

Endogenous Corporate Disclosure during the COVID-19 Lockdown *

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Abstract

Using exogenous state-level lockdown policies during the COVID-19 pandemic, we compared firms that should report their quarterly financial statements during the lockdown period (Treated) to those in the same state that completed their reporting just before lockdown (Control). Lockdown significantly reduced social mobility and consequently limited soft information sharing between corporate managers and outside investors. Under these circumstances, we find that treated firms endogenously disclose more accounting items in their quarterly reports than do control firms in order to substitute for the missing soft information. Such tendencies are evident for firms with a large quantities of intangibles, R&D investments, and accrual accounts, and those that require external funding to support ongoing R&D activities, even during the lockdown. With increasing hard information disclosure, sell-side analysts' forecasts on earnings become more accurate, and firms are more likely to survive in the postlockdown period.

Keywords: disclosure, COVID-19 pandemic, lockdown, financial reporting

JEL: G14, G32, M40, O32

*We have greatly benefited from data support and code sharing by Jae Hyoung Kim. Jongsub Lee gratefully acknowledges financial support from the Institute of Management Research at Seoul National University.

A firm’s managers are perceived to know more about the value of the firm’s assets and investment opportunities than do outside investors. This information asymmetry and its corporate financial consequences have been a long-standing topic that numerous academics have analyzed in the literature (see Leland and Pyle, 1977; Akerlof, 1978; Myers and Majluf, 1984). Firms normally undertake investment projects by selling securities to the external capital markets. Under severe information friction, those securities are sold at a discount. Understanding this capital market feedback, corporate managers seek various ways to convey their internal business-related information to outside claimants.

The information they attempt to disseminate to external capital markets includes both hard and soft information (Liberti and Petersen, 2019). The latter is difficult to summarize via numeric scores and is therefore more subject to geographic distance and social interactions among various participants who are interested in information collection. A large body of empirical literature has illustrated the distinction between soft and hard information in various settings (Coval and Moskowitz, 1999; Petersen and Rajan, 2002; Van Nieuwerburgh and Veldkamp, 2009; Giroud, 2013). In the context of corporate disclosure, studies have traditionally focused on how managers strategically communicate with outside investors through financial reporting (e.g., Bushman and Smith, 2001).

Despite the relatively comprehensive discussion of information asymmetry and corporate disclosure policies that counter such friction, how these two types of information could interact and help mitigate overall information asymmetry between firms’ insiders and outsiders has rarely been addressed (Bertomeu and Marinovic, 2016). The recent COVID-19 pandemic and the exogenously imposed state-level lockdown policies provide an ideal opportunity to address this important economic question. Using staggered stay-at-home (SAH) orders in various states since mid-March in 2020, we identify a group of firms that had to prepare for their quarterly financial reports during the lockdown period and compare them to those that completed their financial reporting outside the lockdown period.

The COVID-19 outbreak was largely unexpected, and therefore, the cross-sectional variation in the fiscal year-end month across firms in the same state provides a sharp experimental opportunity. Specifically, we can examine how firms endogenously determine the amount of hard information to disclose in their financial reports when state-level lockdown policies significantly restrict social mobility in their state of headquarters (Gupta et al., 2021). Using these events, we investigate how corporate disclosure policies endogenously interact with the reduced sharing of soft information among various claimants during times of limited social mobility.

Using a difference-in-differences (DiD) specification, we examine the change in corporate disclosure quality for firms that should prepare their disclosure reports under active state-wide lockdown. As a measure of disclosure quality, we use the disaggregation quality (DQ) of accounting data in quarterly reports developed by Chen, Miao, and Shevlin (2015). DQ captures the extent of details in firms' financial reports by counting the number of nonmissing Compustat line items; it captures the "fineness" of hard information disclosed in financial reports. Exploiting the variation in the timing of corporate quarter-end dates and state-wide lockdown orders in the cross-section and time series (i.e., in and out of lockdown), we run DiD regressions at the firm-state-year-quarter level.

We check the parallel trend assumption in DQ for firms in the treated group (i.e., firms that had to disclose during lockdown) and the nontreated control group before SAH orders started and identify the plausibly causal effects of the mobility restrictions on corporate disclosure policies. To sharpen our identification, we focus on a relatively short sample period, spanning only eight quarters surrounding the onset of the pandemic (i.e., the first quarter of 2021). Controlling for comprehensive time-varying firm and local market characteristics, we uncover the following important results on how firms disclose their hard information in response to the sudden decrease in soft information collection during the lockdown period.

