Pandemic Panic? Effects of Health System Capacity on Firm Confidence During COVID-19*

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Abstract

In this study, we examine the impact of health system capacity and government responses on firms' business confidence in response to the COVID-19 pandemic. Using a sample of firm-level data from 53 countries, we find that *ex ante* proactive measures—such as health spending by the public and private sectors and availability of medical staff—have a favorable impact on the firms' perceptions of risk and sentiment. This effect reduces as the number of COVID-19 cases rise, possibly as a result of the drain on a country's health resources. We also find that the *ex post* reactive measures—such as health and containment actions, and the overall quality of government response—also play a role in bolstering business confidence. These effects vary by firm size and the level of development of the economy, and are largely impervious to prior epidemic experience.

KEYWORDS: health system capacity, COVID-19, private and public healthcare, firm sentiment, firm risk
JEL CLASSIFICATION: D22, H41, H51, I18

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1. Introduction

How much does the external environment affect businesses' assessments of their future prospects? Managers' perceptions, in terms of sentiment and risk, undoubtedly shape the manner by which firms save and invest for the future, which in turn impacts their performance. But such perceptions are shaped not only by the internal dynamics of the firm—such as the skills and motivation of its workforce, its access to capital financing, and the quality of its management and strategic initiatives (Marks 2015; Miller 1992)—but also by external drivers, such as macroeconomic conditions, the overall investment climate, and the socio-political backdrop in which it does business (Miller 1993).

Typically, it is difficult—if not impossible—to disentangle the specific contribution of a given environmental factor from other macro-level correlates, since these may not only be relatively invariant over time, but also potentially associated with other, unobservable factors. However, the rapidity and severity of the onset of the COVID-19 pandemic meant that this exogenous shock stressed one particular factor—the capacity of the national healthcare system—without permitting enough time, by and large, for public and private agents to dramatically adjust their resources endogenously. Consequently, healthcare resources available *at the time of the pandemic* are a reasonable reflection of the systemic capacity available to meet economywide healthcare needs. We exploit this quasi-natural experiment to obtain an estimate of the importance of health system capacity for firm perceptions of risk and sentiment.

Moreover, by decomposing the effects of health expenditure into public and private components, we are further able to evaluate the relative importance of government-provided healthcare management as a public good. In our application, the public good relates to the capacity of government health agencies to mount a credible, effective epidemic response (relative to complementary private resources expended on healthcare). Together with total health expenditures, such estimates provide an important gauge of how *ex ante* systemic measures may shape firms' expectations of their ability to navigate the implications of a disease outbreak for their businesses.

The disease environment is not solely limited to preexisting health system capacity, of course. COVID-19 saw countries worldwide mount proactive responses to manage the disease, including containment measures such as lockdowns and travel bans, along with other epidemic response measures, both of a medical (e.g. deployment of facial coverings, contact tracing) and nonmedical (e.g. income support, debt relief) nature. These *ex post* measures may shore up firms' confidence about the future as well, and hence it is reasonable to ask whether government pandemic management actions may also influence firm perceptions.

In this paper, we examine the importance of systemic capacity in shaping agents' perceptions of their exposure to an aggregate shock. More specifically, we examine how firms' perceptions of disease sentiment and risk associated with the novel coronavirus disease of 2019 (COVID-19)—which we collectively term business confidence[1]—relate to the amount of total healthcare resources available. We also examine the relative importance of public versus private resources devoted to healthcare for such perceptions, along with whether proactive (as opposed to passive) actions by countries made any material difference.

Our central hypothesis is that firm perceptions of negative sentiment and risk due to disease are both negatively related to *ex ante* total health system capacity. To the extent that such capacity is well-provided by the public sector, we hypothesize that confidence should improve; conversely, if not, the private sector may serve as a substitute to perform the same function. And finally, we expect that more intensive *ex post* response measures should, all else equal, bring about even further reductions in perceptions of risk and negative sentiment.

Our results confirm the importance of *ex ante* health system capacity for firms' perception of COVID-19-related risk and sentiment; increased capacity gives rise to lower risk and reduced negative sentiment. These effects are statistically significant, and most pronounced for risk perceptions: a one percentage point increase in capacity results in a 2.5

[1]Business confidence indexes typically employed in the literature generally encompass a much broader range of measures, including quantitative measures such as domestic and export order books. Here, we use the term mainly for expositional economy, but note that it encompasses a similar philosophy as confidence measures: that of forward-looking expectations of firms.

percent decrease in risk, relative to its mean. Furthermore, we find evidence that both public as well as private health expenditures matter—the former more for risk, the latter for sentiment—suggesting that the two systems are complements. Finally, we also verify that *ex post* government interventions play a part in shoring up business confidence.

Related literature and contribution. There has been a surge in papers on COVID-19 that emerged in the aftermath of the pandemic. Within the field of business and economics, papers have addressed the broad macroeconomics of the pandemic (Baldwin & Weder di Mauro 2020a,2)—such as growth (Coutiño & Zandi 2021), inflation (Jaravel & O'Connell 2020), and unemployment (Auray & Eyquem 2020)—along with various applied microeconomic dimensions, such as consumption behavior (Baker, Farrokhnia, Meyer, Pagel & Yannelis 2020; Hoseini & Valizadeh 2021), labor markets (Forsythe, Kahn, Lange & Wiczer 2020; Hensvik, Le Barbanchon & Rathelot 2021), financial assets (Daehler, Aizenman & Jinjarak 2021; Davis, Liu & Sheng 2021), income distribution (Crossley, Fisher & Low 2021), trade patterns (Liu, Ornelas & Shi 2021), and environmental outcomes (Brodeur, Cook & Wright 2021).

Like us, a number of papers have examined firm dynamics resulting from the pandemic. These include, *inter alia*, studies on sales (Bloom, Fletcher & Yeh 2021), business entry and exit (Fairlie 2020; Fareed & Overvest 2021), insolvency and debt (Demmou, Calligaris, Franco, Dlugosch, McGowan & Sakha 2021), productivity (Mischke, Woetzel, Smit, Manyika, Ramaswamy, Birshan, Windhagen, Schubert, Hieronimus, Dagorret & Nogue 2021), human resource management (Caligiuri, De Cieri, Minbaeva, Verbeke & Zimmermann 2020), and resilience (Borino, Carlson, Rollo & Solleder 2021). The first contribution of this paper is that our focus is on firms' business confidence, which is forward-looking in nature, as opposed to the abovementioned alternative aspects of outcomes and performance.

There is a small literature that explicitly considers elements of confidence and expectations. These include works that examine beliefs surrounding COVID-19, from the perspective of either the consumer (Abel, Byker & Carpenter 2021; Bui, Dräger, Hayo & Nghiem 2021) or attitudes toward government (Bol, Giani, Blais & Loewen 2021; Fer-

raresi & Gucciardi 2020). Others take on the question of expectations and sentiment more generally (Aguilar, Ghirelli, Pacce & Urtasun 2021; Altig, Baker, Barrero, Bloom, Bunn, Chen, Davis, Leather, Meyer, Mihaylov, Mizen, Parker, Renault, Smietanka & Thwaites 2020; Binder 2020). By and large, these papers are set within a limited context, encompassing either one or two countries, or a single region. Most do not address business sentiment. Our second contribution is that we encompass a much larger global coverage, which includes both advanced and emerging economies, which permits us to draw general insights relevant at the cross-country level. Moreover, for the clutch of papers that do adopt a more global coverage (Dryhurst, Schneider, Kerr, Freeman, Recchia, van der Bles, Spiegelhalter & van der Linden 2020; Eichengreen, Aksoy & Saka 2021), the analysis is not centered on business sentiment and risk.

A handful of papers are probably closest to our focus on firm-level business confidence, while adopting an expanded coverage. Hassan, Hollander, van Lent & Tahoun (2020), from which we draw our dependent variables of interest, seek to understand how COVID-19 risk and sentiment affect the balance of demand and supply using a global dataset, whereas we are most concerned with how these measures are altered by the healthcare system. Like us, Bartik, Bertrand, Cullen, Glaeser, Luca & Stanton (2020) takes on business expectations—with a focus on small businesses—but the study relies on only U.S. data, and is moreover narrowly focused on the implications of the Coronavirus Aid, Relief, and Economic Security (CARES) Act. This is also the case for Buchheim, Dovern, Krolage & Link (2020), which relies on only German data, and deals with the adaptation and mitigation strategies of firms, as opposed to our concerns about environmental factors. Our third contribution, then, is that we approach the firm confidence question from the perspective of the mediating role played by system capacity.

The rest of this paper is organized as follows. Section 2 sketches out the relevant theories that relate to our question of healthcare capacity and firm perceptions, and explicitly lays out a number of testable hypotheses. This is followed by a discussion of our methodological approach, data description, and identification strategy (section 3). We report our main results in section 4, before proceeding with an extended discussion of

heterogeneity in our main findings in section 5. A final section concludes with limitations and suggestions for future work.

2. Theory

2.1. Environmental factors affecting firm perceptions

Firms have always considered the effects of not just internal benchmarks—in terms of financial leverage, human resources, legal liability, and technological obsolescence—on sentiment and risk (Marks 2015), but also that of the external environment. Such external factors include macroeconomic conditions (Oxelheim & Wihlborg 2005), the legal and regulatory framework (Djankov, La Porta, López-de Silanes & Shleifer 2001,0; Duanmu 2014), the structure of the financial system (Purda 2008), the tax regime (Cevik & Miryugin forthcoming; Gande, John, Nair & Senbet 2020), and the political setting (Boubakri, Mansi & Saffar 2013; Giambona, Graham & Harvey 2017).

In addition to these standard factors, businesses are occasionally exposed to more esoteric external shocks. These include natural disasters (De Mel, McKenzie & Woodruff 2012), as well as public health crises. For the latter, the overall capacity of the health system undoubtedly matters. This would include not just the public system—which oversees disease spread, prevention, and control—but also the private one, which shores up capacity when the typically more affordable and accessible public system is under significant stress.

During the COVID-19 pandemic, health system capacity involved the availability of medical infrastructure (e.g. intensive-care wards, convalescence facilities), medical (e.g. doctors, nurses) and public health (contact tracers, temperature screeners) personnel, and access to medical equipment (e.g. personal protective gear, test kits, and oxygen respirators). Countries that managed to shore up their capacity prior to the arrival of the disease were generally in a better *a priori* position to deal with the shock, thereby mitigating firms' perceptions of the negative impact of the health crisis.

