the driving force for a higher ROA is *Strong people culture* (column (11)) while the driving force for a higher ROS is *Strong technology culture* (column (15)).

Panel C presents the results using strong culture indicators based on the five cultural values: innovation, integrity, respect, teamwork, and quality. We first show that among the three components of *Strong people culture*, both *Strong respect culture* and *Strong teamwork*

culture are the primary drivers of employee productivity and ROA, and *Strong respect culture* is the primary driver of ROS. Moreover, both *Strong innovation culture and Strong quality culture* are the primary drivers of employee productivity and ROS, and *Strong quality culture* is the primary driver of ROA. Again, our findings support both the human capital and technology channels.

In summary, the results in Table 7 provide supporting evidence for the human capital and technology channels through which corporate culture makes firms resilient to pandemics.

5.4 Robustness checks

In this section, we conduct a large number of robustness checks on our main findings. Table IA6 presents panel data regression estimates of the relation between strong culture, overall exposure to COVID-19, and stock returns (as in Table 5) after controlling for other attributes that may make firms resilient during the COVID-19 pandemic.

Albuquerque, Koskinen, Yang, and Zhang (2020) show that firms with high environmental and social (ES) ratings outperform during the first quarter of 2020 compared to other firms. Bae, El Ghoul, Gong, and Guedhami (2020) note that during the COVID-19 crisis period, the relation between CSR and stock returns varies, depending on the data provider of CSR scores. We obtain firms' ES ratings from the Thomson Reuters' Refinitiv ESG (formerly ASSET4) database and firms' summary scores in community, diversity, employee relations, environment, and human rights from the MSCI ESG Stats (formerly KLD Stats) database. In columns (1) and (2), we show that firms with higher CSR scores are associated with a smaller drop in returns. Importantly, we show that after controlling for their CSR practices, firms with a strong corporate culture are associated with higher stock returns than their counterparts without a strong culture. It is worth noting that our finding that firms with a strong corporate culture provide more support to their community during the COVID-

19 crisis distinguishes us from prior research using pre-crisis ratings to study the value of CSR during the crisis.

Pagano, Wagner, and Zechner (2020) show that firms that have flexible work-from-home arrangements significantly outperform those that do not have such arrangements during the COVID-19 outbreak. In column (3), we control for the feasibility of working from home and show that indeed, firms with flexible work arrangements outperform their peers without such arrangements during the pandemic. Moreover, our main findings remain.

Using international data, Hassan et al. (2020) show that firms that have experienced SARS or H1N1 are better at dealing with the COVID-19 outbreak. In column (4), we control for firms' prior experience with other epidemic diseases and show no significant association between U.S. firms' prior exposure and their stock performance during the COVID pandemic. Importantly, our main findings remain.

Ramelli and Wagner (2020) find that firms with lower exposure to China are less affected than other firms. In column (5), we control for firms' business associations with Chinese firms and show no significant association between firms' exposure to China and their stock performance during the first quarter of 2020. One possible explanation is that by March 2020, China emerges from the pandemic and any business connection to China becomes an asset. Importantly, our main findings remain.

Table IA7 presents robustness checks on both cross-sectional and panel data regression estimates using two different return windows: 1) over the period January 20 to March 20, 2020 – the combination of outbreak and fever periods following Ramelli and Wagner (2020); and 2) over the period January 2 to March 31, 2020. We show that our main findings remain unchanged.

Given that industry affiliation is one of a number of factors shaping corporate culture (Graham et al. 2019), in our empirical analysis (Tables 4 and 6), we include industry fixed

effects throughout. As a robustness check, we construct alternative measures of a strong culture by either using the top quartile with an industry, or subtracting industry means before using the top quartile across all firms, as the cutoff. Table IA8 in the Internet Appendix replicate the analyses in Table 4 and Table 5 Panel A. We show that our main findings remain.

Finally, we repeat our analysis in Tables 4-7 after removing utilities and financial firms. Table IA9 in the Internet Appendix present the results. We show that our main findings remain.

In summary, we conclude that firms with a strong culture are associated with a smaller drop in returns than their peers without a strong culture, controlling for their CSR practices, flexibility for employees to work from home, prior pandemic experience, and connections to Chinese businesses. Our main findings remain using different return windows, different ways of defining strong culture, and after excluding utilities and financial firms.

6. Conclusions

After fitting a topic model to 40,927 COVID-19-related paragraphs in 3,581 earnings calls over the period January 22 to April 30, 2020, we obtain firm-level measures of exposure and response related to COVID-19 for 2,894 U.S. firms. We show that despite the many different ways in which COVID-19 affects their operations, firms with a strong corporate culture outperform their peers without a strong culture. Moreover, firms with a strong culture are more likely to support their community, embrace digital transformation, and develop new products, and are no more likely to cut costs than their peers without a strong culture.

To explore the channels through which culture makes firms resilient in the midst of a pandemic, we show that firms with a strong culture have higher sales per employee, a higher ROA, and a higher profit margin. Our results provide support for the hypothesis that

corporate culture is an intangible asset designed to meet unforeseen contingencies as they arise (Kreps 1990).

Appendix
Variable definitions

Continuous variables with the exceptions of COVID-19 exposure/response variables are winsorized at the 1st and 99th percentiles.

Variable	Definition
COVID-19 exposure variables	
Business operations	The proportion of discussion on delays in business operations (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Demand	The proportion of discussion on demand shocks (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Employees	The proportion of discussion on employee safety and wellbeing (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Liquidity	The proportion of discussion on liquidity and financing (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Lockdown	The proportion of discussion on lockdown and its implications for business operations (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Supply chain	The proportion of discussion on supply chain disruptions (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Overall exposure	The sum of proportions of discussion on the six different exposures to COVID-19 (business operations, demand, employees, liquidity, lockdown, and supply chain) over the period January 22 to March 31, 2020.
COVID-19 response variables	
Community engagement	The proportion of discussion on community engagement (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Cost cutting	The proportion of discussion on cost cutting (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Digital transformation	The proportion of discussion on adopting digital technology (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
New product development	The proportion of discussion on developing new products (in percentage points) from the output of fitting a correlated topic model to a corpus of COVID-19-

	relevant paragraphs in earnings calls. For each firm, we take the average of call-level proportions across all calls over the period January 22 to March 31, 2020.
Firm-level variables	
Crisis period return	Buy-and-hold return (in percentage points) from January 2 to March 20, 2020.
Monthly return	Monthly return (in percentage points) from January 2019 to March 2020, where the return for March ends on March 20, 2020.
Strong culture	An indicator variable that takes the value of one if the sum of a firm's five cultural value scores is in the top quartile across all firms in 2017 which is the most recent year with available cultural value data, and zero otherwise. Corporate culture data is from Li et al. (2020) who compute scores of the five top cultural values proposed by Guiso, Sapienza, and Zingales (2015): innovation, integrity, quality, respect, and teamwork.
Strong innovation culture	An indicator variable that takes the value of one if the cultural value score of innovation is in the top quartile across all firms in a year, and zero otherwise.
Strong integrity culture	An indicator variable that takes the value of one if the cultural value score of integrity is in the top quartile across all firms in a year, and zero otherwise.
Strong quality culture	An indicator variable that takes the value of one if the cultural value score of quality is in the top quartile across all firms in a year, and zero otherwise.
Strong respect culture	An indicator variable that takes the value of one if the cultural value score of respect is in the top quartile across all firms in a year, and zero otherwise.
Strong teamwork culture	An indicator variable that takes the value of one if the cultural value score of teamwork is in the top quartile across all firms in a year, and zero otherwise.
Strong people culture	An indicator variable that takes the value of one if the sum of a firm's three people-oriented cultural value scores (integrity, respect, and teamwork) is in the top quartile across all firms in a year, and zero otherwise.
Strong technology culture	An indicator variable that takes the value of one if the sum of a firm's two technology-oriented cultural value scores (innovation and quality) is in the top quartile across all firms in a year, and zero otherwise.
Sales per employee	Sales per employee, in thousands.
Layoff	An indicator variable that takes the value of one if a firm has employee layoff-related announcements in a quarter, and zero otherwise. The data on layoff-related announcements are obtained from RavenPack.
Market share	The share of sales (in percentage points) among all Compustat firms in the same 2-digit SIC industry.
ROA	Operating income before depreciation divided by total assets.
ROS	Operating income before depreciation divided by sales.
ln(Market cap)	Natural logarithm of market capitalization.
ln(Total assets)	Natural logarithm of total assets.
Leverage	Total liabilities divided by total assets.
Cash holdings	Cash and marketable securities divided by total assets.
B/M	Book value of equity divided by market value of equity.
Momentum	Buy-and-hold return (in percentage points) over months (−12, −2) before the focal month. In Table 4, we use buy-and-hold return over the period January to November 2019.
Four-factor loadings	Factor loadings based on the Fama-French three-factor model plus the momentum factor, which are estimated over the previous 60 months period. Firms are excluded from the analysis if fewer than 12 months of data are available to estimate factor loadings. For Table 4, factor loadings are estimated over the previous 60 months period ending in December 2019.
New COVID cases	The weighted average of state-level COVID-19 new cases measured right before a firm's quarterly earnings call (7-day moving average), with the weight being the firm-state citation share. Following Bernile, Kumar, and Sulaeman (2015), we measure a firm's geographical dispersion with the number of unique U.S. states mentioned in its 2019 10-K filing. The relative importance of a particular state for a given firm, the firm-state citation share, is the number of times the state is mentioned in the firm's 10-K divided by the total number of

	mentions of all U.S. states in the same report. State-level COVID-19 new cases per 100,000 people is from Chetty et al. (2020).
Cumulative COVID cases	The weighted average of state-level COVID-19 cumulative cases measured right before a firm's quarterly earnings call (7-day moving average), with the weight being the firm-state citation share (Bernile, Kumar, and Sulaeman 2015).
GPS_residential	The weighted average of state-level change in the amount of time spent at home (in percentage points) measured right before a firm's quarterly earnings call (7-day moving average), with the weight being the firm-state citation share (Bernile, Kumar, and Sulaeman 2015). Time usage data is from Chetty et al. (2020), where they use Google's COVID-19 Community Mobility Reports to construct a measure of daily time spent at residential locations as changes relative to the median value for the corresponding day of the week during the five-week period from January 3 to February 6, 2020.
Labor intensity	Number of employees divided by sales, multiplied by 100.
WFH	Share of jobs that can be done from home at the two-digit NAICS industry level. The data is from Dingel and Neiman (2020).
Prior epidemic experience	An indicator variable that takes the value of one if a firm mentions SARS- and/or H1N1-related words in its earnings calls in 2003 and/or 2009, and zero otherwise. The data is from Hassan et al. (2020).
China	An indicator variable that takes the value of one if a firm mentions China in its annual report in relation to importing and/or exporting activities, and zero otherwise. The data is from Hoberg and Moon (2017).
Tone	The average of the overall tone across all COVID-19-related paragraphs in a call. The overall tone of each COVID-19-related paragraph is computed as the difference between the share of positive words and the share of negative words using the positive/negative word lists developed by Loughran and McDonald (2011).
CSR_ASSET4	A firm's average score in environmental and social practices. The data is from the Thomson Reuters' Refinitiv ESG (formerly ASSET4) database for the year 2017.
CSR_MSCI	A firm's summary score in community, diversity, employee relations, environment, and human rights (Lins et al. 2017). The data is from the MSCI ESG Stats (formerly KLD Stats) database for the year 2017.

References:

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

Albuquerque, R., Y. Koskinen, and C. Zhang, 2019. Corporate social responsibility and firm risk: Theory and empirical evidence, *Management Science* 65, 4451–4469.

Asness, C. S., T. J. Moskowitz, and L. H. Pedersen, 2013. Value and momentum everywhere, *Journal of Finance* 68, 929–985.

Bae, K. H., S. El Ghoul, J. Gong, and O. Guedhami, 2020. CSR in times of crisis: Evidence from the COVID-19 pandemic, *Journal of Corporate Finance* forthcoming.

Bénabou, R., and J. Tirole, 2003. Intrinsic and extrinsic motivation, *Review of Economic Studies* 70, 489–520.

Berger, P., and T. Luckmann, 1967. *The Social Construction of Reality: A Treatise in the Sociology of Knowledge*, New York: Doubleday.