First, we find that firms disclose more in their financial reports during the COVID-19 lockdown. We further find that firms with more intangible assets, long-term R&D projects, and a larger amount of credit sales, as reflected by accounts receivable and payable (i.e., accrual accounts), tend to disclose more of their operational details through quarterly reports. We show that these effects are sharply identified, meaning that the increase in DQ is driven by respective Compustat line items; for example, firms with a large amount of intangible assets disclose more about accounting items that are associated with the firms' asset characteristics. We find similar results for R&D investments and credit sales and purchases. These results suggest that firms disclose more and try to effectively communicate their opaque asset structure, risky innovation activities, and less transparent sales activities with outside investors during the COVID-19 lockdown.

Next, we find that companies with low quarterly earnings, limited financial resources, and a need for external capital during the lockdown period are more likely to increase the amount of hard information they share in their next financial reports. When soft information collection is substantially limited, external investors impose a heavy discount on the prices of securities that these companies sell. By substituting for the missing soft information through aggressive

hard information disclosure, firms attempt to mitigate the information discount at a time when external capital is most needed.

We further test whether these results are evident for firms under more severe information asymmetry. We use the measures of (i) absence of sophisticated institutional investors, (ii) firms that are not covered by Big 4 auditors, which are less likely to be subject to local mobility restrictions due to large company networks in various geographic locations, and (iii) relatively smaller firms that are less visible in each industry. With these information friction proxies, we run difference-in-difference-in-difference (DiDiD) regressions and find that firms that suffer more from negative information externalities tend to disclose more accounting items in their quarterly reports during lockdown.

Finally, we test whether this endogenous corporate disclosure during COVID-19 could improve firms' information transparency and consequently make their survival more likely in the long run. We find that firms that endogenously disclose more of their internal operational details to the public during lockdown tend to enjoy increasing accuracy of analysts' earnings forecasts and are more likely to survive in the post-lockdown period.

Overall, our results indicate that hard information could substitute for missing soft information during the COVID-19 lockdown. More granular disclosure of accounting items associated with intangible assets, R&D investments, and relatively less transparent credit-based sales activities helps external investors overcome information asymmetry and better understand firms' business prospects. With mitigated information asymmetry, external capital provided from outside investors enables firms to continue cumulative innovation efforts and eventually materialize value in the long run. This endogenous corporate disclosure improves firms' competitive advantage in their respective product markets during times of increasing economic uncertainty and information friction.

Our work significantly contributes to several strands of the literature. First, we contribute to the literature on information frictions and corporate financial policies. The literature documents significant information frictions that induce home bias (Coval and Moskowitz, 1999; Van Nieuwerburgh and Veldkamp, 2009), limited business transactions (Petersen and Rajan, 2002), and severe price discounts in external claims that firms issue (Diamond and Verrecchia, 1991; Lang, Lins, and Miller, 2003). We show that two distinct types of information are interactive and substitute for each other during times of increasing information friction. Firms can remain active by endogenously reallocating the amount of information sharing in each of the two distinct channels during times of rising economic uncertainty and lack of transparency.

Second, we show that firms strategically pursue an optimal disclosure policy to secure necessary capital from external claimants. By doing so, they continue long-term business plans that help survive in innovation competition. In this regard, our paper also contributes to the literature on strategic information disclosure, such as strategic R&D expense disclosure documented by Koh and Reeb (2015) and narrative disclosure on R&D investments by Merkley (2014a).

Third, we focus on the COVID-19 pandemic and therefore contribute to the literature on COVID-19 and its consequences for corporate sectors and capital markets in general. Existing studies in this area (Ellul, Erel, and Rajan, 2020) have focused on bank supply of capital to corporations (Acharya and Steffen, 2020; Li, Strahan, and Zhang, 2020), equity shortfall (Carletti et al., 2020) and return resilience (Albuquerque et al., 2020; Ding et al., 2021). None of them focused on endogenous corporate disclosure policies during the COVID-19 lockdown. To the best of our knowledge, we are the first to study this important yet unexplored topic during the COVID-19 pandemic.

1 Hypothesis Development

Outside claimants have difficulty obtaining value-relevant firm-specific information possessed by corporate insiders. For example, the value and performance of research and development (R&D) activities might be clear to top managers who conduct and oversee the innovation process inside the firm, while outside investors may not be fully informed about such innovation value due to the high complexity and risk of R&D activities (Merkley, 2014). This information asymmetry between corporate insiders and outsiders has been shown to be a key factor affecting the cost of capital and corporate investment policies (Leland and Pyle, 1977; Myers and Majluf, 1984). For financially constrained firms, such information asymmetry could also affect long-term survival rates (Zingales, 1998).