Hypothesis 1 (Health system affects firm perceptions) *Conditional on the case load, improvements in* ex ante *health system capacity will lead to reductions in firms' negative disease sentiment and risk.*

2.2. Public and private provision in health system capacity

2.2.1. Benefits of public goods

To the extent that public goods are provided by government policymakers, it is useful to understand the extent to which such public goods provide benefits to agents in the economy. Public goods undoubtedly offer a host of direct benefits; for instance, public roads enhance connectivity and reduce travel times, while clean air improves health and quality of life.

But public goods also offer indirect benefits. For example, public education—by raising the overall literacy level of the society—can simultaneously improve the capacity of the workforce to adopt certain technologies, or improve the overall nature of democratic governance by nurturing an informed, civic-minded electorate. Better public health—by reducing the incidence and transmission of disease, as well as lowering mortality—can improve the overall environment that households live in, and business climate in which firms operate.

There are several approaches to capturing the benefits that derive from public goods. The (public) economics literature evaluates the marginal contribution of public goods mainly from the perspective of their *optimal provision*. The policymaker's problem entails maximizing social welfare, subject to a production constraint, by choosing optimal tax rates. The intuition behind the theory is straightforward: public goods are efficiently provided when the marginal willingness to pay for such goods equals the marginal rate of transformation (between the public good and an arbitrarily chosen private good) (Samuelson 1954). There may be slight modifications to this "Samuelson Rule" in more sophisticated settings—such as when taxation is distortionary (Atkinson & Stern 1974; Stiglitz & Dasgupta 1971) or when agents are heterogeneous (Dahlby 1998; Gahvari 2006)—but the principle of equating the marginal costs of funds to the marginal rate of

transformation remains essentially the same.

The disciplines of public administration and public policy build on the insights above to derive practical *cost benefit analyses* (CBA) for evaluating the net value—in terms of policy impact for a given amount of monetary expenditure—of a public good (Adler & Posner 2006; Boardman, Greenberg, Vining & Weimer 2018). A related literature on *public value* (Alford & O'Flynn 2009) likewise seeks to impute collective valuation, but seeks to do so in a more holistic sense, to expand the shadow price of a public good to include externalities and market power. The shortcoming from this approach is that it deals with the overall impact of a project, rather than the specific marginal effect of (positive) externalities, as we do here.

The environmental sciences apply a number of distinct approaches to valuing externalities from public goods. These fall into *stated preference* techniques—of which survey-based contingent valuation (Carson 2000) is the most pervasive—as well as *revealed preference* models, which include the inference of underlying value from related hedonic markets (Taylor 2003), voluntary contribution behavior (Champ, Bishop, Brown & McCollum 1997), associated travel costs (Parsons 2003), or potential economic damages (Neumann, Willwerth, Martinich, McFarland, Sarofim & Yohe 2020). While such methods have been successfully applied in many dimensions, they tend to be less applicable to the issue of public health, whose use value—whether reported or inferred—is typically known with far less certainty.

The common theme across these different approaches is that public goods generate net benefits, which can be estimated. In the context of this study, the benefits are an improvement in firms' business confidence, which derive from a credible and functional public health system. We capture these benefits within the context of a quasi-natural experiment: the COVID-19 pandemic, which—due to its unexpected nature—served as an exogenous shock that affected firms' perceptions of the importance of public health provision.[2]

[2]It is important to recognize the distinction between an entirely *unplanned* event—a pandemic event certainly fell within the realm of possibility, and many public health agencies did have contingencies for such an eventuality—versus an *unexpected* event, for which, regardless of any advance planning, the actual incidence of the pandemic still represented an idiosyncratic shock, and hence exogenous from the

Hypothesis 2a (Public health affects firm perceptions) *Conditional on the case load, improvements in public health provision will lead to reductions in firms' negative disease sentiment and risk.*

2.2.2. Private provision of public goods

The study of the private provision of public goods has a long history (see, for example, Bergstrom, Blume & Varian 1986; Demsetz 1970). Much of this literature explores the circumstances by which one crowds out the other; put another way, whether the two are substitutes—and if so, what the elasticity of substitution might be—or complements.

Such private provision is remarkably common in emerging and developing economies. This owes, often, to failures of the state to render such goods. In such countries, especially in the education (Ashley, Mcloughlin, Monazza, Engel, Wales, Rawal, Batley, Kingdon, Nicolai & Rose 2014) and health (Basu, Andrews, Kishore, Panjabi & Stuckler 2012) sectors, there is often the emergence of a parallel private sector, of varying levels of quality (Chaudhury, Hammer, Kremer, Muralidharan & Rogers 2006).

Not all medical care is public in nature; a private sector may well emerge to offer healthcare that serves individual health needs that are rivalrous and excludable in nature. Nevertheless, because we do not wish to rule out the possibility that public health needs may also be met by the private sector, we epxlore the possibility that private sector healthcare provision may serve as a substitute, and thereby improve firm perceptions:

Hypothesis 2b (Private health affects firm perceptions) *Conditional on the case load, improvements in private health provision will lead to reductions in firms' negative disease sentiment and risk.*

2.3. Government interventions in health crises

There is a long intellectual history of debate over the proper role of government in healthcare markets (Cutler 2002; Diepeveen, Ling, Suhrcke, Roland & Marteau 2013; Poterba

perspective of agents.

1996). Most of this literature has focused on situations where government involvement is more or less justified, and less on outright healthcare crises.

When pandemics emerge—especially those without any known treatment regime or vaccine—the efficacy of the government's toolkit to end the pandemic is uncertain. Even so, in only a very small number of instances did governments play mainly an informational and coordinating role; Sweden's adoption of a comparatively more *laissez-faire* strategy[3] comes to mind. By and large, however, most countries were proactive (to a greater or lesser extent) in seeking to control the spread of the disease, and the comprehensiveness of their interventions were typically limited by resources, rather than desire.

Nevertheless, governments were not expected to simply act as passive providers of public health services, especially in a pandemic environment. Increases in healthcare budgets provide greater resources for combating the spread of the disease, and specific actions on the part of governments—such as the willingness and speed of deploying facial coverings, the extensiveness of testing accompanied by contact tracing, imposition of physical distancing rules, restrictions on travel, and limitations on the size of public gatherings—all played a role in stemming the transmission of the disease. Such actions were clearly not consequential—indeed, they were hardly even considered—for agents' confidence in disease management in the absence of COVID-19, but were likely to be important after the arrival of the disease. Accordingly, we allow for these reactive policies to play a role in influencing firms' perceptions.

Hypothesis 3 (Health interventions affect firm perceptions) *Conditional on the case load and subject to overall health system capacity, improvements in overall* ex post *health interventions will lead to reductions in firms' negative disease sentiment and risk.*

[3]Unsurprisingly, Sweden has also come under criticism for its approach, and the strategy has been blamed for the relatively higher mortality rates the country has experienced, relative to its Nordic neighbors (Claeson & Hanson 2021).

3. Empirics

3.1. Methodological approach

Our baseline empirical specification seeks to capture our first hypothesis, which is to estimate the effect of *ex ante* health system capacity on firms' business confidence during the COVID-19 pandemic:

$$\begin{aligned} Firm\ Perception_{ijt} = \alpha_0 + \alpha_1 Log\ Cases_{jt} + \alpha_2 Health\ Capacity_j \\ + \alpha_3 Health\ Capacity_j \times Log\ Cases_{jt} + \sum\nolimits_s \alpha_{4,l} \mathbf{X}_{ij} \\ + \alpha_5 \mathbf{Y}_j + \gamma_j \times Time\ Trend + \mu_k \times \tau_t + \epsilon_{it}, \end{aligned} \tag{1}$$

where $Firm\ Perception_{ijt}$ captures the perceptions of management for firm i in country j, during quarter t of 2020. We employ three proxies of management perceptions about the pandemic and its consequent effect on business confidence and firm performance, sourced from Hassan *et al.* (2020). The proxy variables are: (a) COVID-19 risk; (b) COVID-19 negative managerial sentiment; and (c) COVID-19 net managerial sentiment. Our key explanatory variable, *Health Capacity*, is proxied by *Health Exp./GDP*, the average health expenditure as a share of GDP, of country j in the years preceding COVID-19, which serves as a proxy for the *ex ante* health system capacity.[4]

Log Cases is the logarithm of the total number of new COVID-19 cases for a given country, in the given quarter (t ranges from the first to the third quarter of 2020).[5] This variable captures the effects of the rate of increase in new cases on firm confidence. We further include the interaction of this term with that of health system capacity to better understand the important conditioning effect of impending stress on the system.[6]

[4] In our robustness checks, we substitute this variable with an alternative metric for capacity, hospital beds per 1,000 population.

[5] Observe that firm perception enters the left hand side as a level term, but cases on the right hand side is logged. Hence, the coefficient would be the semi-elasticity; that is, the unit response of firm risk/sentiment to a one percent increase in new cases. Moreover, taking logarithms converts exponential growth—typically the problem for case load in an epidemic—to the (linear) trend for new cases.

[6] This is also the reason why we rely on log cases, instead of further adjusting cases per capita of the population. All countries possess total hospital capacities significantly lower than their total populations, and so the trend of total new cases speaks to the magnitude of the shock the system would need to process, regardless of the size of the population. It is also worth noting that, because of the exponential nature

X is a vector that embeds a number of firm-level variables that are standard in the literature. These include (the logarithm of) sales, leverage, market-to-book ratio, cash holdings, and asset tangibility. Sales are a proxy for the overall size of the firm's operations, while leverage takes into account the debt overhang (and the implied financial flexibility) of a firm. The market-to-book ratio represents its growth opportunities, cash holdings the amount of liquid resources at its disposal to face the pandemic, and asset tangibility the ability of a firm to borrow against tangible assets for the same reason. **Y** is a vector that represents country-level variables. In our baseline, this is simply the value of the logarithm of GDP per capita, which serves as a proxy for the level of economic development of the country, and GDP growth, a proxy for recent economic performance. Firm- and country-specific variables all enter in lagged form.[7]

The specification also includes $\gamma_j \times Time\ trend$, which embeds any quarterly country-level trends that may alter firms' perceptions. $\mu_k \times \tau_t$, which are industry-level quarterly interactive fixed effects, subsume any industry-specific changes in managerial perceptions at the quarterly frequency. Estimation of equation (1) is performed with standard errors that are robust to heteroskedasticity, as well as clustered at the firm level, to address the possibility of additional temporal effects (Petersen 2009).