Bernile, G., A. Kumar, and J. Sulaeman, 2015. Home away from home: Geography of information and local investors, *Review of Financial Studies* 28, 2009–2049.

Blei, D. M, A. Y. Ng, and M. I. Jordan, 2003. Latent Dirichlet allocation, *Journal of Machine Learning Research* 3, 993–1022.

Blei, D. M., 2012. Probabilistic topic models, *Communication of the ACM* 55, 77–84.

Blei, D. M., and J. D. Lafferty, 2007. A correlated topic model of science, *Annals of Applied Statistics* 1, 17–35.

Carhart, M. M., 1997. On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Chang, J., S. Gerrish, C. Wang, J. Boyd-Graber, and D. M. Blei, 2009. Reading tea leaves: How humans interpret topic models, *Advances in Neural Information Processing Systems*, 288–296.

Chetty, R., J. N. Friedman, N. Hendren, M. Stepner, and the Opportunity Insights Team, 2020. The economic impacts of COVID-19: Evidence from a new public database built using private sector data, Harvard University Working Paper.

Cremer, J., 1993. Corporate culture and shared knowledge, *Industrial and Corporate Change 2*, 351–386.

Daniel, K., and S. Titman, 1997. Evidence on the characteristics of cross-sectional variation in stock returns, *Journal of Finance* 52, 1–33.

Dingel, J. I., and B. Neiman, 2020. How many jobs can be done at home? *Journal of Public Economics* 189, 1–8.

Dunlop, J. T., 1957. The task of contemporary wage theory, in: J. Dunlop (ed.), *The Theory of Wage Determination*, London: Macmillan and Co., 3–27.

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

Fahlenbrach, R., K. Rageth, and R. M. Stulz, 2020. How valuable is financial flexibility when revenue stops? Evidence from the COVID-19 crisis, *Review of Financial Studies* forthcoming.

Fama, E. F., and K. R. French, 1993. Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

Graham, J. R., J. Grennan, C. R. Harvey, and S. Rajgopal, 2019. Corporate culture: Evidence from the field, Duke University Working Paper.

Guiso, L., P. Sapienza, and L. Zingales, 2015. The value of corporate culture, *Journal of Financial Economics* 117, 60–76.

Harris, Z. S., 1954. Distributional structure, *Word* 10, 146–162.

Hassan, T. A., S. Hollander, L. van Lent, M. Schwedeler, and A. Tahoun, 2020. Firm-level exposure to epidemic diseases: COVID-19, SARS, and H1N1, Boston University Working Paper.

Henderson, R. and Van den Steen, E., 2015. Why do firms have "purpose"? The firm's role as a carrier of identity and reputation, *American Economic Review* 105, 326–330.

Hoberg, G., and S. K. Moon, 2017. Offshore activities and financial vs operational hedging, *Journal of Financial Economics* 125, 217–244.

Huang, A. H., R. Lehavy, A. Y. Zang, and R. Zheng, 2018. Analyst information discovery and interpretation roles: A topic modeling approach, *Management Science* 64, 2473–2972.

Katz, L. F., 1986. Efficiency wage theories: A partial evaluation, in: S. Fischer (ed.), *NBER Macroeconomics Annual Vol. 1*, Chicago: The University of Chicago Press, 235–276.

Kreps, D., 1990. Corporate culture and economic theory, in: Alt, J. E., and Shepsle, K. A. (eds.), *Perspectives on Positive Political Economy*, Cambridge: Cambridge University Press, 93–104.

Lazear, E. P., 1995. Corporate culture and the diffusion of values, in: Siebert, H. (eds.), *Trends in Business Organization: Do Participation and Cooperation Increase Competitiveness?* Tubingen: J. C. B. Mohr, 89–133.

Li, K., F. Mai, R. Shen, and X. Yan, 2020. Measuring corporate culture using machine learning, *Review of Financial Studies* forthcoming.

Lins, K. V., H. Servaes, and A. Tamayo, 2017. Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis, *Journal of Finance* 72, 1785–1824.

Loughran, T., and B. McDonald, 2011. When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks, *Journal of Finance* 66, 35–65.

Luo, X., and C. B. Bhattacharya, 2006, Corporate social responsibility, customer satisfaction, and market value, *Journal of Marketing* 70, 1–18.

Manning, C. D., M. Surdeanu, J. Bauer, J. Finkel, S. J. Bethard, and D. McClosky, 2014. The Stanford CoreNLP Natural Language Processing Toolkit, *Proceedings of the 52nd Annual Meeting of the Association for Computational Linguistics: System Demonstrations*, 55–60.

Mikolov, T., I. Sutskever, K. Chen, G. S. Corrado, and J. Dean, 2013. Distributed representations of words and phrases and their compositionality, *Advances in Neural Information Processing Systems*, 3111–3119.

O'Reilly, C., 1989. Corporations, culture, and commitment: Motivation and social control in organizations, *California Management Review* 31, 9–25.

O'Reilly, C., and J. A. Chatman, 1996. Culture as social control: Corporations, cults, and commitment, in: Staw, B. M., and L. L. Cummings (eds.), *Research in Organizational Behavior*, Vol. 18, Greenwich, CT: JAI Press, Inc., 157–200.

Oswald, A., E. Proto, and D. Sgroi, 2015. Happiness and productivity, *Journal of Labor Economics* 33, 789–822.

Pagano, M., C. Wagner, and J. Zechner, 2020. Disaster resilience and asset prices, University of Naples Federico II Working Paper.

Ramelli, S., and A. F. Wagner, 2020. Feverish stock price reactions to COVID-19, *Review of Corporate Finance Studies* 9, 622–655.

Reynolds, L. 1978. *Labor Economics and Labor Relations*, 7th ed. Englewood Cliffs, N.J.: Prentice-Hall.

Roberts, M. E., B. M. Stewart, and D. Tingley, 2019. stm: R package for structural topic models, *Journal of Statistical Software* 10, 1–40.

Roberts, M. E., B. M. Stewart, and E. M. Airoldi, 2016. A model of text for experimentation in the social sciences, *Journal of the American Statistical Association* 111, 988–1003.
Servaes, H., and A. Tamayo, 2013. The impact of corporate social responsibility on the value of the firm: The role of customer awareness, *Management Science* 59, 1045–1061.
Stiglitz, J., 1986. Theories of wage rigidities, in: J. Butkiewicz, et al. (eds.), *Keynes' Economic Legacy: Contemporary Economic Theories*, New York: Praeger Publishers, 153–206.
Van den Steen, E., 2005. Organizational beliefs and managerial vision. *Journal of Law, Economics, and Organization* 21, 256–283.
Van den Steen, E., 2010. On the origin of shared beliefs (and corporate culture), *RAND Journal of Economics* 41, 617–648.
Zingales, L., 2000. In search of new foundations. *Journal of Finance* 55, 1623–1653.

Figure 1
The flow chart of our machine learning approach

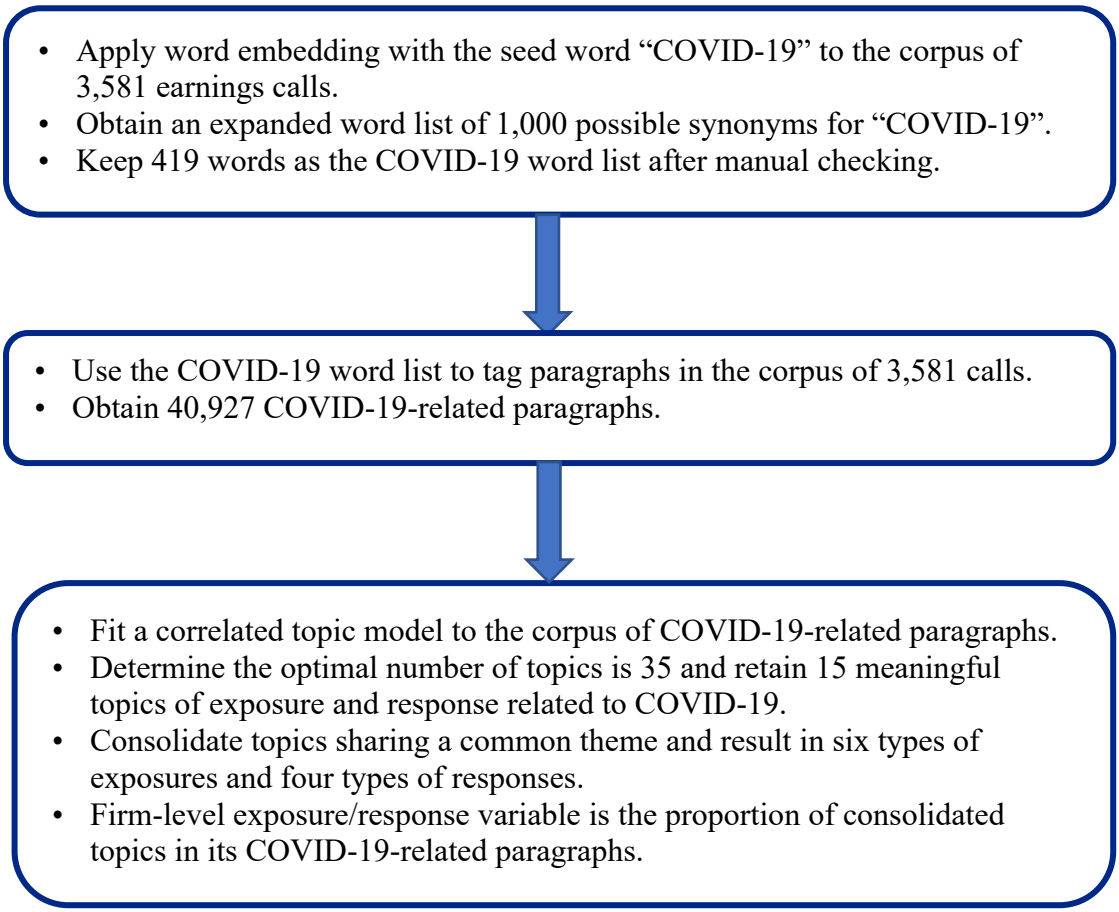


Figure 2
Word clouds for different topics

This figure plots the word cloud for each of the ten topics, six of which are about firms' different exposures to COVID-19 including business operations, demand, employees, liquidity, lockdown, and supply chain, and four of which are about their responses to COVID-19 including community engagement, cost cutting, digital transformation, and new product development. For each topic, we generate a word cloud that shows top words with the highest probabilities. Panel A presents word clouds for the six different exposures to COVID-19. Panel B presents word clouds for the four different responses to COVID-19.

Panel A: Word clouds for different exposures to COVID-19



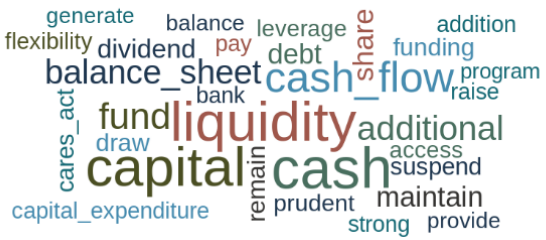
Business operations



Demand



Employees



Liquidity



Lockdown

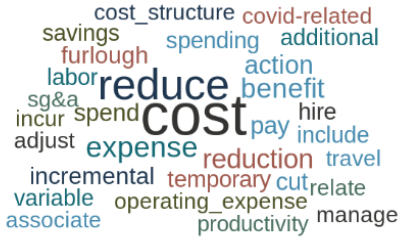


Supply chain

Panel B: Word clouds for different responses to COVID-19



Community engagement



Cost cutting



Digital transformation



New product development

Figure 3
An overview of COVID-19 exposure and response

This figure plots the average proportion (in percentage points) of each topic across 40,927 COVID-19-relevant paragraphs in earnings calls made over the period January 22 to April 30, 2020. The blue bars represent the six different exposures to COVID-19, including business operations, demand, employees, liquidity, lockdown, and supply chain. The red bars represent the four different responses to COVID-19, including community engagement, cost cutting, digital transformation, and new product development. The *x* axis is the average proportion of each topic. Topics on the *y* axis are ranked by the average proportion in descending order.