To reduce this information gap, corporate managers disseminate a considerable amount of information about their business prospects. Managers transmit such value-relevant information through several avenues, including quarterly and annual financial reports, shareholder meetings, earnings conference calls, and media releases. This soft and hard information (Liberti and Petersen, 2019) is used by external information agents such as sell-side equity analysts, external auditors, and credit rating agencies to help investors learn about the firms' value and growth

potential. They also guide investors to fairly price firms in external capital markets. Effective communication with outside investors and information agents is, therefore, key to corporate survival and growth, particularly during economic downturns as information asymmetry widens, and financial constraints tend to bind for a vast majority of firms in the economy.

Through active social engagement and physical interaction with various information intermediaries, firms' managers could share valuable soft information with outside investors, filling the important information gap to achieve fair pricing in external capital markets. Earlier studies highlight the importance of private interaction with corporate managers in the creation of external information (Green et al. (2014); Soltes (2014); Cheng et al. (2016); Bushee, Gerakos, and Lee (2018)).

The recent COVID-19 outbreak exogenously changed the corporate information landscape. With suddenly imposed state-level lockdown policies, social and physical interactions were greatly limited in local markets (Gupta et al., 2021). The empirical literature (Petersen and Rajan, 2002, among many others) has documented the importance of distance in disseminating some types of information (i.e., soft information). With reduced human interactions, the challenge of transmitting soft information within geographically proximate areas intensified. Consequently, human-interaction-based information sharing in capital markets was severely restricted (Bai and Massa, 2021). Given the reduced social mobility during the COVID-19 lockdown, the degree of information asymmetry between corporate insiders and outsiders rose sharply, particularly in the form of soft information. Therefore, corporate managers naturally shifted their attention to alternative information sharing channels, through which they could fill the rising soft information gap with outside investors. These managers might consider a greater amount of hard information disclosure as a substitute for the missing soft information during the COVID-19 lockdown.

As an illustration, let us consider a firm that strategically hid its R&D activities prior to the COVID-19 outbreak. Suppose also that the firm requires external capital to carry out its on-going innovation projects during this lockdown. Koh and Reeb (2015) document that a substantial number of NYSE-listed companies strategically hide their R&D activities to avoid unnecessary innovation competition from rivals and bundle the R&D expenses with other operating expenses in their financial statements. Bushee (1998) also emphasize that corporate R&D is a critical component of evaluating a firm's long-term value, although the outcome of innovation effort is highly uncertain. With intensive R&D expenses, the firm's near-term earnings could appear inferior to those of its rivals, which could disappoint outside investors

who may not fully understand the firm’s long-term strategic plans. In these circumstances, the firm might want to endogenously disclose more about its R&D activities to justify poor near-term earnings. With detailed disclosure of R&D expenses, outside investors could better understand the potential trade-offs between short-term earnings sacrifice and long-term growth potential. Such improved communication between corporate insiders and outsiders during the COVID-19 lockdown could help firms improve access to external capital when capital is most needed.

Under the exogenously changing information environments during the COVID-19 lockdown, firms that require external capital (Barry et al., 2022) during the lockdown period might more proactively disclose the details of strategic investment plans in their financial reports. Such additional hard information disclosure would be increasingly more beneficial for firms with a greater amount of difficult-to-value assets (e.g., a large amount of intangibles) and credit sales (e.g., a large amount of accounts receivables and payables).

Corporate managers must consider various types of external investors (Bushee, 1998). Some investors tend to be myopic (Stein, 1989), placing greater emphasis on near-term earnings than long-term growth. In contrast, other investors, such as sophisticated institutional investors, may understand the temporal trade-off between long term innovative investment and poor short-term earnings. When the valuable soft information sharing becomes limited during the COVID-19 lockdown, corporate managers must account for all these information externalities and carefully decide how much hard information to disclose in their financial reports.

On the basis of the foregoing discussions, we hypothesize that firms endogenously adopt the following disclosure policies under the state-level lockdown to substitute for limited soft information collection. We further hypothesize that such an endogenous disclosure policy is affected by the firm’s external information environment prior to the COVID-19 outbreak:

Hypothesis 1 (Endogenous Disclosure in Lockdown) *As information asymmetry widens due to the reduced social mobility and physical interactions among investors, firms would endogenously disclose more information related to business prospects in their financial reporting.*

Hypothesis 2 (Asset Opacity, Investment Horizon and Transparency in Sales Activities) *When firms endogenously disclose their internal information to the public through financial reporting during the COVID-19 lockdown, firms with more opaque assets (e.g., intangibles),*

long-term R&D projects, and a large amount of accounts receivable and payable, tend to disclose their operational details to the public.