3.2. Data description

We employ data from various sources in our analysis. The firm-level variables are obtained from the Worldscope database of Thomson Reuters. The firm-level quarterly outlook variables are drawn from the firm-level disease exposure database maintained by Hassan *et al.* (2020). Data on COVID-19 cases, containment measures, and government responses are obtained from the Oxford COVID-19 Government Response Tracker (OxCGRT) (Hale, Anania, Angrist, Boby, Cameron-Blake, Di Folco, Ellen, Goldszmidt, Hallas, Kura, Lucino, Majumda, Nagesh, Petherick, Phillips, Tatlow, Webster, wood &

by which cases develop, there is actually an imperfect relationship between the absolute number of cases and population size ($\rho = 0.65, p = 0.00$).

[7]Since our dependent variable is only available for three quarters in 2020, and the firm and country controls are only available annually, this effectively means that the variables in **X** and **Y** are a cross-section from the year 2019.

Zhang 2020). All country-level macroeconomic variables are obtained from the World Development Indicators (WDI) of the World Bank. Full details of the definitions and sources are reported in Table A.1 of the appendix. Here, we focus on providing additional explanation for the main variables of interest.

Firm-level COVID-19 disease risk and sentiment measures from Hassan *et al.* (2020) cover the first three quarters of 2020. The negative disease sentiment and risk indexes are derived from textual analysis of quarterly earnings calls.[8] The risk index is computed on the basis of the usage of synonyms for risk or uncertainty in the vicinity of the mention of the term COVID-19, and the sentiment index is computed based on an algorithm that takes into account the tone of the words around instances of the mention of COVID-19. For example, negative sentiment is computed from the use of words with negative connotations, such as "loss," "decline," and "difficult," in conjunction with exposure. Net sentiment, then, is computed on the basis of the difference between positive and negative sentiment.

While perceptions of sentiment and risk are relatively uncommon (and indirect) measures of firm performance, the literature has long recognized the difficulty of adopting a single metric for organizational performance that is appropriate under all circumstances (Hult, Ketchen Jr, Griffith, Chabowski, Hamman, Dykes, Pollitte & Cavusgil 2008; Kaplan & Norton 1992; Richard, Devinney, Yip & Johnson 2009). While indirect, firm confidence may be viewed as a subjective organizational performance measure that is nevertheless collected in a systematic, quantitatively-driven manner that allows cross-country comparison. Accordingly, our chosen measures align well with recent calls to embrace the greater use of subjective performance metrics in cross-country analyses (Singh, Darwish & Potočnik 2016).

We then match the managerial sentiment data of each firm with corresponding firm-level financial information using unique ISIN codes. The final matched firm-level data spans 53 countries, which comprise 24 advanced and 29 developing economies.[9] The average firm in our estimation sample has reported a positive risk due to COVID-19

[8]These correspond, respectively, to the first and second moments of business confidence.
[9]The full list of countries is provided in the appendix.

exposure, and reported a negative future outlook due to the pandemic.

We utilize three country-level variables to measure health system capacity. The key variable is overall health expenditure, as a share of GDP. This measure captures variations in country-level preparedness in facing the pandemic. Given the paucity of recent data on the health system capacity, we take the average of the health expenditure variable over the years 2010–18. This averaging captures the effects of sustained investment in national health capacity, while smoothing out the confounding effects of year-to-year fluctuations. To explore our other hypotheses, we also separately employ data on the capacity of the government, along with the private, health system. In a number of additional specifications, we employ measures of health system capacity at the micro-level, such as the number of doctors per 1,000 population.

Overall health expenditure, as a share of GDP, is close to 13 percent, reflecting the dominance of advanced economy firms in our sample. Public spending constituted about 56 percent of the total, with the rest accounted for by private (out-of-pocket) health expenditure. The OxCGRT health and containment measures index ranges from 12.7 to 87.4 (on a scale of 0–100), while the overall government response index ranges from 12.7 to 85.6, with median values of 67.4 and 68.0 respectively (hence, containment measures tended on the high side). Average *new* COVID-19 cases over the two quarters amounted to around 247,700 per quarter. The geographical distribution of health expenditures, along with associated COVID-19 risk, is shown in Figure 1.

While firm-level financial data, as well as country-level variables, are available for a larger set of firms and countries, the availability of managerial sentiment data is based on earnings transcripts of listed firms, which constrains the size of our sample. The final working dataset includes 11,544 firm-quarter observations. This comprises 4,398 unique firms, of which a little less than half (2,126 firms) are from the United States.

The average firm in our sample reported total sales of 1.14 billion USD, and maintains a debt equity ratio of 1.04, suggesting leverage levels of 50 percent or higher. The average firm also has significant growth opportunities, as suggested by an M/B ratio of 3.4. Most firms were reasonably liquid: the average firm maintained 15 percent of its assets in cash

and cash equivalents, whereas the median firm's liquid assets amounted to 8 percent of its total assets. Unsurprisingly for publicly-listed firms, the average firm invested a significant amount in fixed assets: around a third (32 percent).

3.3. Identification considerations

As alluded to in the introduction, our primary identification strategy entails exploiting how the suddenness and severity of the COVID-19 pandemic meant that both public and private actors in the economy had little sense of the impending crisis—or the impetus to endogenously alter their behavior—which meant that the shock was effectively exogenous. This allows us to treat healthcare resources available at the pandemic's onset as a reasonable reflection of the systemic capacity available to meet economywide healthcare needs.

In addition, given how our primary units of measurements occur at the firm level—whereas the environmental variable of interest, health system capacity, is at the country level—simultaneity bias is extremely unlikely (no individual firm is generally able to directly alter national healthcare expenditures). Our reliance on lagged firm- and country-specific controls (corresponding to the pre-COVID year, 2019) is designed to further attenuate concerns over reverse causality.

Of course, omitted confounding variables could still introduce bias. To further isolate the health system capcity channel, we incorporate country-specific time trends ($\gamma_j \times Time\ trend$) and industry-quarter interactive fixed effects ($\mu_k \times \tau_t$) to accommodate such additional unobserved heterogeneity.

Country-time effects are important, because perceptions of healthcare management may exhibit differential trends across countries during the COVID-19 period. For instance, a firm in a developing country where institutional support is weak may expect a comparatively less policy support for businesses as compared to an advanced economy, which would give rise to a less steep (or even downward) trend. By a similar token, industry-period effects are likely to matter. For example, the hospitality and tourism sectors were more adversely affected by declines in demand, and lockdowns disrupted supply chains for

certain goods—such as semiconductors—more than others. Interactive fixed effects will control for such industry-specific shocks over each of the three quarters. Such interactive fixed effects also subsume quarterly fixed effects, which could result from seasonality in firms' perception at an aggregate level over the full sample period.

Taken together, this suite of fixed effects help us saturate the model in a fashion that controls for the possibility of omitted-variable bias at both country- and industry-levels (Gormley & Matsa 2014).

Finally, it is worth noting that our dependent variables—whether risk or sentiment—are coded in a fashion, as described in subsection 3.2, that are remarkably specific to the COVID-19 health shock. As a consequence, there is little concern that they are measuring aspects of firm business confidence associated with other types of unexpected shocks.

4. Results

4.1. Health system capacity and firm confidence

The results for the estimation of Equation 1 are presented in Table 1. Columns (1)–(2) report the results of the relationship between health expenditure and COVID-19 risk (as the dependent variable), columns (3)–(4) for COVID-19 negative sentiment, and columns (5)–(6) for COVID-19 net sentiment. Odd-numbered columns present the effect of prior health expenditure on the perceived risk and sentiment of the firm, whereas even-numbered columns show the effect of health expenditure on firm risk and sentiment, conditional on the number of cases.

We find that the impact of health system capacity, as proxied by prior health expenditure, on risk perceptions of firms due to COVID-19 exposure is negative and significant (see the coefficient of $Health\ Exp./GDP$ in the first column). This result suggests that higher investment in health capacity is associated with a decline in firms' COVID-19 risk perception; specifically, a one percent increase in heath capacity gives rise to a 0.002 unit decline in risk (or a 2.5 percent drop, relative to its mean). Put another way, a one standard deviation capacity increase mitigates risk by approximately 1/15 standard

deviations.

However, this positive perception—which implies reduced risk—is adversely affected as the cases rise; this is evident from the positive coefficient on *Health Exp./GDP* × *Log Cases* in the second column. In our view, this contrary sign results from how, as cases rise, resource constraints end up overburdening the overall health system's capacity to deliver a positive outcome. Hence, while prior investment in health expenditure is viewed positively by firms overall, there is nevertheless an inflection point—contingent on the number of cases—beyond which firm perceptions become adversely affected.[10] This effect is demonstrated visually in Figure 2.

The coefficients in columns (4) and (6) indicate, respectively, that increased health system capacity contributes to a reduction in the negative sentiment of firms, while improving their net sentiment. This (partial) effect of expenditures persists after controlling for (observable and unobservable) confounders, and is statistically significant, albeit small.[11] As before, this effect is moderated by increases in the number of cases. Indeed, the countervailing effect of cases on sentiment is sufficiently strong that the total effect is roughly nil. Taken together, the large negative effects of system capacity on negative sentiment alongside positive effects on net sentiment suggest that it is this diminution of negative sentiment that drives the improvement in net sentiment.

Insofar as the coefficient estimates on the other control variables are concerned, these tend to be consistent with *a priori* expectations. For instance, larger cash holdings are associated with higher (lower) net sentiment (negative sentiment), consistent with how such firms have a superior ability to meet liquidity demands arising from the pandemic. Similarly, larger firms are also likely to reflect greater (lesser) net sentiment (negative sentiment), since they are likely to have greater access to resources necessary to ride out a crisis. Even the somewhat counterintuitive coefficient on the level of development (marginally significant for one of the specifications) is consistent with an emerging stylized

[10]Note that the total effect of health system capacity on risk remains negative even after conditioning on cases, albeit with a larger magnitude; when total cases are zero, the total effect of health expenditure is -0.002—the unadjusted coefficient in the first specification, since *Health Exp./GDP* is already demeaned—whereas, when further conditioned on nonzero cases, the coefficient is -0.0021 (using coefficients in the second specification, $-0.015 + (12.89 * 0.001) = -0.0021$).