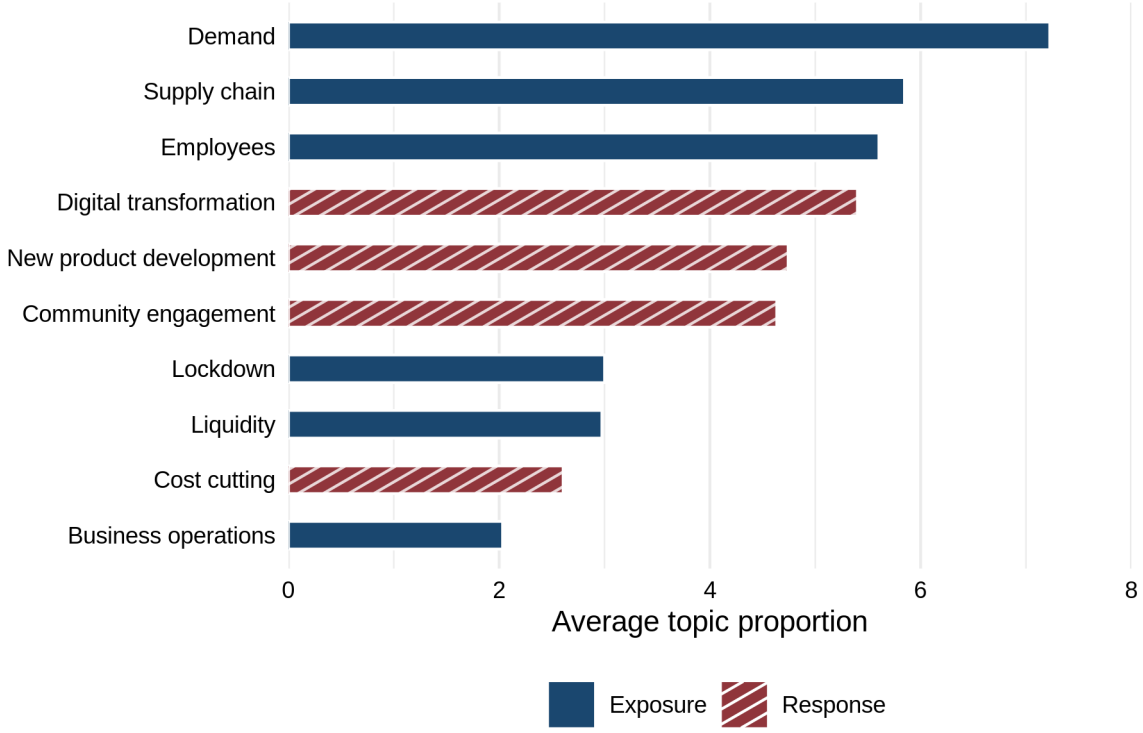
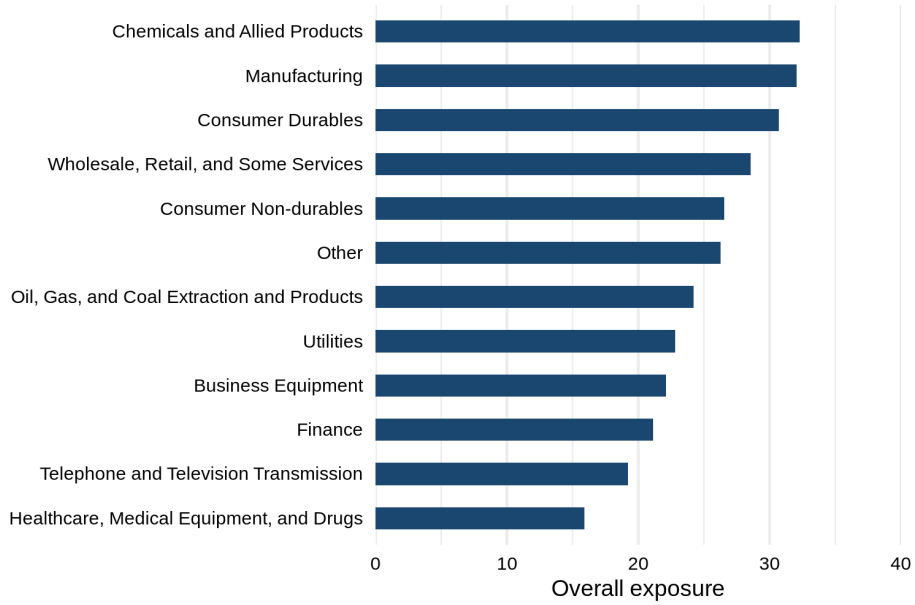


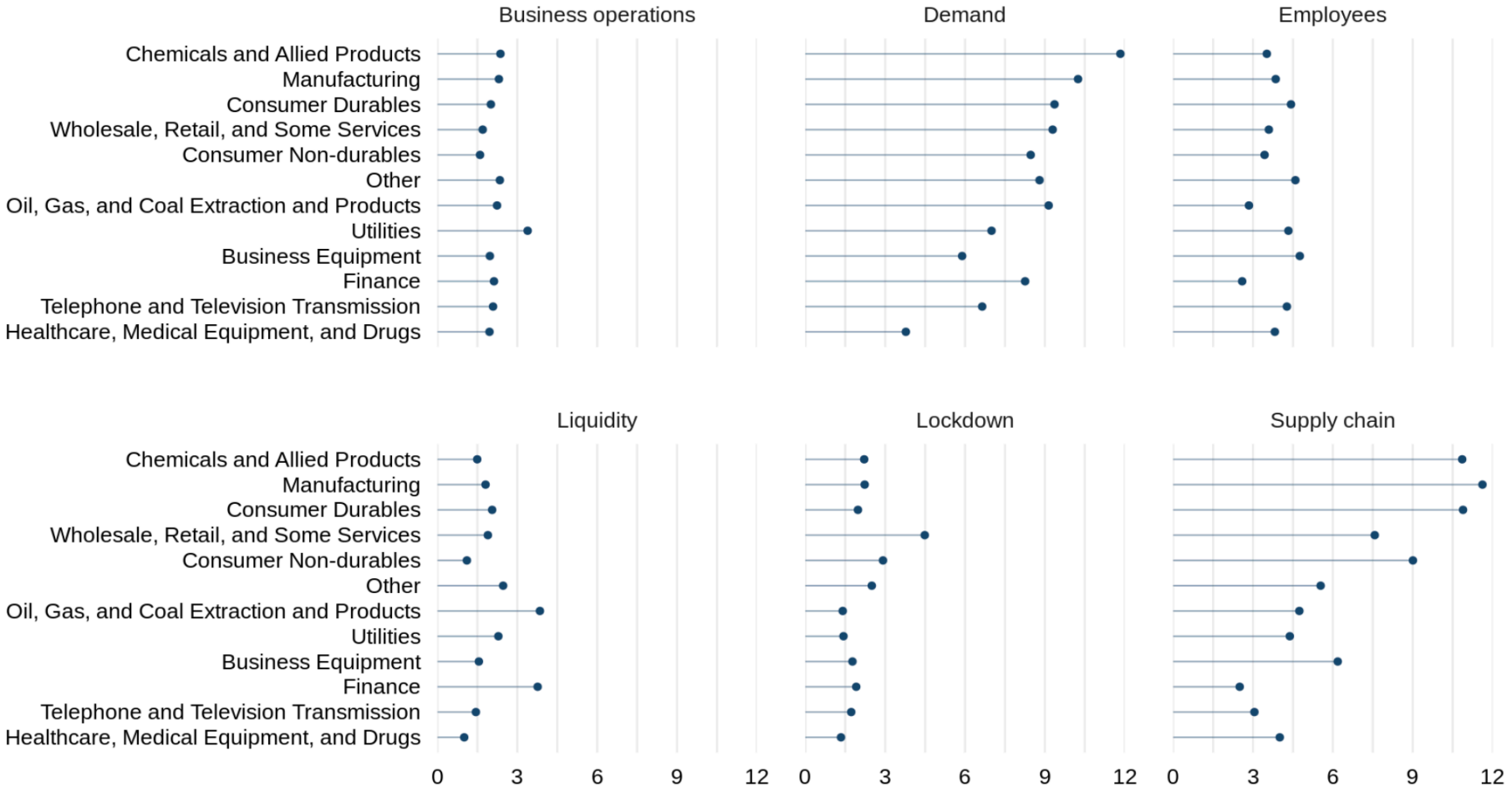
Figure 4
Exposure and response related to COVID-19 across 12 Fama-French industries

This figure plots measures of exposure and response related to COVID-19 across 12 Fama-French industries. Panel A plots overall exposure to COVID-19. Panel B plots six different exposures to COVID-19, including business operations, demand, employees, liquidity, lockdown, and supply chain. Panel C plots four different responses to COVID-19, including community engagement, cost cutting, and digital transformation, and new product development. The *x* axis is the average exposure/response (in percentage points) across firms within an industry.

Panel A: Overall exposure to COVID-19 across 12 Fama-French industries



Panel B: Different exposures to COVID-19 across 12 Fama-French industries



Panel C: Different responses to COVID-19 across 12 Fama-French industries

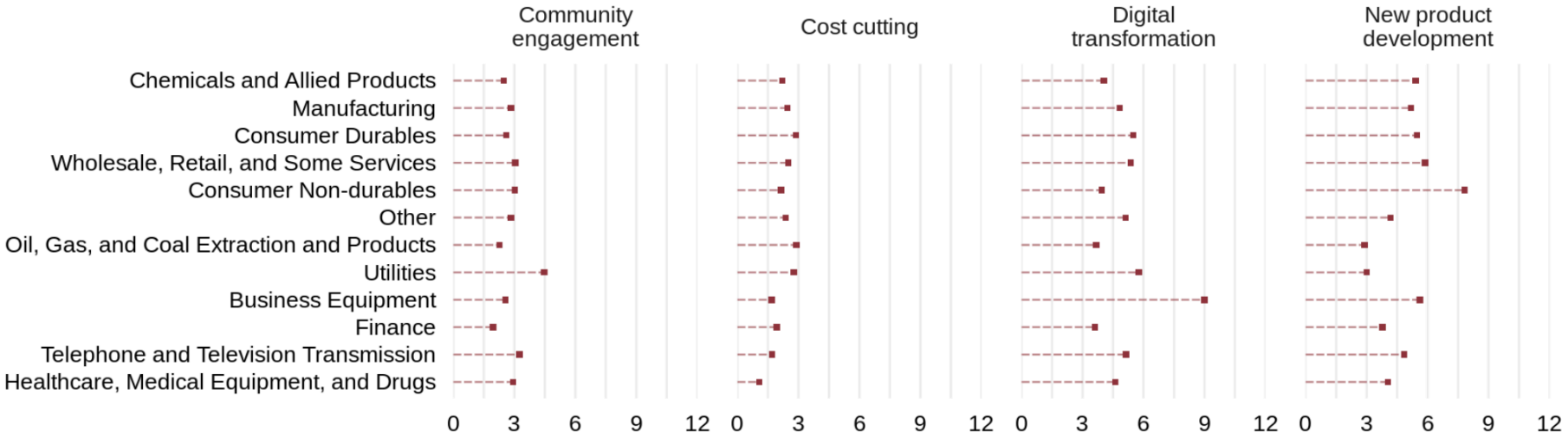


Table 1
Sample formation

This table lists the steps taken to form the sample for regression analysis. We obtain earnings call transcripts from the S&P's Global Market Intelligence database for the period January 22 to April 30, 2020.