[11]Figure A.2 in the appendix captures this visually for all three measures of confidence.

fact for the COVID-19 pandemic: that developing economies were hit less hard, and this in turn spurred (perhaps premature) optimism on the part of agents in these countries (Vigo, Thornicroft & Gureje 2020).

Overall, while proactive *ex ante* investments in system capacity help alleviate both risk perceptions and contributes to the positive outlook of firms, an overwhelming rise in infections ultimately serve to undermine business confidence. It is likely that the fatigue brought about the rising number of cases drains the ability of the health system to deal with a pandemic of such proportion, which in turn erodes confidence. The results in Table 1 support our baseline Hypothesis 1.

Robustness of the baseline. We consider a suite of additional robustness checks to the baseline specifications reported in Table 1. The most important among these is to replace our main proxy for health system capacity used in the baseline—the health expenditure share of GDP (a financial capacity metric)—with the number of hospital beds per 1,000 of the population (a real resource capacity measure). These are reported in appendix Table A.3.

The other robustness checks we consider allow for alternative estimation methods, along with changes to the independent covariates (such as the inclusion of only statistically significant firm controls, the inclusion of additional country controls, and variations in the fixed effects). These are described in greater detail in appendix Tables A.4 and A.5. By and large, our main conclusions are unaltered by this set of sensitivity tests.

4.2. Public and private health capacity and firm confidence

We now turn to exploring the relative contributions of health capacity of the public and private sectors on firms' COVID-19 exposure and managerial confidence, along the lines of Hypotheses 2a and 2b.

The results are shown in Table 2. In columns (1)–(3), we jointly estimate the effect of government and private healthcare spending on firms' business confidence regarding the COVID-19 pandemic. This approach decomposes the separate contribution (if any) of public versus private sector healthcare provision, which we proxy with their respective

shares of health expenditures.

We find that a large private healthcare sector diminishes COVID-19 risk perceptions, as evidenced by the negative coefficient on *Pvt. Health Exp./GDP* in column (1). This effect, while potentially amenable to attenuation by the case load, appears to only be only weakly affected by it (the coefficient on the interaction term is marginally significant in only one specification). This could be due to the overall greater efficiency of private sector healthcare, at the margins, which in turn reduces the risk perceptions of firms. There is no (statistically) appreciable effect of greater private expenditures on sentiment, however.

In contrast, greater government healthcare provision does improve managerial sentiment, as can be seen in columns (2) and (3). Even so, this positive outlook is mitigated when the number of cases increase, similar to the findings in Table 1. This suggests that public health capacity—or its limits—was what drove the results for overall health expenditure, and implies that the average firm's confidence is more shaken by its perceptions of how well the public sector is able to cope with rising cases during a pandemic. Therefore, when considering the prospects of a recovery over the medium term, proactive actions by the government in building up public health capacity may play a critical role in improving firm sentiment.

In columns (4)–(6), we report an alternative approach to this decomposition. As a measure of healthcare provision, we focus on human resource allocation, instead of financial expenditures alone. Specifically, we include the number of doctors and community health workers, alongside total healthcare expenditures.[12] While data limitations mean that it is not possible to fully disentangle the public-private distinction via this measure, we posit that community healthcare workers generally operate in the public sector (Schaaf, Warthin, Freedman & Topp 2020), while no such systematic pattern exists for doctors.[13]

[12]Unfortunately, data limitations mean that, for community workers, the data are from disparate years, and for the majority of countries, only one year was available. That said, for the countries where time-series data *are* available, the share is generally stable, which lends some comfort that the specific year from which observations are drawn is not as critical.

[13]It is useful to note that for this argument to work, it is not necessary that doctors be *equally* distributed between the public and private sectors, merely that there is no bias in this allocation that favors of one sector versus the other in different countries.

Conditional on the health expenditure of a country, a larger number of doctors is associated with lower firm perceptions of COVID-19 risk. Understandably, countries with a greater number of skilled medical personnel (regardless of sector) are generally better able to manage the large health shock, thereby contributing to lower risk perceptions. As before, this effect is also attenuated by a rise in the cases load. Similarly, the presence of a larger mass of community health workers—a proxy for public health personnel—tends to be accompanied by a deterioration in negative sentiment.

Overall, the results in this subsection suggest that both public and private health capacity appear to be relevant for firm confidence, although they appear to be more substitutes rather than complements.

4.3. Government ex post *responses and firm confidence*

While we have examined the impact of proactive measures on firm perceptions, it is also important to understand how reactive government measures to address the health consequences of the pandemic impact business confidence. One of the earliest and most demonstrable reactions by governments around the world in limiting the spread of the virus was the institution of *containment* measures. The most dramatic among these—the imposition of lockdowns of varying degrees of severity—is often accompanied by other measures to limit social activity, such as restrictions on public movements and enforcement of physical distancing. More *health*-related measures include public information campaigns, a widespread testing regime, and contact tracing of potentially infected individuals.[14] Many countries also engaged in *economic* interventions, such as COVID-19-related debt relief or other forms of income support.

The results from specifications related to such reactive government health interventions, along the lines of Hypothesis 3, are shown in Table 3. The left panel reports results corresponding to an index comprising containment and health measures, while the right panel considers an index of overall government response, which includes containment,

[14]One key intervention for COVID-19 involves vaccines and their rollout. Because our data encompass the initial phase of the crisis (the first three quarters of 2020), and vaccines only began to be available at the end of that year (and even so, for a limited set of countries), we leave the important issue of vaccines and firm confidence to future research.

health, and economic policies. For each panel, we have retained the three confidence measures of risk, negative sentiment, and net sentiment, respectively.

We find that more stringent containment measures designed to slow down the pace of the pandemic, as shown in columns (1)–(3), contributed only very tangentially to improved business confidence. While the signs of these coefficients do point in the expected direction—both in terms of lower risk perceptions and reduced negative sentiment—most are statistically indistinguishable from zero, with only the moderating effect on risk entering with marginally significance. Expanding these *ex post* interventions to encompass the overall degree of government response, presented in columns (4)–(6), reveal very similar (limited) effects. This is somewhat surprising, since one might expect business confidence to be heavily influenced by economic measures (the main difference between the two panels), but it is clear that—insofar as a health crisis is concerned—such policies turn out to be distinctly second order.

Despite our inclusion of these *ex post* measures, our *ex ante* aspects of system capacity remain statistically significant. We do not wish to overplay this result. While the relationship between the two classes of measures is weak,[15] the *quality* of execution of many components of health and containment measures must surely do rely on *ex ante* capacity. Nevertheless, it would appear that the old health adage—prevention is better than cure—appears to be applicable here.

Policies closely linked to health infrastructure. In addition to the aggregative indexes considered above, we also look more carefully at responses to three policies that are closely linked to the capacity of the healthcare infrastructure: emergency health care spending (investments in enhancing the capacity of health systems, especially pertaining to quarantine facilities and respiratory support equipment); testing policies (PCR tests for active infection, as opposed to antibody tests for immunity); and contact tracing (the extent to which health authorities reach out to recent contacts following a positive diagnosis). Furthermore, testing and tracing are often viewed as key complementary

[15]For example, the correlation between the containment & health index and health expenditure share of GDP is very low ($\rho = -0.005$, $p = 0.62$). This result also likely means that the specification is unlikely to exhibit multicollinearity.

policies that would still need to be continued even after a reasonably successful vaccination campaign (Agarwal & Gopinath 2021). These are documented in, respectively, the left, middle, and right panels of Table A.6 in the appendix.

Overall, we find that emergency spending and contact tracing tend to lower perceived risk, while the former also elevates sentiment; both are also moderated by the case load. In terms of efficacy, contact tracing appears to offer much more improvement in business confidence, with coefficients an order of magnitude larger. We do not, however, find any evidence of statistically distinguishable effects of testing on either risk or sentiment.

5. Discussion

5.1. Development status amplifies effects of capacity on confidence

As discussed in subsection 4.1, per capita incomes have followed an atypical pattern over the course of this pandemic, with higher-income countries performing comparatively more poorly in their responses. Accordingly, we consider the distinct effects of the level of development on the effects of *ex ante* health system capacity (or, conversely, the effects of system capacity contingent on development status), on business confidence. We do so by introducing an indicator variable that classifies a country into either advanced economy (AE) or emerging market and developing economy (EMDE) status, and estimating the respective conditional effects. These are reported in the left panel of Table 4.

In general, the unconditional effect of health expenditure on both risk and sentiment appears to be more pronounced in EMDEs, as compared to AEs. We interpret this as reflective of how firms in developing economies already operate in a relatively riskier and more fragile environment, and so when this is compromised by an additional health shock, the detrimental effects on business confidence are correspondingly greater. In both cases, these effects are (again) moderated by the case load.

5.2. Firm size amplifies effects of capacity on sentiment but not risk

The other obvious dimension where we might expect systematically different effect estimates is by firm size. After all, larger firms often possess superior capacity to develop their risk management capabilities; moreover, firm sizes often correlate with many other unobserved firm characteristics (such as political connections or strong banking relationships) that could be important for the same. We therefore separate our firms into large or small—depending on whether its total assets fall above or below the median—designate an indicator variable accordingly, and repeat the exercise above. The results are reported in the right panel of Table 4.

Interestingly, firm size does not appear to matter that much for risk, although it remains deleterious to sentiment, with sentiment responding much more sensitively in smaller as opposed to larger firms. There is, likewise, a more pronounced moderating effect for smaller firms as the case load increases. We attribute the irrelevance of size for risk to the fact that the riskiness emanating from a poor external health environment are likely to be comparable regardless of size, whereas the sentiment in smaller firms may be more reliant on the mercurial nature of a founder or early-stage CEO, as opposed to the more staid but collected management teams found in larger organizations, and hence more materially affected by any deterioration in the health environment.

5.3. Other sources of heterogeneity

We also consider two additional aspects, both related to firm financing capability, where heterogeneity in firms' confidence may present itself: whether the firm has sufficient liquidity (via its *cash holdings/asset* ratio) to weather the pandemic storm, and whether the firm is able to borrow (via its degree of asset *tangibility*) to finance liquidity needs. These are reported in Table A.7 of the appendix. By and large, conditioning on these additional dimensions do not introduce substantial differences in the estimated coefficients of interest.

5.4. Do exposure and experience with pandemics matter?

In our baseline specifications in section 4, we had focused on a number of firm and country controls that are standard in the literature, but not specific to the pandemic experience. In this section, we introduce two additional variables: a measure of the current amount of exposure to COVID-19,[16] and a measure of experience with past epidemics (namely H1N1 and SARS). These are meant to better capture the importance of direct exposure in shaping a firm's perceived confidence, as well as whether firms may have learned from their prior experience with epidemics in the handling of this one.

There is reason to believe that productive learning can and does occur within organizations. After all, one of the central functions of firms is to facilitate low-cost knowledge transfer (Coase 1937) and to serve as repositories of such knowledge (Winter 1988); such learning may then transform into a source of competitive advantage for the firm (Argote & Ingram 2000). To the extent that knowledge transfers occur over time, the firm can be said to exhibit a capacity for "learning" (Huber 1991); it is in this sense that we consider learning about optimal responses to crises as possible within banking institutions. There is empirical evidence that the process of knowledge transfer and retention does occur within firms (Kogut & Zander 1993; Walsh & Ungson 1991), which in turn translates into improved firm performance (Haleblian & Finkelstein 1999; Yelle 1979).

The results of this exercise are reported in Table 5. As might be expected, *contemporaneous* exposure to the pandemic heightens risk perceptions, while diminishing sentiment. Firms that are more exposed to COVID-19 are, understandably, more affected in terms of risk and sentiment. Furthermore, we also find some evidence in support of learning in bolstering confidence. Firms that had some prior epidemic experience are associated with lower risk, as well as a lower degree of negative sentiment; this result—that learning can improve firm performance—is broadly consistent with the findings of Haleblian & Finkelstein (1999), albeit in a different context.

[16]It is important to recognize that since this indicator is constructed from the frequency of mentions of the disease name (and synonyms) in earnings-call transcripts, its accuracy as a proxy for exposure could be due to either direct exposures (for example, employees catching COVID), or indirect exposures (company profits being hit by reduced demand or supply chain disruptions that result from COVID).

It is also worth noting that, in spite of controlling for these idiosyncratic disease-related firm factors, overall health system capacity remains an important influence on business confidence, with both risk and sentiment retaining their effects, as reported in our baseline specification.

6. Conclusion

In this paper, we provide an estimate of the importance of health sector capacity for business confidence, using the incidence of COVID-19 as a quasi-natural experiment. We find that not only is the *ex ante* capacity of the healthcare system important for firms' perceptions of risk and sentiment, both the public and private systems play a complementary role, as do *ex post* government interventions. While the COVID-19 pandemic has often sparked panicked responses from observers, this study has shown that the erosion of sentiment and risk could actually be rational business responses to deteriorating prospects due to a worsening external environment.

Our work has also offered some useful takeaways, both for international businesses, and for policymakers. For the former, our findings that firms' confidence in a weak public system can be ameliorated by sound private provision suggest that multinational firms venturing into new markets should consider not just the public system but also whether the private sector may offer robust support for their operations. For the latter, we demonstrate that the important role that governments play in public goods provision matters not just directly—in terms of societal health and wellbeing—but also *indirectly*, by improving the business climate in which firms operate. This secondary benefit is seldom recognized, but should be seen as an additional important positive externality for public investment.

While we believe that this study offers important insight into the role that environmental factors play in shaping firm perceptions, it is, admittedly, a circumscribed one—limited especially to understanding healthcare conditions—and so we do not intend to suggest that all environmental factors play a comparably important (whether more

or less) role. Hence, more studies of this nature—relying on different settings to assess the contribution of other sorts of environmental drivers of business confidence—will be a welcome avenue for future research.

References

Abel, Martin, Tanya Byker & Jeffrey Carpenter (2021). "Socially Optimal Mistakes? Debiasing COVID-19 Mortality Risk Perceptions and Prosocial Behavior". *Journal of Economic Behavior & Organization* 183(1) (March): 456–480

Adler, Matthew D. & Eric A. Posner (2006). *New Foundations of Cost-Benefit Analysis*. Cambridge, MA: Harvard University Press

Agarwal, Ruchir & Gita Gopinath (2021). "A Proposal to End the COVID-19 Pandemic". *IMF Staff Discussion Note* 2021/004, Washington, DC: International Monetary Fund

Aguilar, Pablo, Corinna Ghirelli, Matías Pacce & Alberto Urtasun (2021). "Can News Help Measure Economic Sentiment? An Application in COVID-19 Times". *Economics Letters* 199(1) (February): 109730

Alford, John & Janine L. O'Flynn (2009). "Making Sense of Public Value: Concepts, Critiques and Emergent Meanings". *International Journal of Public Administration* 32(3–4) (March): 171–191

Altig, Dave, Scott Baker, Jose Maria Barrero, Nicholas Bloom, Philip Bunn, Scarlet Chen, Steven J. Davis, Julia Leather, Brent Meyer, Emil Mihaylov, Paul Mizen, Nicholas Parker, Thomas Renault, Pawel Smietanka & Gregory Thwaites (2020). "Economic Uncertainty Before and During the COVID-19 Pandemic". *Journal of Public Economics* 191(1) (November): 104274

Argote, Linda M. & Paul L. Ingram (2000). "Knowledge Transfer: A Basis for Competitive Advantage in Firms". *Organizational Behavior and Human Decision Processes* 82(1) (May): 150–169

Ashley, Laura D., Clare Mcloughlin, Aslam Monazza, Jakob Engel, Joseph Wales, Shenila Rawal, Richard Batley, Geeta Kingdon, Susan Nicolai & Pauline Rose (2014). "The Role and Impact of Private Schools in Developing Countries: A Rigorous Review of the Evidence". *Education Rigorous Literature Review.* 2206, London, England: Department for International Development

Atkinson, Anthony B. & Nicholas H. Stern (1974). "Pigou, Taxation and Public Goods". *Review of Economic Studies* 41(1) (January): 119–128

Auray, Stéphane & Aurélien Eyquem (2020). "The Macroeconomic Effects of Lockdown Policies". *Journal of Public Economics* 190(1) (October): 104260

Baker, Scott R., Robert A. Farrokhnia, Steffen Meyer, Michaela Pagel & Constantine Yannelis (2020). "How Does Household Spending Respond to an Epidemic? Consumption during the 2020 COVID-19 Pandemic". *The Review of Asset Pricing Studies* 10(4) (December): 834–862

Baldwin, Richard E. & Beatrice Weder di Mauro (editors) (2020a). *Economics in the Time of COVID-19*. London, England: CEPR Press

Baldwin, Richard E. & Beatrice Weder di Mauro (editors) (2020b). *Mitigating the COVID Economic Crisis: Act Fast and Do Whatever It Takes*. London, England: CEPR Press

Bartik, Alexander W., Marianne Bertrand, Zoe Cullen, Edward L. Glaeser, Michael Luca & Christopher Stanton (2020). "The Impact of COVID-19 on Small Business Outcomes and Expectations". *Proceedings of the National Academy of Sciences* 117(30) (July 28): 17656–17666

Basu, Sanjay, Jason Andrews, Sandeep Kishore, Rajesh Panjabi & David Stuckler (2012). "Comparative Performance of Private and Public Healthcare Systems in Low- and Middle-Income Countries: A Systematic Review". *PLoS Medicine* 9(6) (June): e1001244

Bergstrom, Theodore C., Lawrence E. Blume & Hal R. Varian (1986). "On the Private Provision of Public Goods". *Journal of Public Economics* 29(1) (February): 25–49

Binder, Carola (2020). "Coronavirus Fears and Macroeconomic Expectations". *Review of Economics and Statistics* 102(4) (October): 721–730

Bloom, Nicholas, Robert S Fletcher & Ethan Yeh (2021). "The Impact of COVID-19 on US Firms". *NBER Working Paper* 28314, Cambridge, MA: National Bureau of Economic Research

Boardman, Anthony E., Anthony E. Greenberg, Anthony E. Vining & David L. Weimer (2018). *Cost-Benefit Analysis: Concepts and Practice*. New York, NY: Prentice-Hall

Bol, Damien, Marco Giani, André Blais & Peter John Loewen (2021). "The Effect of COVID-19 Lockdowns on Political Support: Some Good News for Democracy?" *European Journal of Political Research* 60(2) (May): 497–505

Borino, Floriana, Eric Carlson, Valentina Rollo & Olga Solleder (2021). "International Firms and COVID-19: Evidence from a Global Survey". *Covid Economics* 75, London, England: Centre for Economic Policy Research

Boubakri, Narjess, Sattar A Mansi & Walid Saffar (2013). "Political Institutions, Connectedness, and Corporate Risk-Taking". *Journal of International Business Studies* 44(3) (April): pages 195–215

Brodeur, Abel, Nikolai Cook & Taylor Wright (2021). "On the Effects of COVID-19 Safer-at-Home Policies on Social Distancing, Car Crashes and Pollution". *Journal of Environmental Economics and Management* 106(1) (March): 102427

Buchheim, Lukas, Jonas Dovern, Carla Krolage & Sebastian Link (2020). "Firm-Level Expectations and Behavior in Response to the COVID-19 Crisis". *CESifo Working Paper Series* 8304, Munich, Bavaria: CESifo

Bui, Dzung, Lena Dräger, Bernd Hayo & Giang Nghiem (2021). "Consumer Sentiment during the COVID-19 Pandemic: The Role of Others' Beliefs". *CESifo Working Paper* 9010, Munich, Bavaria: CESifo

Caligiuri, Paula, Helen De Cieri, Dana Minbaeva, Alain Verbeke & Angelika Zimmermann (2020). "Inter-

national HRM Insights for Navigating the COVID-19 Pandemic: Implications for Future Research and Practice". *Journal of International Business Studies* 51(5) (July): 697–713

Carson, Richard T. (2000). "Contingent Valuation: A User's Guide". *Environmental Science and Technology* 34(8) (Apr): 1413–1418

Champ, Patricia A., Richard C. Bishop, Thomas C. Brown & Daniel W. McCollum (1997). "Using Donation Mechanisms to Value Nonuse Benefits from Public Goods". *Journal of Environmental Economics and Management* 33(2) (June): 151–162

Chaudhury, Nazmul, Jeffrey S. Hammer, Michael R. Kremer, Karthik Muralidharan & F. Halsey Rogers (2006). "Missing in Action: Teacher and Health Worker Absence in Developing Countries". *Journal of Economic Perspectives* 20(1) (Winter): 91–116

Chinn, Menzie D. & Hiro Ito (2008). "A New Measure of Financial Openness". *Journal of Comparative Policy Analysis* 10(3) (September): 309–322