	# calls/firms
All call transcripts from January 22 to April 30, 2020	10,449
Limiting to earnings call transcripts	8,155
Limiting to firms listed on NYSE, NASDQ, or NYSE American (formerly AMEX)	4,140
Matching by	
Tickers	4,083
Compustat company names	9
Manually if no perfect match using above	16
Removing call transcripts by non-U.S. firms	-440
Keeping the most recent call if duplicate entries	-87
# calls/firms	3,581/2,894
Corporate culture data available from Li et al. (2020)	2,400
Return and control variables available	2,394
# firms	2,394

Table 2
Validating our measure of firm-level exposure related to COVID-19

This table validates our measure of firm-level exposure related to COVID-19. Overall exposure (in percentage points) is from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls in the first three months in 2020. We control for the natural logarithm of total assets, leverage, cash holdings, ROA, and B/M. Industry fixed effects are based on Fama-French 48-industry classification. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors are presented in parentheses. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Overall exposure					
	(1)	(2)	(3)	(4)	(5)	(6)
New COVID cases	0.126**					
	(0.051)					
Cumulative COVID cases		0.003**				
		(0.002)				
GPS_residential			0.105***			
			(0.038)			
Labor intensity				0.724**		
				(0.355)		
WFH					-0.119***	
					(0.026)	
China						3.192***
						(0.582)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2,129	2,129	2,129	2,347	2,394	2,394
Adj. R^2	0.295	0.295	0.296	0.149	0.163	0.165

Table 3
Summary statistics

The sample consists of 2,394 firms in the baseline cross-sectional quarterly return regression in the first quarter of 2020. Panel A provides the summary statistics. Panel B presents the correlation matrix for variables in the baseline regression. Panel C presents correlations among *Strong culture* and firm exposure to COVID-19. Panel D presents correlations among *Strong culture* and firm response to COVID-19. Definitions of variables are provided in Appendix. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Summary statistics

	Mean	SD	25th percentile	Median	75th percentile
Crisis period return	-41.034	20.399	-54.976	-41.401	-28.283
Strong culture	0.252	0.434	0.000	0.000	1.000
Total assets (in millions)	10079.470	24849.160	545.118	1955.709	7043.412
Market cap (in millions)	9267.865	23769.350	430.674	1814.735	6154.253
ln(Market cap)	7.409	1.989	6.068	7.504	8.725
Leverage	0.328	0.241	0.124	0.317	0.467
Cash holdings	0.166	0.212	0.024	0.074	0.213
ROA	-0.029	0.210	-0.020	0.022	0.059
B/M	0.532	0.589	0.187	0.411	0.739
Momentum	21.074	44.748	-3.855	19.587	41.109
Overall exposure	23.943	13.256	16.065	24.790	32.710
Business operations	2.143	2.557	0.980	1.459	2.356
Demand	7.853	7.671	2.777	5.831	10.647
Employees	3.711	4.093	1.382	2.557	4.568
Liquidity	2.184	3.962	0.628	1.049	2.057
Lockdown	2.160	2.366	0.980	1.582	2.508
Supply chain	5.891	6.092	1.844	3.681	8.357
Community engagement	2.644	3.143	0.937	1.742	3.208
Cost cutting	2.019	2.471	0.835	1.318	2.314
Digital transformation	5.225	5.978	1.956	3.455	6.303
New product development	4.637	4.143	2.303	3.690	5.851

Panel B: Correlation matrix for variables in the baseline regression

	Crisis period return	Strong culture	ln(Market cap)	Leverage	Cash holdings	ROA	B/M	Momentum
Crisis period return	1.000							
Strong culture	0.155***	1.000						
ln(Market cap)	0.149***	-0.062***	1.000					
Leverage	-0.196***	-0.131***	0.064***	1.000				
Cash holdings	0.214***	0.271***	-0.197***	-0.273***	1.000			
ROA	0.017	-0.118***	0.464***	0.021	-0.487***	1.000		
B/M	-0.203***	-0.171***	-0.301***	-0.133***	-0.232***	-0.011	1.000	
Momentum	0.109***	-0.019	0.257***	-0.016	0.030	0.195***	-0.310***	1.000

Panel C: Correlation matrix for strong culture and firm exposure to COVID-19

	Strong culture	Overall exposure	Business operations	Demand	Employees	Liquidity	Lockdown	Supply chain
Strong culture	1.000							
Overall exposure	-0.102***	1.000						
Business operations	-0.036*	0.373***	1.000					
Demand	-0.136***	0.668***	0.062***	1.000				
Employees	0.138***	0.313***	0.125***	-0.144***	1.000			
Liquidity	-0.073***	0.327***	0.065***	0.109***	-0.032	1.000		
Lockdown	-0.005	0.401***	0.112***	0.116***	0.185***	0.031	1.000	
Supply chain	-0.078***	0.599***	0.144***	0.151***	0.087***	-0.094***	0.146***	1.000

Panel D: Correlation matrix for strong culture and firm response to COVID-19

	Strong culture	Community engagement	Cost cutting	Digital transformation	New product development
Strong culture	1.000				
Community engagement	0.063***	1.000			
Cost cutting	-0.052**	0.029	1.000		
Digital transformation	0.247***	0.302***	-0.008	1.000	
New product development	0.102***	0.080***	0.033	0.324***	1.000

Table 4
Corporate culture and stock returns in the crisis period

This table presents baseline cross-sectional regression estimates of the relation between strong culture and stock returns in the crisis period of January 2 to March 20, 2020. Industry fixed effects are based on Fama-French 48-industry classification. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors are presented in parentheses. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture	4.872***	4.996***	3.862***	3.928***
	(1.081)	(1.063)	(1.064)	(1.070)
ln(Market cap)			1.216***	0.814***
			(0.241)	(0.256)
Leverage			-13.098***	-11.077***
			(2.057)	(2.069)
Cash holdings			7.659**	8.161***
			(3.035)	(3.001)
ROA			8.528***	6.344**
			(3.204)	(3.104)
B/M			-2.709***	-1.514
			(0.971)	(0.981)
Momentum			0.003	0.001
			(0.011)	(0.012)
Constant	-42.272***	-34.012***	-46.361***	-37.563***
	(0.458)	(1.041)	(2.374)	(2.671)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394
Adj. R^2	0.161	0.226	0.218	0.256

Table 5
Corporate culture, COVID-19 exposure, and stock returns

This table presents panel data regression estimates of the relation between strong culture and stock returns over the period January 2019 to March 2020, contingent on firms' exposure to COVID-19. Overall exposure and six different exposures (in percentage points) are from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls in the first three months in 2020, and zero for the entire year of 2019. Panel A presents the regression results using the overall exposure variable. Panel B presents the regression results using the six different exposure variables. Control variables are the same as those in Table 4. Firm fixed effects and month fixed effects are included. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors in parentheses are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Strong culture, overall exposure, and stock returns

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.098***	-0.105***	-0.092***	-0.098***
	(0.015)	(0.015)	(0.014)	(0.015)
Overall exposure × Strong culture	0.109***	0.109***	0.084***	0.085***
	(0.017)	(0.018)	(0.016)	(0.017)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505
Adj. R^2	0.407	0.415	0.423	0.429

Panel B: Strong culture, different exposure, and stock returns

	Monthly return					
	(1)	(2)	(3)	(4)	(5)	(6)
Business operations	-0.162*					
	(0.084)					
Business operations × Strong culture	0.573***					
	(0.137)					
Demand		-0.145***				
		(0.024)				
Demand × Strong culture		0.177***				
		(0.047)				
Employees			-0.099*			
			(0.053)			
Employees × Strong culture			0.387***			
			(0.072)			
Liquidity				-0.240***		
				(0.054)		
Liquidity × Strong culture				0.355***		
				(0.093)		
Lockdown					-0.512***	
					(0.100)	
Lockdown × Strong culture					0.466***	
					(0.124)	
Supply chain						-0.118***
						(0.032)
Supply chain × Strong culture						0.158***
						(0.055)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Four-factor loadings	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505	35,505	35,505
Adj. R^2	0.427	0.428	0.428	0.428	0.428	0.427

Table 6
Corporate culture and firm response in the crisis period

This table presents cross-sectional regression estimates of the relation between strong culture and firm response in the crisis period. Overall exposure and four firm responses (in percentage points) are from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls in the first three months in 2020. We control for the natural logarithm of total assets, leverage, cash holdings, ROA, and B/M. Industry fixed effects are based on Fama-French 48-industry classification. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors are presented in parentheses. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Community engagement			Cost cutting			Digital transformation			New product development		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Strong culture	0.394***	0.417***		-0.068	-0.003		1.800***	1.834***		0.548**	0.609***	
	(0.148)	(0.147)		(0.104)	(0.098)		(0.326)	(0.325)		(0.213)	(0.209)	
Overall exposure		0.021***	0.017***		0.059***	0.059***		0.031***	0.018**		0.056***	0.051***
		(0.004)	(0.004)		(0.003)	(0.003)		(0.008)	(0.008)		(0.006)	(0.006)
Overall exposure × Strong culture			0.017***			0.002			0.056***			0.018**
			(0.005)			(0.004)			(0.011)			(0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394	2,394	2,394	2,394	2,394	2,394	2,394	2,394	2,394
Adj. R^2	0.039	0.046	0.047	0.052	0.161	0.161	0.111	0.116	0.111	0.081	0.112	0.111

Table 7
Corporate culture, COVID-19 exposure, and performance and real outcomes

This table presents panel data regression estimates of the relation between strong culture, its components, and performance and real outcomes, contingent on firms' exposure to COVID-19. The sample consists of 2,032 firms whose accounting data is available for at least three fiscal quarters since the onset of the pandemic and four quarters prior from Compustat. For the fiscal quarters in 2020, overall exposure (in percentage points) is from the output of fitting a correlated topic model to a corpus of COVID-19-relevant paragraphs in earnings calls in the first quarter in 2020. For the prior four fiscal quarters, overall exposure is zero. Panel A presents the summary statistics. Panel B presents panel data regression estimates of the relation between strong culture, its two components – strong people culture and strong technology culture, and performance and real outcomes, contingent on firms' exposure to COVID-19. Panel C presents panel data regression estimates of the relation between the five cultural values (the three components of strong people culture—integrity, respect, and teamwork, the two components of strong technology culture—innovation and quality) and performance and real outcomes, contingent on firms' exposure to COVID-19. We control for the natural logarithm of total assets, leverage, cash holdings, ROA, and B/M. Firm fixed effects and quarter fixed effects are included. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors in parentheses are clustered at the firm level. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Summary statistics

	N	Mean	SD	25th percentile	Median	75th percentile
Sales per employee	14,594	148.069	216.737	52.314	82.370	147.457
Layoff (%)	14,594	12.697	33.295	0.000	0.000	0.000
Market share (%)	14,594	1.806	4.553	0.036	0.216	1.143
ROA (%)	14,594	1.243	4.594	0.519	2.107	3.436
ROS (%)	14,594	6.875	37.083	3.720	13.203	24.818
Overall exposure	14,594	11.132	15.010	0.000	0.000	23.983

Panel B: Strong culture, strong people/technology culture, overall exposure, and performance and real outcomes

	Sales per employee			Layoff		
	(1)	(2)	(3)	(4)	(5)	(6)
Overall exposure	0.028	0.062	0.013	0.207***	0.216***	0.206***
	(0.130)	(0.129)	(0.133)	(0.040)	(0.040)	(0.041)
Overall exposure × Strong culture	0.382***			0.009		
	(0.117)			(0.050)		
Overall exposure × Strong people culture		0.465***			-0.110**	
		(0.129)			(0.055)	
Overall exposure × Strong technology culture			0.354***			0.010
			(0.102)			(0.047)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
N	14,594	14,594	14,594	14,594	14,594	14,594
Adj. R^2	0.058	0.058	0.058	0.035	0.036	0.035

Panel B *(continued)*

	Market share			ROA			ROS		
	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Overall exposure	0.001	0.000	0.001	-0.007*	-0.007*	-0.007*	-0.015	-0.008	-0.018
	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.031)	(0.031)	(0.032)
Overall exposure × Strong culture	-0.001			0.008**			0.059**		
	(0.002)			(0.004)			(0.027)		
Overall exposure × Strong people culture		0.000			0.011**			0.041	
		(0.002)			(0.005)			(0.038)	
Overall exposure × Strong technology culture			-0.001			0.005			0.057**
			(0.002)			(0.004)			(0.025)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594
Adj. R^2	0.036	0.036	0.036	0.063	0.063	0.063	0.048	0.048	0.048

Panel C: Five cultural values, overall exposure, and performance and real outcomes

	Sales per employee					Layoff				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Overall exposure	0.082	0.041	0.079	0.020	0.006	0.207***	0.212***	0.211***	0.205***	0.225***
	(0.130)	(0.130)	(0.129)	(0.130)	(0.135)	(0.040)	(0.040)	(0.040)	(0.041)	(0.041)
Overall exposure × Strong integrity culture	0.090					0.015				
	(0.148)					(0.059)				
Overall exposure × Strong respect culture		0.324***					-0.020			
		(0.112)					(0.050)			
Overall exposure × Strong teamwork culture			0.342**					-0.061		
			(0.167)					(0.058)		
Overall exposure × Strong innovation culture				0.384***					0.021	
				(0.103)					(0.047)	
Overall exposure × Strong quality culture					0.336***					-0.065
					(0.099)					(0.046)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594
Adj. R^2	0.056	0.057	0.057	0.058	0.057	0.035	0.035	0.035	0.035	0.036