Claeson, Mariam & Stefan Hanson (2021). "COVID-19 and the Swedish Enigma". *The Lancet* 397(10271) (January): P259–261

Coase, Ronald H. (1937). "The Nature of the Firm". *Economica* 4(16) (November): 386–405

Coutiño, Alfredo & Mark M. Zandi (2021). "Global Loss of Production Capacity Caused by the COVID-19 Pandemic". *Journal of Policy Modeling* 43(3) (May–June): 493–502

Crossley, Thomas F., Paul Fisher & Hamish Low (2021). "The Heterogeneous and Regressive Consequences of COVID-19: Evidence from High Quality Panel Data". *Journal of Public Economics* 193(1) (January): 104334

Cutler, David M. (2002). "Health Care and the Public Sector". In Alan J. Auerbach & Martin S. Feldstein (editors), *Handbook of Public Economics*, volume 4 of *Handbook of Public Economics*, pp. 2143–2243. Amsterdam, the Netherlands: North-Holland

Daehler, Timo B., Joshua Aizenman & Yothin Jinjarak (2021). "Emerging Markets Sovereign CDS Spreads During COVID-19: Economics versus Epidemiology News". *Economic Modelling* 100 (July): 105504

Dahlby, Bev (1998). "Progressive Taxation and the Social Marginal Cost of Public Funds". *Journal of Public Economics* 67(1) (January): 105–122

Davis, Steven J., Dingqian Liu & Xuguang Simon Sheng (2021). "Stock Prices, Lockdowns, and Economic Activity in the Time of Coronavirus". *NBER Working Paper* 28320, Cambridge, MA: National Bureau of Economic Research

De Mel, Suresh, David McKenzie & Christopher Woodruff (2012). "Enterprise Recovery Following Natural Disasters". *Economic Journal* 122(559) (March): 64–91

Demmou, Lilas, Sara Calligaris, Guido Franco, Dennis Dlugosch, Müge Adalet McGowan & Sahra Sakha (2021). "Insolvency and Debt Overhang Following the COVID-19 Outbreak: Assessment of Risks and Policy Responses". *OECD Economics Department Working Papers* 1651, Paris, France:

Organisation for Economic Cooperation and Development

Demsetz, Harold (1970). "The Private Production of Public Goods". *Journal of Law and Economics* 13(2) (October): 293–306

Diepeveen, Stephanie, Tom Ling, Marc Suhrcke, Martin Roland & Theresa M. Marteau (2013). "Public Acceptability of Government Intervention to Change Health-Related Behaviours: A Systematic Review and Narrative Synthesis". *BMC Public Health* 13 (August): 756

Djankov, Simeon, Rafael La Porta, Florencio López-de Silanes & Andrei Shleifer (2001). "The Regulation Of Entry". *Quarterly Journal of Economics* 117(1) (February): 1–37

Djankov, Simeon, Rafael La Porta, Florencio López-de Silanes & Andrei Shleifer (2003). "Courts". *Quarterly Journal of Economics* 118(2) (May): 453–517

Driscoll, John C. & Aart C. Kraay (1998). "Consistent Covariance Matrix Estimation With Spatially Dependent Panel Data". *Review of Economics and Statistics* 80(4) (November): 549–560

Dryhurst, Sarah, Claudia R. Schneider, John Kerr, Alexandra L.J. Freeman, Gabriel Recchia, Anne Marthe van der Bles, David Spiegelhalter & Sander van der Linden (2020). "Risk Perceptions of COVID-19 Around the World". *Journal of Risk Research* 23(7–8) (July–August): 994–1006

Duanmu, Jing-Lin (2014). "State-Owned MNCs and Host Country Expropriation Risk: The Role of Home State Soft Power and Economic Gunboat Diplomacy". *Journal of International Business Studies* 45(8) (October): 1044–1060

Eichengreen, Barry, Cevat Giray Aksoy & Orkun Saka (2021). "Revenge of the Experts: Will COVID-19 Renew or Diminish Public Trust in Science?" *Journal of Public Economics* 193(1) (January): 104343

Fairlie, Robert W. (2020). "The Impact of COVID-19 on Small Business Owners: Evidence from the First Three Months After Widespread Social-Distancing Restrictions". *Journal of Economics & Management Strategy* 29(4) (Winter): 727–740

Fareed, Fozan & Bastiaan Overvest (2021). "Business Dynamics During the COVID Pandemic". *CPB COVID-19 Publication* 1, The Hague, Netherlands: Netherlands Bureau for Economic Policy Analysis

Ferraresi, Massimiliano & Gianluca Gucciardi (2020). "Centralisation, Voter Perception, and the Sense of Government Unpreparedness During the COVID-19 Pandemic in Italy"". *Covid Economics* 60: 110–141

Forsythe, Eliza, Lisa B. Kahn, Fabian Lange & David Wiczer (2020). "Labor Demand in the Time of COVID-19: Evidence from Vacancy Postings and UI Claims". *Journal of Public Economics* 189(1) (September): 104238

Gahvari, Firouz G. (2006). "On the Marginal Cost of Public Funds and the Optimal Provision of Public Goods". *Journal of Public Economics* 90(6) (August): 1251–1262

Gande, Amar, Kose John, Vinay B. Nair & Lemma W. Senbet (2020). "Taxes, Institutions, and Innovation: Theory and International Evidence". *Journal of International Business Studies* 51(9) (December): 1413–144

Giambona, Erasmo, John R. Graham & Campbell R. Harvey (2017). "The Management of Political Risk". *Journal of International Business Studies* 45(4) (May): 523–533

Gormley, Todd A. & David A. Matsa (2014). "Common Errors: How To (and Not To) Control for Unobserved Heterogeneity". *Review of Financial Studies* 27(2) (February): 617–661

Hale, Thomas, Jessica Anania, Noam Angrist, Thomas Boby, Emily Cameron-Blake, Martina Di Folco, Lucy Ellen, Rafael Goldszmidt, Laura Hallas, Beatriz Kura, Maria Lucino, Saptarshi Majumda, Radhika Nagesh, Anna Petherick, Toby Phillips, Helen Tatlow, Samuel Webster, Andrew wood & Yuxi Zhang (2020). "Variation in Government Responses to COVID-19". *Blavatnik School of Government Working Paper* BSG-WP-2020/032, Oxford, England: University of Oxford

Haleblian, Jerayr J. & Sydney Finkelstein (1999). "The Influence of Organizational Acquisition Experience on Acquisition Performance: A Behavioral Learning Perspective". *Administrative Science Quarterly* 44(1) (March): 29–56

Hassan, Tarek Alexander, Stephan Hollander, Laurence van Lent & Ahmed Tahoun (2020). "Firm-Level Exposure to Epidemic Diseases: COVID-19, SARS, and H1N1". *NBER Working Paper* 26971, Cambridge, MA: National Bureau of Economic Research

Hensvik, Lena, Thomas Le Barbanchon & Roland Rathelot (2021). "Job Search During the COVID-19 Crisis". *Journal of Public Economics* 194(1) (February): 104349

Hoseini, Mohammad & Abolmohsen Valizadeh (2021). "The Effect of COVID-19 Lockdown and the Subsequent Reopening on Consumption in Iran". *Review of Economics of the Household* 19(2) (June): 373–397

Huber, George P. (1991). "Organizational Learning: The Contributing Processes and the Literatures". *Organization Science* 2(1) (February): 88–115

Hult, G. Tomas M., David J. Ketchen Jr, David A. Griffith, Brian R. Chabowski, Mary K. Hamman, Bernadine Johnson Dykes, Wesley A. Pollitte & S. Tamer Cavusgil (2008). "An Assessment of the Measurement of Performance in International Business Research". *Journal of International Business Studies* 39(6) (September): 1064–1080

Jaravel, Xavier & Martin O'Connell (2020). "Real-Time Price Indices: Inflation Spike and Falling Product Variety During the Great Lockdown". *Journal of Public Economics* 191(1) (November): 104270

Kaplan, Robert S. & David P. Norton (1992). "The Balanced Scorecard—Measures that Drive Performance". *Harvard Business Review* 1992(1) (January): 71–79

Kaufmann, Daniel, Aart C. Kraay & Massimo Mastruzzi (2011). "The Worldwide Governance Indicators: Methodology and Analytical Issues". *Hague Journal on the Rule of Law* 3(2) (September): 220–

246

Kogut, Bruce & Udo Zander (1993). "Knowledge of the Firm and the Evolutionary Theory of the Multinational Corporation". *Journal of International Business Studies* 24(4) (Fourth Quarter): 625–645

Liu, Xuepeng, Emanuel Ornelas & Huimin Shi (2021). "The Trade Impact of the Covid-19 Pandemi". *CEPR Discussion Paper* 16201, London, England: Centre for Economic Policy Research

Marks, Norman (2015). *World-Class Risk Management*. Scotts Valley, CA: CreateSpace

Miller, Kent D. (1992). "A Framework for Integrated Risk Management in International Business". *Journal of International Business Studies* 23(2) (June): 311–331

Miller, Kent D. (1993). "Industry and Country Effects on Managers' Perceptions of Environmental Uncertainties". *Journal of International Business Studies* 24(4) (December): 693–714

Mischke, Jan, Jonathan Woetzel, Sven Smit, James Manyika, Sree Ramaswamy, Michael Birshan, Eckart Windhagen, Jörg Schubert, Solveigh Hieronimus, Guillaume Dagorret & Marc Canal Nogue (2021). "Pathways for Productivity and Growth After the COVID-19 Crisis". *MGI Special Report*, San Francisco, CA: McKinsey Global Institute

Neumann, James E., Jacqueline C. Willwerth, Jeremy A. Martinich, James R. McFarland, Marcus C. Sarofim & Gary W. Yohe (2020). "Climate Damage Functions for Estimating the Economic Impacts of Climate Change in the United States". *Review of Environmental Economic Policy* 14(1) (January): 25–43

Oxelheim, Lars C. & Clas G. Wihlborg (2005). *Corporate Performance and the Exposure to Macroeconomic Fluctuations*. Stockholm, Sweden: Norstedts Akademiska Förlag

Parsons, George R. (2003). "The Hedonic Method". In Patricia A. Champ, Kevin J. Boyle & Thomas C. Brown (editors), *A Primer on Nonmarket Valuation*, pp. 331–393. Dordrecht, the Netherlands: Springer

Petersen, Mitchell A (2009). "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches". *Review of Financial Studies* 22(1) (January): 435–480

Poterba, James M. (1996). "Government Intervention in the Markets for Education and Health Care: How and Why?" In Victor R. Fuchs (editor), *Individual and Social Responsibility: Child Care, Education, Medical Care, and Long-Term Care in America*, pp. 277–308. Chicago, IL: University of Chicago Press

Purda, Lynnette D. (2008). "Risk Perception and the Financial System". *Journal of International Business Studies* 39(7) (October): 1178–1196

Richard, Pierre J., Timothy M. Devinney, George S. Yip & Gerry Johnson (2009). "Measuring Organizational Performance: Towards Methodological Best Practice". *Journal of Management* 35(3) (June): 718–804

Samuelson, Paul A. (1954). "The Pure Theory of Public Expenditure". *Review of Economics and*

Statistics 36(4) (November): 387–389

Schaaf, Marta, Caitlin Warthin, Lynn Freedman & Stephanie M. Topp (2020). "The Community Health Worker as Service Extender, Cultural Broker and Social Change Agent: A Critical Interpretive Synthesis of Roles, Intent and Accountability". *BMJ Global Health* 5(6) (June): e002296

Singh, Satwinder, Tamer K. Darwish & Kristina Potočnik (2016). "Measuring Organizational Performance: A Case for Subjective Measures". *British Journal of Management* 27(1) (January): 214–224

Stiglitz, Joseph E. & Partha S. Dasgupta (1971). "Differential Taxation, Public Goods, and Economic Efficiency". *Review of Economic Studies* 38(2) (April): 151–174

Taylor, Laura O. (2003). "The Hedonic Method". In Patricia A. Champ, Kevin J. Boyle & Thomas C. Brown (editors), *A Primer on Nonmarket Valuation*, pp. 331–393. Dordrecht, the Netherlands: Springer

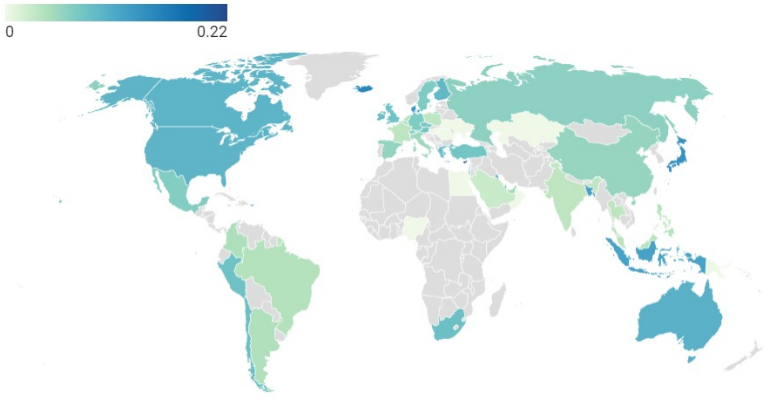
Vigo, Daniel, Graham Thornicroft & Oye Gureje (2020). "The Differential Outcomes of Coronavirus Disease 2019 in Low- and Middle-Income Countries vs High-Income Countries". *JAMA Psychiatry* 77(12) (December): 1207–1208

Walsh, James P. & Gerardo Rivera Ungson (1991). "Organizational Memory". *Academy of Management Review* 16(1) (January): 57–91

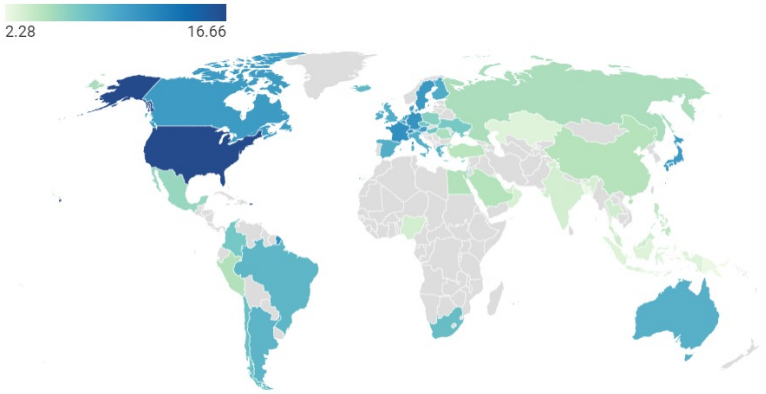
Winter, Sidney G. (1988). "On Coase, Competence, and the Corporation". *Journal of Law, Economics, and Organization* 4(1) (Spring): 163–180

World Bank (2020). *Doing Business 2020: Comparing Business Regulation in 190 Economies*. Washington, DC: The World Bank

Yelle, Louis E. (1979). "The Learning Curve: Historical Review and Comprehensive Survey". *Decision Sciences* 10(2) (April): 302–328

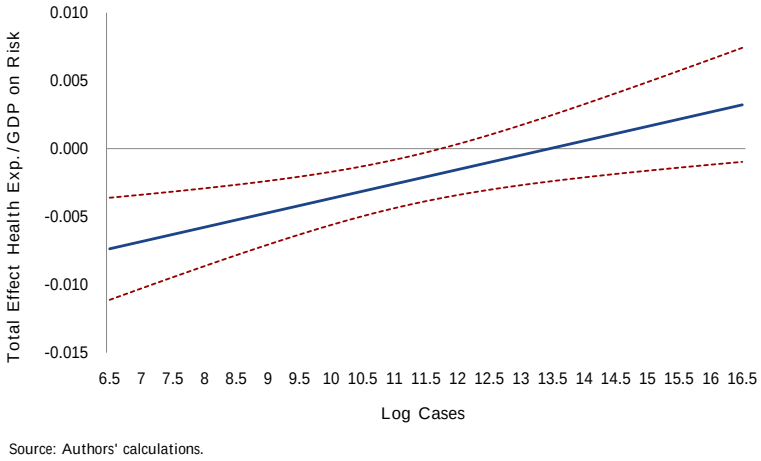


(a) COVID-19 Risk



(b) Health Expenditure/GDP

Figure 1: The map shows the global geographic distribution of perceived COVID-19 risk by firms (top panel) and health expenditures as a share of GDP (bottom panel), averaged across country-year observations. Darker shades indicate greater perceived risk (health expenditure), while gray shading indicates that no data were available. Visual inspection suggests that risks were perceived to be highest for North America, as well as Chile, Indonesia, and Japan, while health system capacity is greatest in advanced economies, especially in Australia, Japan, the United States, and Western Europe.



Source: Authors' calculations.

Figure 2: The figure represents the total effect of health system capacity on firm perceptions of COVID risk, as the number of cases rise. The conditioning effect of (the logarithm of) cases is allowed to range from between 6.5 and 16.5. The solid blue line represents the total effect, and the dashed red lines are the 95 percent confidence intervals. While the total effect remains negative for around two thirds of the lower range of cases, after around 13.4 for Log Cases, the total effect turns positive, although this never turns statistically significant.

Table 1: Health spending and firms' COVID-19 risk & sentiment

The dependent variable in columns (1)–(2) is COVID *Risk*, in columns (3)–(4) is COVID *Negative Sentiment*, and in columns (5)–(6) is COVID *Net Sentiment*. The health expenditure variable is demeaned to aid in interpretation of the interaction terms. Additional firm and country controls are defined in the text and Table A.1. Robust heteroskedasticity-consistent standard errors are clustered at the firm level. P-values are shown below the estimated coefficients in parentheses. Country-specific trends capture any country-level quarterly trends in the variables.

	COVID *Risk*		COVID *Neg. Sent.*		COVID *Net Sent.*	
	(1)	(2)	(3)	(4)	(5)	(6)
Health Exp./GDP	-0.002	-0.015	0.001	-0.048	0.000	0.032
	(0.046)	(0.002)	(0.772)	(0.002)	(0.893)	(0.031)
Health Exp./GDP × *Log Cases*		0.001		0.004		-0.003
		(0.008)		(0.002)		(0.033)
Log Cases	0.002	0.008	0.010	0.033	0.007	-0.008
	(0.476)	(0.029)	(0.208)	(0.003)	(0.326)	(0.482)
Log Sales	-0.002	-0.002	-0.018	-0.018	0.011	0.011
	(0.057)	(0.058)	(0.000)	(0.000)	(0.000)	(0.000)
Leverage	-0.002	-0.002	0.009	0.008	0.000	0.000
	(0.253)	(0.244)	(0.113)	(0.118)	(0.933)	(0.947)
Market/Book	0.000	0.000	-0.004	-0.004	0.003	0.003
	(0.192)	(0.192)	(0.002)	(0.002)	(0.004)	(0.004)
Cash/Assets	-0.007	-0.007	-0.174	-0.173	0.124	0.123
	(0.540)	(0.549)	(0.000)	(0.000)	(0.001)	(0.001)
Tangibility	0.000	0.000	-0.123	-0.123	0.048	0.048
	(0.972)	(0.982)	(0.000)	(0.000)	(0.096)	(0.094)
Log GDP per capita	0.000	0.008	-0.036	-0.008	-0.011	-0.030
	(0.958)	(0.252)	(0.065)	(0.725)	(0.526)	(0.137)
GDP growth (3-yr avg.)	-0.004	-0.008	0.004	-0.009	-0.001	0.008
	(0.151)	(0.013)	(0.664)	(0.415)	(0.952)	(0.410)
Constant	0.097	-0.058	1.066	0.485	-0.403	-0.026
	(0.116)	(0.506)	(0.000)	(0.079)	(0.024)	(0.922)
Firm-year obs.	11,544	11,544	11,544	11,544	11,544	11,544
Country-specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.099	0.099	0.283	0.283	0.113	0.114

Table 2: Government and private health spending and availability of doctors & CHWs: Firms' COVID-19 risk & sentiment

The dependent variable in columns (1) and (4) is COVID *Risk*, in columns (2) and (5) is COVID *Negative Sentiment*, and in columns (3) and (6) is COVID *Net Sentiment*. The health expenditure variables are demeaned to aid in interpretation of the interaction terms. Robust heteroskedasticity-consistent standard errors are clustered at the firm level. P-values are shown below the estimated coefficients in parentheses. Country-specific trends capture any country-level quarterly trends in the variables.