Panel C *(continued)*

	Market share					ROA				
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Overall exposure	0.000	0.000	0.001	0.001	0.001	-0.007*	-0.008**	-0.007*	-0.007*	-0.008**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Overall exposure × Strong integrity culture	0.001					0.004				
	(0.002)					(0.004)				
Overall exposure × Strong respect culture		0.002					0.011***			
		(0.002)					(0.003)			
Overall exposure × Strong teamwork culture			-0.001					0.014***		
			(0.002)					(0.005)		
Overall exposure × Strong innovation culture				-0.001					0.005	
				(0.002)					(0.004)	
Overall exposure × Strong quality culture					-0.000					0.007**
					(0.001)					(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594	14,594
Adj. R^2	0.036	0.036	0.036	0.036	0.036	0.063	0.063	0.064	0.063	0.063

Panel C *(continued)*

	ROS				
	(21)	(22)	(23)	(24)	(25)
Overall exposure	-0.004	-0.018	-0.007	-0.016	-0.023
	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)
Overall exposure × Strong integrity culture	-0.009				
	(0.039)				
Overall exposure × Strong respect culture		0.083***			
		(0.026)			
Overall exposure × Strong teamwork culture			0.042		
			(0.040)		
Overall exposure × Strong innovation culture				0.058**	
				(0.025)	
Overall exposure × Strong quality culture					0.071***
					(0.023)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes
N	14,594	14,594	14,594	14,594	14,594
Adj. R^2	0.047	0.048	0.048	0.048	0.048

Internet Appendix for

"The Role of Corporate Culture in Bad Times: Evidence from the COVID-19 Pandemic"

Table IA1
Stop word list

This table provides our stop word list when preprocessing earnings call transcripts. We combine the stopwords-iso list (available at https://github.com/stopwords-iso/stopwords-iso) with the words listed below.

afternoon, answer, answer_question, bit, comment, couple, curious, et_cetera, follow_up, go_on, guy, hear, lot, mention, morning, pretty, question, speak, talk

Table IA2
COVID-19 word list

This table provides our word list for COVID-19 ordered by descending similarity to the word COVID-19 after we apply the *word2vec* method to earnings call transcripts over the period January 22 to April 30, 2020. There are 419 words in our final word list.

covid-19, covid-19_pandemic, pandemic, covid, virus, coronavirus_pandemic, coronavirus, covid-19_virus, covid-19_outbreak, covid-19_crisis, coronavirus_outbreak, global_pandemic, covid_pandemic, impact_covid-19, covid-19-related, outbreak, covid-related, spread_covid-19, coronavirus_situation, coronavirus_crisis, health_crisis, crisis, covid-19_situation, global_health_crisis, impact_covid-19_pandemic, epidemic, covid-19_disruption, impact_coronavirus, covid-19_impact, covid_crisis, spread_virus, government-imposed, business_disruption, business_closure, public_health, response_pandemic, outbreak_covid-19, response_covid-19, covid-19_patient, covid_virus, public_health_crisis, outbreak_coronavirus, coronavirus_epidemic, c-19, economic_shutdown, stay-at-home, shelter-in-place, illness, shutdown, travel_restriction, economic_slowdown, virus-related, pandemic-related, contagion, government_restriction, covid-19_challenge, social_distancing_measure, government-mandated, supply_chain_disruption, response_covid-19_pandemic, virus_spread, emergency, covid-19_case, government_action, coronavirus-related, devastating, unprecedented, covid_situation, virus_outbreak, covid-19_environment, recovery_effort, pandemic-driven, coronavirus_issue, evolve_situation, combat_covid-19, economic_crisis, duration_severity, maintain_business_continuity, covid_outbreak, tragedy, stay_at-home, corona, business_continuity, quarantine, covid-19_response, closely_monitor_situation, temporary_closure, health_care_worker, protect_employee, shelter_place_order, pace_recovery, reopen_economy, fight_pandemic, shelter, economic_downturn, preventative_measure, lockdown, shelter-at-home, medical_supplies, unprecedented_time, physical_distancing, widespread, flatten_curve, precaution, health_risk, health_issue, covid-19_testing, infectious_disease, infection, disruption_supply_chain, anxiety, government_order, national_emergency, economic_uncertainty, employee_safe, daily_life, safety_employee, social_distancing, coronavirus_impact, deadly, restriction_lift, protect_health, precautionary_measure, stoppage, social_distance_measure, severity_duration, proactive_measure, government_mandate, infect, air_travel, continue_monitor_situation, infected, shelter-in-place_restriction, monitor_situation_closely, rapidly_evolve, actively_monitor, un-covid-related, stay-at-home_mandate, virus_situation, pathogen, cares_act, situation_evolve, social_distance, travel_ban, health_emergency, factory_shutdown, uncertain_economic_environment, stimulus_program, patient_visit, covid-19-induced, ensure_safety_employee, interruption, rapidly_evolve_situation, diagnostic_testing, employee_family, sars-cov-2, work-from-home, government_stimulus_program, financial_hardship, unemployment, supply_chain_challenge, step_protect, recovery_period, covid-19_issue, stay-in-place, health_concern, health_care_worker_responder, monitor_closely, health_official, ventilator, self-quarantine, closely_monitor, contingency_plan, fight_virus, fight_covid-19, unprecedented_challenge, well-being_team_member, safeguard_employee, economic_recovery, safety_well-being, protect_health_safety, elective_surgery, stimulus, preparedness, demand_impact, social-distancing, rapidly_change_environment, personal_protective_equipment, facility_closure, catastrophic, hospitalize, store_closure, covid_patient, shutdown_period, job_loss, ensure_health_safety, reopen, public_health_official, health_well-being, restriction, medical_equipment, reopening, shelter-in, plant_closure, safety_protocol, work-from-home_policy, health_safety, supply_challenge, supply_disruption, continue_monitor, stay-at-home-order, layoff, viral, ensure_safety, safety_health, containment_measure, shutdown-related, response_team, covid-19-driven, employee_safety, government_regulation, curfew, implementation_cecl, unique_circumstance, stay_home_order, turbulence, demand_shock, home_order, safety_concern, ppe, health_care_system, component_shortage, emergency_room, safety_measure, consumer_spending, corona-19, mitigate_risk, work-at-home, distance_measure, icu, task_force, cecl_implementation, isolation, unprecedented_situation, fluid_situation, uncertain_economic, frontline_worker, social_distance_practice, front_line, abundance_caution, crisis-related, situation_fluid, sars, situation_unfold, business_challenge, demand_destruction, cecl_adoption, relief_fund, event_unfold, business_continuity_plan, government_stimulus, recessionary, well-being_employee, remain_closed, unpredictability, sequestration, consumer_behavior, frontline_health_care, operating_environment, preventative, virus-caused, swift_action, vaccinate, supply_base, safety_well-being_employee, save_life, homebound, emergent, closure, community_serve, employee_health, remote_workforce, supply_chain_impact, challenging_time, force_majeure, temperature_check, acutely, health_care_customer, labor_shortage, prolonged_period, remote_location, infectious, health_service, fatality, patient_volume, unemployment_rate,

medical_professional, economy_recover, patient_safety, covid_impact, sale_impact, consumer_confidence, shape_recovery, infection_rate, construction_activity, navigate_unprecedented, health_care_organization, business_interruption, immune, crisis_management_team, payroll_protection, demand_weakness, severely_impact, unprecedented_circumstance, demand_decline, supply_chain_perspective, recession, surge_demand, vulnerable, health_safety_employee, health_care_professional, life-saving, minimize_disruption, chaos, respiratory, devastate, production_schedule, caregiver, sanitizer, disease_progression, protective_equipment, production_delay, local_community, hard-hit, consumer_demand, essential_worker, sanitize, economy_reopen, resume_operation, impact_covid-19_crisis, unintended, impending, mitigant, qualitative_reserve, prolonged_downturn, face_mask, business_operation, telemedicine, project_delay, credit_environment, health_welfare, safe_healthy, escalate, homeschooling, proactively, business_condition, government_support, covid-driven, precautionary, aggravate, provide_essential_service, selfless, postponement, frontline, sick, suspension, practice_social_distancing, mitigation_effort, adverse_impact, sanitation, manufacturing_activity, at-home, ensure_continuity, sanitary, non-covid-related, respirator, zero-contact, visit_volume, monitor_coronavirus_situation, end_market_demand, inventory_correction, covid-situation, supply_chain_logistics, government-provided, remotely, customer_demand, hospitalization, pandemic-generated, employee-directed, challenging_environment, demand_side, stimulus_package, co-infection, relief_program, prolong, minimal_disruption, ramp_back_up, extended_period_time, health_well-being_employee, furlough, extended_shutdown, health_care_industry, covid-induced, quarantine-related, adversely_affect, safety_precaution, minimize_risk, ensure_business_continuity, remote-capable, wear_mask, demand_disruption, work_environment, testing_volume, assistance_program, health_hygiene, staggering, rapid_response, impossible_predict, life-threatening

Table IA3
Representative paragraphs for different topics

This table provides representative paragraphs for each of the ten topics relating to COVID-19 exposure/response. Panel A presents representative paragraphs for the six different exposures to COVID-19, including business operations, demand, employees, liquidity, lockdown, and supply chain. Panel B presents representative paragraphs for the four different responses to COVID-19, including community engagement, cost cutting, digital transformation, and new product development. For each topic, we list the five most representative paragraphs ranked by the proportion of discussion devoted to a particular topic.

Panel A: Representative paragraphs for topics related to COVID-19 exposure

Topic	*Representative paragraphs*
Business operations	Yes. Collyn, we've spoken to most of our clients there in the construction realm, and for quite a while, they were doing okay even through the crisis until the state ordered the shutdown. And that's only been a couple of weeks. So we recognize there will be some delays in delivery of projects. There were also some delays that we observed through materials that were coming from overseas that will be tied up. Anything that's coming from Asia, anything that's coming from Europe, there will be some slight delays in getting windows and door knobs and those kinds of things.
	In looking at our existing development projects, at 405 Colorado, as we identified in our supplemental, we did have a disappointment post-quarter close. Our lead 70,000 square foot tenant terminated their lease pursuant to a onetime right to terminate if we did not meet an interim milestone delivery date. Based on the original construction schedule we had, we had a significant cushion built in to meet that milestone. The general contractor, while still being able to complete the project on time, missed that milestone date. We will naturally have a claim against that contractor. But right now, our focus is on getting the project built and leased. So that project now stands at 18% leased with 160,000 square feet to lease in what we know will be a very exciting addition to Austin's skyline. We had a great pipeline of deals before the crisis, and we expect that pipeline to reemerge, and I've been in touch with a number of those prospects. Due to the short construction shutdown we did have in Austin, we did slide the completion date back to Q1 '21, and due to this tenant event, moved the stabilization date back to Q4 '21. On the Bulletin Building, due solely to the mandated construction work stoppage, we are moving the completion date back 1 quarter to Q3 '20. Given that, that building is fully leased, we did move the stabilization date up through the Q4 of '20, so that will be fully stabilized. 3000 Market Street, this is a renovation project within Schuylkill Yards. This 64,000 square foot building is being fully converted into a life science facility, and we're very fortunate to have recently signed a lease with a life science tenant, where they will take the entire building on a 12-year lease, commencing; in the third quarter of '21 and then deliver a development yield of 8.5%. So we're really excited. This is truly a great exclamation point to our emerging life science push in University City. Just quick updates on Broadmoor and Schuylkill Yards. On Broadmoor, we're advancing block a, which is a combination of 360,000 square foot office building and 340 apartments through final design and pricing. At Schuylkill Yards, we continued the design development process for a dedicated life science building. And anticipate that with the schedule we have in place, market conditions permitting, that could start in the first half of next year. On our Schuylkill Yards West project, which is our office residential tower, as you know from previous calls, that's fully approved, priced and ready to go, subject to finalizing our debt and equity structure. Certainly, the virus had a big impact on the timing of this project start. We continue to work with our preferred QOZ equity partner, but the crisis has certainly slowed the pace of procuring financing. We do remain optimistic that we'll get that across the finish line when the situation returns to some level of normalcy.