	Health exp. sample			*CHW and doctors sample*		
	Risk	*Neg. Sent.*	*Net Sent.*	*Risk*	*Neg. Sent.*	*Net Sent.*
	(1)	(2)	(3)	(4)	(5)	(6)
Govt. Health Exp./GDP	-0.011	-0.052	0.037			
	(0.096)	(0.010)	(0.054)			
Govt. Health Exp./GDP	0.001	0.005	-0.004			
× Log Cases	(0.106)	(0.021)	(0.041)			
Pvt. Health Exp./GDP	-0.021	-0.042	0.021			
	(0.022)	(0.149)	(0.439)			
Pvt. Health Exp./GDP	0.002	0.004	-0.002			
× Log Cases	(0.069)	(0.205)	(0.584)			
Doctors per 1000				-0.173	-0.531	0.378
				(0.003)	(0.001)	(0.022)
Doctors per 1000				0.020	0.054	-0.038
× Log Cases				(0.003)	(0.004)	(0.052)
CHW per 1000				-0.626	-1.659	1.335
				(0.018)	(0.009)	(0.061)
CHW per 1000				0.060	0.082	-0.061
× Log Cases				(0.010)	(0.177)	(0.329)
Log Cases	0.009	0.032	-0.006	-0.002	0.026	-0.001
	(0.022)	(0.010)	(0.627)	(0.803)	(0.204)	(0.974)
Log Sales	-0.002	-0.018	0.011	-0.002	-0.023	0.017
	(0.056)	(0.000)	(0.000)	(0.139)	(0.000)	(0.000)
Leverage	-0.002	0.008	0.000	-0.001	0.011	-0.005
	(0.241)	(0.118)	(0.949)	(0.625)	(0.106)	(0.392)
Market/Book	0.000	-0.004	0.003	0.000	-0.003	0.002
	(0.196)	(0.002)	(0.004)	(0.589)	(0.045)	(0.060)
Cash/Assets	-0.007	-0.173	0.123	-0.008	-0.180	0.117
	(0.562)	(0.000)	(0.001)	(0.558)	(0.000)	(0.005)
Tangibility	0.000	-0.123	0.048	-0.002	-0.089	0.028
	(0.976)	(0.000)	(0.096)	(0.838)	(0.034)	(0.438)
Log GDP per capita	0.002	-0.004	-0.030	0.038	0.137	-0.115
	(0.831)	(0.885)	(0.231)	(0.081)	(0.030)	(0.076)
GDP growth (3-yr avg.)	-0.006	-0.009	0.006	0.024	0.173	-0.122
	(0.040)	(0.424)	(0.577)	(0.123)	(0.000)	(0.008)
Constant	-0.010	0.459	-0.047	-0.315	-1.396	1.071
	(0.906)	(0.115)	(0.867)	(0.108)	(0.023)	(0.086)
Firm-year obs.	11,544	11,544	11,544	7,559	7,559	7,559
Country-specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.099	0.283	0.113	0.111	0.287	0.102

Table 3: *Ex post* government responses to COVID-19 and firms' risk & sentiment

The dependent variable in columns (1) and (4) is COVID *Risk*, in columns (2) and (5) is COVID *Negative Sentiment*, and in columns (3) and (6) is COVID *Net Sentiment*. The containment & health measure and overall government response variables are demeaned to aid in interpretation of the interaction terms. Robust heteroskedasticity-consistent standard errors are clustered at the firm level. P-values are shown below the estimated coefficients in parentheses. Country-specific trends capture any country-level quarterly trends in the variables.

	Containment & health score			*Overall govt. response score*		
	Risk	*Neg. Sent.*	*Net Sent.*	*Risk*	*Neg. Sent.*	*Net Sent.*
	(1)	(2)	(3)	(4)	(5)	(6)
Log Containment	-0.035	-0.079	0.040			
	(0.133)	(0.253)	(0.537)			
Log Containment	0.005	0.006	0.000			
× *Log Cases*	(0.062)	(0.394)	(0.986)			
Log Govt. Response				-0.037	-0.071	0.040
				(0.112)	(0.305)	(0.533)
Log Govt. Response				0.004	0.005	0.000
× *Log Cases*				(0.068)	(0.443)	(0.978)
Health Exp./GDP	-0.008	-0.041	0.035	-0.008	-0.042	0.037
	(0.133)	(0.011)	(0.026)	(0.130)	(0.010)	(0.023)
Health Exp./GDP	0.001	0.004	-0.003	0.001	0.004	-0.003
× *Log Cases*	(0.075)	(0.003)	(0.021)	(0.075)	(0.002)	(0.018)
Log Cases	0.007	0.034	-0.012	0.007	0.034	-0.012
	(0.079)	(0.004)	(0.304)	(0.062)	(0.004)	(0.294)
Log Sales	-0.002	-0.018	0.011	-0.002	-0.018	0.011
	(0.056)	(0.000)	(0.000)	(0.058)	(0.000)	(0.000)
Leverage	-0.002	0.008	0.000	-0.002	0.008	0.000
	(0.244)	(0.118)	(0.949)	(0.244)	(0.118)	(0.949)
Market/Book	0.000	-0.004	0.003	0.000	-0.004	0.003
	(0.196)	(0.002)	(0.004)	(0.195)	(0.002)	(0.004)
Cash/Assets	-0.007	-0.173	0.123	-0.007	-0.173	0.123
	(0.545)	(0.000)	(0.001)	(0.550)	(0.000)	(0.001)
Tangibility	0.000	-0.123	0.048	0.000	-0.123	0.048
	(0.980)	(0.000)	(0.093)	(0.982)	(0.000)	(0.093)
Log GDP per capita	0.000	-0.018	-0.030	0.000	-0.016	-0.031
	(0.998)	(0.491)	(0.222)	(0.996)	(0.528)	(0.204)
GDP growth (3-yr avg.)	-0.006	-0.004	0.005	-0.005	-0.004	0.005
	(0.067)	(0.709)	(0.605)	(0.092)	(0.694)	(0.596)
Constant	0.037	0.558	0.035	0.030	0.543	0.056
	(0.693)	(0.063)	(0.903)	(0.754)	(0.072)	(0.847)
Firm-year obs.	11,544	11,544	11,544	11,544	11,544	11,544
Country-specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.099	0.283	0.113	0.099	0.283	0.113

Table 4: *Ex ante* health spending and firms' COVID-19 risk & sentiment: development status and firm size

The dependent variable in columns (1) and (4) is COVID *Risk*, in columns (2) and (5) is COVID *Negative Sentiment*, and in columns (3) and (6) is COVID *Net Sentiment*. The health expenditure variable is demeaned to aid in interpretation of the interaction terms. The coefficients for the "*AE*" and "*EMDE*" represent the effect of the variables for firms in advanced economies and emerging markets and developing economies, respectively. The coefficients for the "*Small*" and "*Large*" represent the effect for firms that fall below and above the median values of total assets, respectively. Robust heteroskedasticity-consistent standard errors are clustered at the firm level. P-values are shown below the estimated coefficients in parentheses. Country-specific trends capture any country-level quarterly trends in the variables. Firm and country controls comprise variables reported in Table 1.

	AE vs. EMDE countries			*Large vs. small firms*		
	Risk	*Neg. Sent.*	*Net Sent.*	*Risk*	*Neg. Sent.*	*Net Sent.*
	(1)	(2)	(3)	(4)	(5)	(6)
Health Exp./GDP	-0.012	-0.039	0.020			
× *AE*	(0.025)	(0.027)	(0.258)			
Log Cases	0.017	0.090	-0.036			
× *AE*	(0.034)	(0.001)	(0.185)			
Health Exp./GDP	0.002	0.010	-0.006			
× *Log Cases* × *AE*	(0.041)	(0.004)	(0.075)			
Health Exp./GDP	-0.024	-0.091	0.047			
× *EMDE*	(0.009)	(0.002)	(0.093)			
Log Cases	0.010	0.043	-0.014			
× *EMDE*	(0.012)	(0.000)	(0.250)			
Health Exp./GDP	0.002	0.009	-0.004			
× *Log Cases* × *EMDE*	(0.027)	(0.004)	(0.138)			
Health Exp./GDP				-0.015	-0.040	0.027
× *Large*				(0.003)	(0.014)	(0.076)
Log Cases				0.007	0.029	-0.005
× *Large*				(0.043)	(0.009)	(0.613)
Health Exp./GDP				0.001	0.004	-0.002
× *Log Cases* × *Large*				(0.012)	(0.015)	(0.090)
Health Exp./GDP				-0.015	-0.055	0.036
× *Small*				(0.003)	(0.001)	(0.017)
Log Cases				0.008	0.033	-0.008
× *Small*				(0.025)	(0.003)	(0.487)
Health Exp./GDP				0.001	0.005	-0.003
× *Log Cases* × *Small*				(0.007)	(0.000)	(0.014)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year obs.	11,544	11,544	11,544	11,544	11,544	11,544
Country-specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.099	0.284	0.114	0.1	0.283	0.113

Table 5: Health spending and firms' COVID-19 risk & sentiment: Robustness to COVID-19 exposure and prior epidemic exposure

The dependent variable in columns (1)–(2) is COVID *Risk*, in columns (3)–(4) is COVID *Negative Sentiment*, and in columns (5)–(6) is COVID *Net Sentiment*. The health expenditure variable is demeaned to aid in interpretation of the interaction terms. Robust heteroskedasticity-consistent standard errors are clustered at the firm level. P-values are shown below the estimated coefficients in parentheses. Country-specific trends capture any country-level quarterly trends in the variables. Firm and country controls comprise variables reported in Table 1.

	Risk		*Neg. Sentiment*		*Net Sentiment*	
	(1)	(2)	(3)	(4)	(5)	(6)
Health Exp./GDP	-0.002	-0.013	0.001	-0.030	0.000	0.025
	(0.034)	(0.007)	(0.740)	(0.012)	(0.902)	(0.079)
Health Exp./GDP × *Log Cases*		0.001		0.003		-0.002
		(0.025)		(0.011)		(0.084)
Log Cases	-0.002	0.003	-0.015	-0.001	0.018	0.006
	(0.388)	(0.412)	(0.010)	(0.939)	(0.012)	(0.530)
COVID Exposure	0.055	0.054	0.353	0.353	-0.149	-0.149
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Prior Pandemic Exposure	-0.010	-0.010	-0.024	-0.024	0.020	0.020
	(0.033)	(0.032)	(0.101)	(0.098)	(0.154)	(0.152)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Country controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Firm-year obs.	11,544	11,544	11,544	11,544	11,544	11,544
Country-specific trends	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FEs	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.224	0.224	0.637	0.637	0.21	0.21