	Moving to our on-campus development pursuits. We are extremely pleased to announce 2 new on- campus development initiatives. On March 27, we entered into a predevelopment agreement with MIT for the development of a graduate student housing community expected to consist of approximately 650 beds. In addition, we were awarded a second development project on the campus of Virginia Commonwealth University. The full scope, transaction structure, feasibility, fees and timing for both projects has not yet been finalized. We continue to pursue numerous active procurements that are continuing throughout the COVID-19 crisis, and we remain active and continue to work with our university partners on predevelopment activities surrounding our previously announced awarded projects. So our goal right from the very beginning was to try to provide estimate, a timing of this filing since actually the announcement in October. But the timing is always not easy to predict. And in fact, as I said before, this is an unusual process. So it's even harder to predict timing when you have a process that actually is pretty unusual and, in my experience, unique. I would just say that the constructive engagement, though, has been there since the very beginning, that continues. These Type C meetings are formal ways to have engagement with FDA. A pre-BLA meeting is another formal meeting with FDA to continue on the path to approval. We have an open BLA. And yes, there's a -- we said early 2020, so now it's Q3. We did have some impact from COVID. But I would say that overall, what we're saying is that the potential for approval, we're still on track with that. I should note, that given the terms of the recent carrier service contracts event we entered into, we expect very little seasonality in revenue and EBITDA this year compared to past years. With respect to site construction and related revenue under the FirstNet agreement, the overall timing has been delayed due to permitting and construction delays caused by the pandemic. We currently expect construction revenues to begin in late 2020 but this could be further delayed by any of the pandemic impacts. As we noted in the release, the delay in construction revenue should have little impact on operating income as revenues will largely be offset by construction expenses. Similar to the International Telecom segment, we also expect capital expenditures to be lower in the US segment as about half of the original forecast at $35 million to 40 million is for tower construction and building backhaul as part of the FirstNet agreement. Some portion of that will likely be pushed into 2021.
Demand	Net income per diluted share was $1.31 compared to $1.35 last year, with FX adversely impacting year-over-year results by approximately $0.07. For the full year, excluding our -- excluded from our 2019 operating results were approximately $13 million of pretax charges related to flagship store asset impairments. This compares to approximately $11 million of excluded charges last year related to certain legal matters and flagship store asset impairment. Net sales were $3.6 billion, up 1% on a reported basis and up 2% on a constant currency basis compared to last year. Comp sales were plus 1% versus plus 3% last year. Gross profit rate was 59.4%, down 80 basis points from last year, with flat AUR offset by higher AUC. Results include adverse impact from changes in FX of 30 basis points and from China tariffs of 10 basis points. So what I heard was that the increase -- the puts and takes in gross margin versus the increased sales, the increased revenues, the increased throughput that we saw in the first quarter are likely to carry through during this emergency period. Our first quarter operating income was $69.9 million, down 53.7% sequentially and down 20.3% year- over-year. Our first quarter operating margin was 12.7%, down 10.6 points sequentially and down 3.3 points year-over-year. The sequential decrease in operating income and operating margin are primarily attributed to lower volume, revenue and gross margin as a result of the COVID-19 impacts. Operating margin was impacted by approximately 0.8 points year-over-year from foreign exchange. On a year-over-year basis, the decrease in operating margin primarily reflects lower gross profit and higher operating expenses related to go-to-market activities, partially offset by the $29.8 million charge related to the Invisalign store closure in Q1 2019.

	Enterprise revenue increased 2.7% to $15.2 billion, primarily due to the comparable sales increase of 3.2%. Enterprise non-GAAP diluted EPS increased $0.18 or 7% to $2.90. This increase was driven by a $0.12 per share benefit from the net share count change and a $0.06 per share benefit from a lower effective tax rate. In our Domestic segment, revenue increased 2.6% to $13.85 billion. The comparable sales increase of 3.4% was partially offset by the loss of revenue from store closures in the past year.
Employees	In our plants and other facilities where remote work isn't feasible, we have instituted robust safety protocols. These include stringent cleaning and medical screening, along with staggering shifts and reorganizing how we work to increase social distancing. In order to protect our employees during this period, we have mobilized our crisis response team and have adopted a comprehensive response plan, the details of which are included on Slide 5 of the presentation. Our response plan includes taking precautions consistent with the local, state and national government health authority guidelines, including the Centers for Disease Control and Prevention and the World Health Organization. Equipping our employees with additional personal protective equipment and enacting social distancing procedures, including staggering shifts, implementing rotating work schedules and modifying workspaces and break areas. In addition, they enforce protective measures and, most importantly, regularly communicate with all the relevant personnel. In early March, we began consulting with a medical adviser and implemented social distancing through revised shift schedules, isolating work groups, work from home policies and restricted nonessential business travel, just to mention a few proactive items. For our employees, who must leave their homes to perform essential service for our customers, a big thank you. They haven't missed a beat in the work they do and have maintained excellent operations. We have equipped these employees with the proper protective equipment, such as masks and protective suits for entering homes. We are performing our tasks with safe social distancing and are regularly sanitizing our facilities, trucks and tools. Every employee that leaves their home gets their temperature checked everyday. We have since partially reopened our San Leandro manufacturing facility in full accordance with federal, state and local regulations and guidance. We have also implemented the enhanced safety measures at each of our manufacturing facilities. Those measures include smaller staggered shifts to ensure social distancing between employers -- employees, personal safety equipment for each worker, including masks and gloves and, most importantly, cleaning between shifts.
Liquidity	Turning to the balance sheet and cash flow. We ended the quarter with cash and cash equivalents of $32.1 million. During the quarter, we drew down $10 million from our existing $30 million revolving credit facility. While we are adequately capitalized, we believed it was prudent to place some additional liquidity on our balance sheet given the uncertain economic situation. We repurchased over 217,000 shares in the first quarter, before suspending the program on March 20, 2020, as the health crisis unfolded, and we prioritized capital preservation. After analyzing our capital position, we did declare a $0.33 per share dividend for the first quarter. Our liquidity remains strong with over $200 million of funds available via a mix of cash on hand and credit facilities. As Mike mentioned earlier, we proactively drew down $90 million on our revolving credit facilities via a partial borrowing on each of our U.S. and Icelandic agreements. While we do not have a foreseeable need for the funds, we secured them out of an abundance of caution in this uncertain and volatile environment.

Finally, very little of our existing debt matures until 2024, inclusive of our convertible notes, revolver and term loan. Our current net leverage ratio is 3.1x, and our cash on hand is $89 million as of March 31. Given our balance sheet, the recent covenant amendment and our cost reduction actions, we do not currently foresee using the CARES Act.

We have two maintenance financial covenants in our revolver, and we were in compliance with these covenants at the end of March. We have proactively obtained a waiver for these covenants through the financial covenant reporting period ending June 30, 2021, with modified covenant calculations for the reporting periods ending September 30, 2021 and December 31, 2021. As part of the waiver agreement, we've agreed to a minimal liquidity requirement of $150 million, and we agree to refrain from share repurchases until we are no longer under the waiver agreement, either through compliance with the covenants or by opting out of the waiver agreement.

Lockdown

And as I said, this week -- last week, it started to go up [near] the end of the week. We're starting to see it come up again a little bit this week. And in the U.S. and Europe are actually very similar. They've been trending very similarly. In Europe, what you're seeing is the southern countries are pretty much still in not ordering mode, but in the more northern countries, so Germany, The Netherlands and the Nordic countries, Switzerland, some of those areas are actually -- there is -- they're kind of getting back to work and actually treating patients again as well. So those countries is where you're kind of seeing it over in Europe right now. But the southern countries like France, Spain and Italy, which we don't do a ton of business in those areas, but in general, they're still pretty much in lockdown.

I can take a stab at those, Jeff. First of all, we're not planning any closures in the year. Our closure last year is one of our small original, we call our beach and college restaurants on the Balboa Peninsula as our lease expired there. But we've been very fortunate as a concept not to experience any closures at all. So that's the answer to that.

In Europe and Australia, New Zealand, many of our dealers and boat OEMs, which have been closed since mid-March, are now starting to reopen as countries relax shelter restrictions. We were pleased to see Australia and New Zealand recently announcing some relaxation of boating restrictions.

Despite our optimism for the future, the near-term impact on our business has been profound. Many retail locations across the globe, including our wholesale customers, our own stores and our partner stores were closed at some point during Q1, and many remain closed today. In the Americas and Western Europe, our company-operated stores have been closed since mid-March. And in Russia, our stores closed in early April. Many but not all of our wholesale customer stores in these regions have also been closed. In Asia, we've seen a second wave of the virus. Japan, India and much of Southeast Asia have been impacted, with many stores now closed as of early April. In China, our stores and the approximately 350 partner stores that were closed from January through March are now reopened. We are seeing a slow and steady recovery with week-on-week improvements in traffic and sales, but comps are down materially.

Yes. And then -- and I think if you look at EMEA, you're going to see there are another raft of stores that are scheduled to open next week. So in terms of the decision-making that the -- we're, obviously, looking to follow local country state guidelines, right? So we're not certainly planning to open any stores in contravention of any stay at home orders. So when the stay at home orders are released, when malls are opened, we will consider opening stores. We are also looking to the majority of the stores in a mall being opened. We don't want to be the 1 or 2 stores that open, otherwise, you just have all of the costs and potentially very limited traffic.

Supply chain	As far as financial impact, there are 3 areas that we are monitoring: one, reduced manufacturing capacity in the quarter due to the shutdown and lower-than-typical headcount in the factory; two, additional expenses incurred as a result of the outbreak; and three, supply chain issues. As many of our suppliers are in China, we are working closely with them as they return to work to assess whether they will be able to supply necessary raw materials for our production. At this point, the vast majority of our suppliers in China have returned to work, and we currently believe that we will not have constraints on our production capacity in Q1 due to virus-related supply chain disruption. I think on biodiesel demand. What we're seeing, Tom, is in Europe, we're actually seeing more of a hit in terms of our biodiesel demand. Part of it is just simply due to the fact that, as in Europe, passenger cars actually use diesel a lot, in addition to commercial vehicles. And so when you have to shelter and place orders come in for Europe, it really negatively impacted the demand environment over there. What's interesting in the United States, we actually have not seen that drop off. In fact, in the early part of the quarter, we actually saw strong demand for diesel. Because as you know, trucks -- the trucking industry, were actually running very, very hard in order to keep the warehouses supplied. And as airlines kind of shut down, a lot of the goods actually start moving on the truck front. So we've seen on the biodiesel front, which is tied to the really diesel demand that United States actually has held up reasonably well. In terms of our block, our biodiesel block, we've got it, a lot of it already sold out into the second and third quarter. So we feel good about this part of the business actually holding up right now. Our supply chain team has been proactively managing part supply during this pandemic since the early days of the outbreak in China. The team is assessing risk areas with our suppliers every day and taking preventative steps to ensure our critical supply lines remain open. However, the global supply base remains subject to the same ordinances and decrees that affect our operations and are causing inevitable interruption in our suppliers, ultimately impacting our output. While we do not manufacture any of our products in China, we do source key components from the region and have plans in place to ensure business continuity. Importantly, we maintain a buffer supply of any critical component sourced overseas. So we know we are in great shape for the next couple of quarters. Our hard goods sourcing is more diversified, and we actively manage our inventory levels to protect against potential disruptions in the supply chain, given the long lead times from order to having the inventory on hand.

Panel B: Representative paragraphs for topics related to COVID-19 response

Topic	*Representative paragraphs*
Community engagement	Our Anthem culture and values serve as our foundation for giving back in our local communities. Our deeply committed associates have been giving back in various ways, such as online teaching, outreach via phone or mail to those isolated at home, making masks for non-health care industry workers, helping to provide personal care supplies and providing meal delivery to those homebound by the crisis across the country with partners like the American Red Cross, Boys & Girls Club, Feeding America and Americares. Anthem is on the forefront of delivering relief and support to those most impacted. To support our community, Banc of California partnered with food finders to provide over 300,000 meals to our most vulnerable neighbors in Southern California. And lastly, on behalf of all our employees and our Board of Directors, I want to give our heartfelt thanks to the extremely brave and courageous health care workers and others on the frontline, and they are tirelessly working to fight this pandemic. Have a wonderful day.

Thank you, operator. We could not be more impressed by the truly extraordinary efforts of our entire organization, which has quickly adapted to these challenging times. We have seen team members display unwavering tenacity and an unparalleled commitment to serving our valued homebuyers. On behalf of our entire leadership team, we want to sincerely thank them for their hard work and continued dedication during these unprecedented times.

Now none of this will be possible without the hard work and dedication of our colleagues around the globe. Every day, their commitment and passion embodies our mission to improve the health well-being and peace of mind of those we serve. This has never been more clear and defining than over the last several months, as they have stepped up in countless ways to support the needs of our key stakeholders around the globe at a time when they most need us.

Cost cutting

The next question, I think, we've already talked a lot about permanent head count reductions and cost cutting. But the question is, can the head count be permanently reduced? And obviously, it's been part of your cost-cutting for the last couple of years. But is this an incremental opportunity, do you think? Or will it -- will you go back to the levels you were before COVID-19?

Second, we continue to flex our conversion costs across the globe, including temporary layoffs of direct and indirect hourly associates, across-the-board compensation reductions for salary associates, as well as intermittent temporary layoffs and reduced workweeks throughout the organization. We're also dramatically reducing our overhead spending across all nonlabor categories.

We have had a growing workforce over the last 5 years. And unfortunately, in many cases, the work has abruptly stopped over the last 6 weeks. We have reduced our hourly workforce by 20% to 25% overall, in line with those projects that are active. About 40% of our salaried workforce is either furloughed or working with reduced hours or reduced pay of up to 25% on a temporary basis. For example, as early as March 18, we announced and temporarily reduced most of the headquarters staff pay and/or hours by 25%. This includes me and all the named executive officers. Our Board of Directors have reduced their compensation by about 22%. Our segment leadership also implemented similar cost reductions for their segment staff and leadership teams. However, about 40% of our company is still working, get pre-COVID salary and hourly levels. And in those cases, we have not significantly reduced our SG&A or cost as we need to have them have the resources they need to continue to perform for our customers.

Given the outlook, we have taken a series of aggressive measures to reduce costs and preserve liquidity. First, we are reducing crews that no longer have scheduled work and releasing the crews-related support staff. Second, we have reduced all employee labor costs through a combination of layoffs, rolling furloughs, wage and salary reductions, and the suspension of our short-term incentive plan. Since February, we have reduced our total company active headcount by over 800 employees or nearly 65%.

In addition, we remain challenged to leverage our expenses on low single-digit sales comps. These cost pressures and the lack of leverage let us to develop 2019 cost savings plan, which we announced last quarter and Paul covered earlier. Through these initiatives, which are well underway today, we expect to generate meaningful savings as we move forward in 2020 primarily in the areas of personnel and headcount associated with various organizational changes. In accordance with the savings plan, the company recognized $112 million in restructuring cost in the fourth quarter that are accounted for as a component of operating expenses. These restructuring cost reflect severance and other employee costs including a voluntary retirement program as well as facility and closure costs related to the consolidation of certain operations. The company also recorded $43 million in special termination costs related to the retirement benefits provided to employees that expected this voluntary retirement package. These costs are presented as nonoperating expenses.

Digital transformation

As Paul noted, our remote workforce plan has been rolled out with an overall smooth transition. We already had virtual private network, VPN, technology capability over the last quarter, and we've expanded VPN access to over 70% of our employees. In addition to VPN, we are well set up with the latest technologies that enable our operations to continue efficiently. Our teams are using collaboration tools, including Microsoft Teams and several other cloud-

	based software programs. For our customers, we continue to offer our current online and mobile banking tools, and we are making good progress on our new digital offerings as part of our RISE2020 initiative. Banking is deemed an essential service and I've been so proud of how our CPB employees have risen to deliver exceptional service in these challenging times. More broadly, the pandemic has created a heightened focus on a need for interoperability, secure access to information, analytics and other needs that align with our capabilities. We believe this could be a catalyst for an industry to move faster to realize the potential that has yet to be realized from a base level of digitization that it was established during the meaningful use era. Not doing so would be a missed opportunity. We achieved another strong quarter of growth with AppDynamics, demonstrating our ability to deliver unique real-time, AI-powered insights from a single pane of glass, providing complete visibility. Our customers are looking to connect application performance monitoring with infrastructure automation to simplify IT and increase productivity. 2 weeks ago, we announced we are bringing together AppDynamics and our Intersight Workload Optimizer to deliver comprehensive visibility of applications and infrastructure, both on-prem and in the cloud, using machine learning and AI to proactively remediate problems and optimize user experiences. Nortek selected our SmartVoice product for its Numera Libris personal emergency response system, supporting long battery life while adding always listening features. These achievements, coupled with the recent wins in the smartphone market, including the newly launched Oppo K2 smartphone, continue to demonstrate the depth, strength and diversity of our SmartVoice franchise and our ability to drive down power consumption while raising the bar on quality and performance for edge devices. At CES, we demonstrated how we are leveraging our voice expertise to create innovative AI solutions as the next frontier in machine learning is now applied to voice. As more AI processing gets performed at the edge to address privacy concerns, reduce latency and to make better use of available bandwidth, more efficient hardware and associated algorithms must be tightly coupled and optimized to meet consumers' requirements. We will continue to enrich our product portfolio with a suite of algorithms and hardware that address the rising need to create increasingly accurate AI solutions for edge devices for applications such as sound detection, proximity, acoustic beaconing and more, all while maintaining the lowest power consumption. We believe that our SmartVoice business will continue to be a pivotal growth driver, powering a broad array of exciting new applications. So broadly stated, I would say the EUV is one for technology for the semiconductor industry. I mean it will allow us, as an industry, to continue to have really bold dreams about [frank] and about complex architectures. And that's why it's going to be enabling 5-nanometer this year, and we will, in short order, I'm sure go to 3 and beyond. And that's wonderful because those new architectures will be requiring new materials, but more precise etching chemistries. And more importantly, would be increasingly vulnerable to contaminations. And if you think about the value proposition of Entegris, we will be ideally positioned to develop the solutions required for the industry to continue to advance on the road map.
New product development	Sure. I think when you think about Marlboro and really -- we really believe it's related to that consumer movement across categories. And so as we saw those older -- especially that 50 and older consumer move back from e-vapor into cigarettes, we know from demographics that, that consumer has a higher propensity for discount brands. And so that's why we wanted to show -- you see Marlboro's rock steady is its share of premium. It is something that we'll continue to monitor and make sure there's nothing else there, but we believe that's what occurred -- the majority of that in the first quarter. Turning now to NICS. As a reminder, we transfer firearms only to law enforcement agencies and federally licensed distributors and retailers, not directly to end consumers. Therefore, since NICS is a measurement of consumer activity, it does not directly correlate to our shipments in any given time period. That said, adjusted NICS background checks are generally considered to be the best available proxy for consumer demand for firearms at retail.

Our non-detachable, tamper-evident, tear band and closure are also featured on the Youcui brand of infant formula in China. In the beverage market, our sports closures are featured on a line of Dasani Bottled Water in Ecuador and on several new Disney-themed bottled waters by Danone in Brazil.

Yes, certainly. Over the last couple of years, we've been building out various relationships and partnerships. And the relationships are pretty widespread. I would describe a couple broaden our geographical footprint in a few parts of the world that gets us a leverage distribution opportunity, where we're providing a sub-advisory relationship and leveraging into someone else's distribution network and professionals. We are also looking at a few opportunities that we've solidified to get us deeper into the intermediary and wealth channel that's, I think, will be beneficial in the future here.

Yes. This is Bryan Koop. If you look at our strategy with FLEX in Boston, it's really been almost complementary to our existing products. So as an example, with The Hub on Causeway, we have one full floor that we had always planned on putting in the podium, and that's 100% pre-leased and opened last week, and we're just thrilled with the product and how it came out. By year-end, we hope to have 4 locations, but it's really complementary to our existing assets and has nothing to do with what's taking place in the greater market. And then in the greater market on coworking, I think our FLEX product has been immune from, call it, a lot of the noise because the FLEX product is really for the small-to- medium enterprise, and it's not a coworking product per se. It's a Space as a Service for small-to-medium enterprises.

Table IA4
Validating our measure of firm-level exposure and response related to COVID-19 using tone

This table uses tone in COVID-19 related discussions to validate our measures of firm-level exposure and response related to COVID-19. We control for the natural logarithm of total assets, leverage, cash holdings, ROA, and B/M. Industry fixed effects are based on Fama-French 48-industry classification. Definitions of variables are provided in Appendix. Heteroskedasticity-consistent standard errors are presented in parentheses. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Tone				
	(1)	(2)	(3)	(4)	(5)
Overall exposure	-0.007***				
	(0.001)				
Community engagement		0.017***			
		(0.003)			
Cost cutting			-0.021***		
			(0.003)		
Digital transformation				0.018***	
				(0.002)	
New product development					0.015***
					(0.002)
Controls	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	2,129	2,129	2,129	2,129	2,129
Adj. R^2	0.059	0.046	0.044	0.110	0.051

Table IA5
Summary statistics of panel data regression in Table 5

This table presents the summary statistics of variables used in the panel data regression in Table 5. The sample consists of 35,505 firm-month observations over the period January 2019 to March 2020.

	Mean	SD	25th percentile	Median	75th percentile
Monthly return	-1.473	15.615	-8.060	0.314	6.700
Overall exposure	4.793	11.278	0.000	0.000	0.000
Business operations	0.428	1.428	0.000	0.000	0.000
Demand	1.575	4.665	0.000	0.000	0.000
Employees	0.739	2.346	0.000	0.000	0.000
Liquidity	0.436	1.978	0.000	0.000	0.000
Lockdown	0.433	1.371	0.000	0.000	0.000
Supply chain	1.181	3.612	0.000	0.000	0.000

Table IA6
Controlling for other characteristics that make firms resilient

This table presents panel data regression estimates of the relation between strong culture, overall exposure to COVID-19, and stock returns, controlling for other characteristics known to make firms resilient during the pandemic. The specification is the same as in Table 5 Panel A column (4). Definitions of variables are provided in Appendix. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

	Monthly return				
	(1)	(2)	(3)	(4)	(5)
Overall exposure	-0.149***	-0.114***	-0.122***	-0.099***	-0.093***
	(0.024)	(0.016)	(0.019)	(0.015)	(0.017)
Overall exposure × Strong culture	0.084***	0.061***	0.081***	0.084***	0.084***
	(0.020)	(0.020)	(0.017)	(0.017)	(0.017)
Overall exposure × CSR_ASSET4	0.001**				
	(0.000)				
Overall exposure × CSR_MSCI		0.042**			
		(0.019)			
Overall exposure × WFH			0.063**		
			(0.030)		
Overall exposure × Prior epidemic experience				0.007	
				(0.016)	
Overall exposure × China					-0.009
					(0.013)
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Four-factor loadings	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes
N	24,510	23,625	35,505	35,505	35,505
Adj. R^2	0.468	0.490	0.429	0.429	0.429

Table IA7
Using different return windows

This table presents robustness checks on Table 4 and Table 5 Panel A. Panels A and B present the results using daily returns over the period January 20 to March 20, 2020 – the combination of outbreak and fever periods following Ramelli and Wagner (2020). Panels C and D present the results using daily returns over the period January 2 to March 31, 2020. Definitions of variables are provided in Appendix. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Baseline cross-sectional regression using daily returns over the period January 20 to March 20, 2020

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture	3.243***	3.377***	2.511***	2.566***
	(0.974)	(0.957)	(0.952)	(0.955)
ln(Market cap)			1.219***	0.915***
			(0.216)	(0.229)
Leverage			-12.880***	-11.198***
			(1.886)	(1.901)
Cash holdings			6.447**	6.888***
			(2.641)	(2.629)
ROA			10.881***	9.053***
			(2.845)	(2.791)
B/M			-2.196**	-1.169
			(0.914)	(0.921)
Momentum			-0.005	-0.005
			(0.009)	(0.010)
Constant	-43.702***	-36.094***	-47.809***	-40.476***
	(0.425)	(0.952)	(2.155)	(2.446)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394
Adj. R^2	0.145	0.206	0.213	0.246

Panel B: Panel data regression using daily returns over the period January 20 to March 20, 2020

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.079***	-0.087***	-0.075***	-0.081***
	(0.013)	(0.014)	(0.013)	(0.013)
Overall exposure × Strong culture	0.072***	0.072***	0.048***	0.049***
	(0.015)	(0.016)	(0.015)	(0.015)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505
Adj. R^2	0.419	0.426	0.435	0.440

Panel C: Baseline cross-sectional regression using daily returns over the period January 2 to March 31, 2020

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture	4.991***	5.074***	3.700***	3.799***
	(1.213)	(1.194)	(1.188)	(1.193)
ln(Market cap)			1.579***	1.199***
			(0.269)	(0.284)
Leverage			-15.436***	-13.184***
			(2.283)	(2.318)
Cash holdings			9.011***	9.283***
			(3.330)	(3.310)
ROA			8.814**	6.494*
			(3.533)	(3.461)
B/M			-4.634***	-3.315***
			(0.966)	(0.962)
Momentum			0.019	0.018
			(0.012)	(0.013)
Constant	-34.667***	-25.734***	-40.142***	-31.284***
	(0.513)	(1.121)	(2.618)	(2.901)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394
Adj. R^2	0.197	0.266	0.276	0.309

Panel D: Panel data regression using daily returns over the period January 2 to March 31, 2020

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.103***	-0.110***	-0.095***	-0.100***
	(0.015)	(0.016)	(0.015)	(0.016)
Overall exposure × Strong culture	0.111***	0.111***	0.087***	0.088***
	(0.017)	(0.018)	(0.017)	(0.018)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505
Adj. R^2	0.326	0.334	0.342	0.347

Table IA8
Using alternative measures of strong culture

This table presents robustness checks on Table 4 and Table 5 Panel A by using two alternative measures of strong culture. *Strong culture_ind* is an indicator variable that takes the value of one if the sum of a firm's five cultural value scores is in the top quartile across all firms in the same Fama-French 48 industry in a year, and zero otherwise. *Strong culture_dm* is an indicator variable that takes the value of one if the sum of a firm's five cultural value scores subtracting their industry means is in the top quartile across all firms in a year, and zero otherwise. Panels A and B present the results using *Strong culture_ind*. Panels C and D present the results using *Strong culture_dm*. Definitions of variables are provided in Appendix. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Baseline cross-sectional regression using *Strong culture_ind*

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture_ind	3.697***	3.799***	2.759***	2.842***
	(0.933)	(0.910)	(0.928)	(0.917)
ln(Market cap)			1.214***	0.810***
			(0.242)	(0.256)
Leverage			-13.155***	-11.147***
			(2.063)	(2.072)
Cash holdings			8.332***	8.821***
			(3.012)	(2.975)
ROA			8.387***	6.220**
			(3.207)	(3.107)
B/M			-2.803***	-1.610
			(0.974)	(0.985)
Momentum			0.001	0.000
			(0.011)	(0.012)
Constant	-41.976***	-33.742***	-46.091***	-37.279***
	(0.435)	(1.028)	(2.383)	(2.671)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394
Adj. R^2	0.158	0.224	0.216	0.254

Panel B: Panel data regression using *Strong culture_ind*

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.094***	-0.102***	-0.090***	-0.096***
	(0.015)	(0.015)	(0.014)	(0.015)
Overall exposure × Strong culture_ind	0.068***	0.069***	0.056***	0.057***
	(0.016)	(0.017)	(0.015)	(0.016)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505
Adj. R^2	0.407	0.415	0.423	0.428

Panel C: Baseline cross-sectional regression using *Strong culture_dm*

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture_dm	3.911***	4.112***	3.051***	3.163***
	(0.947)	(0.925)	(0.948)	(0.940)
ln(Market cap)			1.219***	0.812***
			(0.241)	(0.256)
Leverage			-13.152***	-11.127***
			(2.060)	(2.070)
Cash holdings			8.138***	8.590***
			(3.021)	(2.988)
ROA			8.440***	6.273**
			(3.208)	(3.106)
B/M			-2.768***	-1.569
			(0.973)	(0.984)
Momentum			0.002	0.000
			(0.011)	(0.012)
Constant	-42.049***	-33.866***	-46.209***	-37.415***
	(0.439)	(1.035)	(2.378)	(2.671)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	2,394	2,394	2,394	2,394
Adj. R^2	0.159	0.225	0.217	0.255

Panel D: Panel data regression using *Strong culture_dm*

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.096***	-0.104***	-0.091***	-0.097***
	(0.015)	(0.015)	(0.014)	(0.015)
Overall exposure × Strong culture_dm	0.074***	0.079***	0.057***	0.062***
	(0.016)	(0.017)	(0.015)	(0.016)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	35,505	35,505	35,505	35,505
Adj. R^2	0.407	0.415	0.423	0.428

Table IA9
Excluding utilities and financial firms

This table presents robustness checks on Tables 4-7 after dropping utilities and financial firms. Definitions of variables are provided in Appendix. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Baseline cross-sectional regression after dropping utilities and financial firms

	Crisis period return			
	(1)	(2)	(3)	(4)
Strong culture	3.605***	3.617***	3.141***	3.075***
	(1.172)	(1.154)	(1.138)	(1.147)
ln(Market cap)			1.406***	0.975***
			(0.275)	(0.292)
Leverage			-12.062***	-9.543***
			(2.511)	(2.523)
Cash holdings			7.703**	7.631**
			(3.443)	(3.391)
ROA			7.708**	5.747*
			(3.361)	(3.236)
B/M			-1.227	-0.301
			(1.117)	(1.132)
Momentum			-0.003	-0.003
			(0.011)	(0.012)
Constant	-41.731***	-33.298***	-48.453***	-39.490***
	(0.564)	(1.273)	(2.678)	(3.068)
Four-factor loadings	No	Yes	No	Yes
Industry FE	Yes	Yes	Yes	Yes
N	1,829	1,829	1,829	1,829
Adj. R^2	0.171	0.230	0.223	0.254

Panel B: Panel data regression (overall exposure) after dropping utilities and financial firms

	Monthly return			
	(1)	(2)	(3)	(4)
Overall exposure	-0.128***	-0.136***	-0.119***	-0.126***
	(0.018)	(0.019)	(0.018)	(0.019)
Overall exposure × Strong culture	0.105***	0.103***	0.076***	0.075***
	(0.019)	(0.020)	(0.018)	(0.019)
Firm characteristics	No	No	Yes	Yes
Four-factor loadings	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
N	27,060	27,060	27,060	27,060
Adj. R^2	0.371	0.380	0.389	0.394

Panel C: Panel data regression (different exposures) after dropping utilities and financial firms

	Monthly return					
	(1)	(2)	(3)	(4)	(5)	(6)
Business operations	-0.266*					
	(0.155)					
Business operations × Strong culture	0.572***					
	(0.174)					
Demand		-0.194***				
		(0.030)				
Demand × Strong culture		0.148***				
		(0.057)				
Employees			-0.155**			
			(0.065)			
Employees × Strong culture			0.401***			
			(0.079)			
Liquidity				-0.382***		
				(0.121)		
Liquidity × Strong culture				0.443***		
				(0.158)		
Lockdown					-0.540***	
					(0.117)	
Lockdown × Strong culture					0.423***	
					(0.138)	
Supply chain						-0.148***
						(0.037)
Supply chain × Strong culture						0.139**
						(0.058)
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Four-factor loadings	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes
N	27,060	27,060	27,060	27,060	27,060	27,060
Adj. R^2	0.393	0.394	0.393	0.393	0.393	0.393

Panel D: Corporate culture and firm response in the crisis period after dropping utilities and financial firms

	Community engagement			Cost cutting			Digital transformation			New product development		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Strong culture	0.456***	0.469***		-0.005	0.033		1.659***	1.676***		0.513**	0.545**	
	(0.160)	(0.160)		(0.111)	(0.105)		(0.340)	(0.339)		(0.225)	(0.222)	
Overall exposure		0.021***	0.015***		0.057***	0.055***		0.026**	0.011		0.050***	0.045***
		(0.005)	(0.005)		(0.004)	(0.004)		(0.011)	(0.011)		(0.008)	(0.008)
Overall exposure × Strong culture			0.020***			0.005			0.054***			0.018**
			(0.006)			(0.005)			(0.011)			(0.008)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,829	1,829	1,829	1,829	1,829	1,829	1,829	1,829	1,829	1,829	1,829	1,829
Adj. R^2	0.023	0.031	0.032	0.074	0.169	0.170	0.101	0.104	0.100	0.079	0.101	0.100

Panel E: Strong culture, strong people/technology culture, overall exposure, and performance and real outcomes after dropping utilities and financial firms

	Sales per employee			Layoff			Market share		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Overall exposure	0.059	0.096	0.030	0.234***	0.240***	0.235***	0.001	0.001	0.001
	(0.125)	(0.124)	(0.127)	(0.046)	(0.045)	(0.046)	(0.001)	(0.001)	(0.001)
Overall exposure × Strong culture	0.334***			0.004			-0.001		
	(0.094)			(0.052)			(0.002)		
Overall exposure × Strong people culture		0.367***			-0.133**			0.000	
		(0.120)			(0.057)			(0.002)	
Overall exposure × Strong technology culture			0.361***			-0.001			-0.001
			(0.086)			(0.049)			(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512
Adj. R^2	0.071	0.070	0.071	0.040	0.041	0.040	0.039	0.039	0.039

Panel E *(continued)*

	ROA			ROS		
	(10)	(11)	(12)	(13)	(14)	(15)
Overall exposure	-0.008*	-0.007	-0.008*	-0.041	-0.031	-0.049
	(0.005)	(0.005)	(0.005)	(0.045)	(0.044)	(0.046)
Overall exposure × Strong culture	0.010**			0.077**		
	(0.004)			(0.035)		
Overall exposure × Strong people culture		0.012**			0.040	
		(0.005)			(0.052)	
Overall exposure × Strong technology culture			0.007*			0.089***
			(0.004)			(0.033)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
N	12,512	12,512	12,512	12,512	12,512	12,512
Adj. R^2	0.065	0.065	0.064	0.040	0.040	0.040

Panel F: Five cultural values, overall exposure, and performance and real outcomes after dropping utilities and financial firms

	Sales per employee					Layoff				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Overall exposure	0.108	0.076	0.103	0.052	0.024	0.234***	0.237***	0.237***	0.231***	0.255***
	(0.125)	(0.124)	(0.124)	(0.124)	(0.128)	(0.045)	(0.046)	(0.045)	(0.047)	(0.046)
Overall exposure × Strong integrity culture	0.056					0.009				
	(0.136)					(0.064)				
Overall exposure × Strong respect culture		0.270***					-0.018			
		(0.083)					(0.053)			
Overall exposure × Strong teamwork culture			0.401***					-0.107*		
			(0.138)					(0.062)		
Overall exposure × Strong innovation culture				0.329***					0.021	
				(0.080)					(0.049)	
Overall exposure × Strong quality culture					0.334***					-0.077
					(0.083)					(0.048)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512
Adj. R^2	0.069	0.070	0.071	0.071	0.071	0.040	0.040	0.041	0.040	0.041

Panel F *(continued)*

	Market share					ROA				
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Overall exposure	0.001	0.000	0.001	0.001	0.001	-0.007	-0.008*	-0.007	-0.008*	-0.009*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Overall exposure × Strong integrity culture	0.001					0.003				
	(0.002)					(0.005)				
Overall exposure × Strong respect culture		0.002					0.011***			
		(0.002)					(0.004)			
Overall exposure × Strong teamwork culture			-0.001					0.016***		
			(0.002)					(0.005)		
Overall exposure × Strong innovation culture				-0.001					0.007*	
				(0.002)					(0.004)	
Overall exposure × Strong quality culture					-0.001					0.009**
					(0.002)					(0.004)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512	12,512
Adj. R^2	0.039	0.039	0.039	0.039	0.039	0.064	0.065	0.065	0.064	0.064

Panel F *(continued)*

	ROS				
	(21)	(22)	(23)	(24)	(25)
Overall exposure	-0.026	-0.043	-0.030	-0.044	-0.054
	(0.044)	(0.045)	(0.045)	(0.045)	(0.046)
Overall exposure × Strong integrity culture	-0.035				
	(0.056)				
Overall exposure × Strong respect culture		0.100***			
		(0.035)			
Overall exposure × Strong teamwork culture			0.053		
			(0.053)		
Overall exposure × Strong innovation culture				0.080**	
				(0.033)	
Overall exposure × Strong quality culture					0.093***
					(0.030)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes
N	12,512	12,512	12,512	12,512	12,512
Adj. R^2	0.040	0.041	0.040	0.040	0.041