Hypothesis 3 (External Financing Demand) *When firms endogenously disclose key operational characteristics to the public during the COVID-19 lockdown, firms that are more financially constrained with the reduced short-term earnings, those that rely heavily on external financing to fund their ongoing long-term projects, tend to disclose their business prospects to outside investors by reporting more granular information about their operation.*

Hypothesis 4 (Types of Outside Investors and External Information Environment) *During the state-level lockdown, firms that are i) owned by sophisticated institutional investors, ii) are audited by Big 4 auditors, and iii) are already sizable in their respective industries, thereby suffering less from the innate information asymmetry, tend to disclose less, despite the reduced soft information sharing between firms' insiders and outsiders.*

Hypothesis 5 (Real Effects of Endogenous Information Disclosure in Lockdown) *Firms that proactively disclose more about their asset structure, investment details, and sales activities during the state-level lockdown period are more likely to survive more likely due to the mitigated information asymmetry.*

2 Identification Strategy & Empirical Design

2.1 State-level lockdowns in 2020 as a quasi-natural experiment

As the COVID-19 pandemic swept across states, states started to issue SAH orders starting in mid-March. When a governor issues an SAH order, the residents must stay home except for essential activities such as purchasing medicine or food. California was the first state to implement an SAH order on March 19th, 2020, and additional 38 states followed and issued SAH orders by April 7th, 2020. We focus on the mandatory SAH orders (also known as "shelter-in-place" laws) as an exogenous shock to social mobility. Among various forms of lockdown policies (e.g., restrictions on gatherings, school closures), SAH orders are the most restrictive and sharply reduce mobility in obvious ways (see Adolph et al. (2021) for evidence on the effect of different types of policies on mobility outcomes).

During the early phase of the COVID-19 pandemic in mid March, it was mainly under governors’ discretion on how to adopt state-level social distancing mandates. Orders to SAH lasted for weeks. Although most states enacted initial SAH orders between March 19, 2020 (California) and April 7, 2020 (South Carolina), there is large heterogeneity in terms of the duration of the mandates, as depicted in Figure 1. Alaska was the first to lift its mandatory SAH on April 24, seven states ended their SAH orders by the end of April, and 32 states ended their mandatory SAH orders through May and June. California’s SAH order did not expire until Aug. 31. On the other hand, 12 states never issued SAH orders.¹ We adopt an identification strategy based on the staggered declaration of state-wide SAH orders. The timing of SAH issuance varies by approximately three weeks across these 39 states. The duration of the state-wide mandatory SAH order ranges from 27 days to 165 days.

2.1.1 Effect of Stay-at-Home Orders on Mobility

Based on the information on the start and end dates of mandatory SAH orders of the states where firms’ headquarters are located, we define *Lockdown* as an indicator variable that equals one if one month after the fiscal date of the quarterly financial statement falls into the SAH order period.² We reassure that our *Lockdown* variable captures the dramatic changes in social mobility during the pandemic period by using the Safegraph database.³ Safegraph provides foot traffic data based on 45 million mobile devices in the U.S. to 3.6 million points-of-interest (POI). We aggregate the information on the number of stops at POIs and the average distance from the home of the devices visiting POIs at the census-block-group level. In Figure 2, we show the patterns of social mobility over time. In Panel A2, over a month period from March to April 2020, which was the starting date of SAH orders in most states, the number of stops and distance from home sharply dropped by almost 40%, and the impact remained for the rest of the year until the end of 2020. More importantly, when we split the states into two groups – lockdown periods less and longer than 30 days – in Panel B2, we find that the impact of social distancing policies on social mobility measures is more pronounced for the state-level lockdown

¹Twelve states did not mandate any SAH orders, including Arkansas, Connecticut*, Iowa, Kentucky*, Massachusetts*, Nebraska*, New Mexico*, Oklahoma, South Dakota, Utah*, and Wyoming, but six of them (*) recommended SAH social distancing actions.

²We find that on average it takes 44 days from quarterly fiscal date until the actual filing date based on the subset of observations where we could obtain actual filing dates. Since 22% of observations have missing filing date variables, we use 30 days to approximately estimate the filing date.

³The data and detailed description of the data are available from <https://www.safegraph.com>.

period.

2.1.2 Variable Construction

Leveraging the fact that workers mostly work from home or temporarily stop working when SAH orders are in effect, we aim to identify firms whose quarterly reporting had to be prepared under mobility constraints. We first examine the exact timing of a firm’s quarter-end dates and filing dates. We examine the data on the financial reporting practice of our sample firms in the three years prior to the COVID-19 pandemic and find that the median days companies took before filing their quarterly disclosure was 39 days. On average, it takes approximately 44 days to file quarterly documents. Assuming that approximately one week would be needed to finalize and transfer documents, we assign that a median (average) firm would take approximately 30 (35) days to work on their disclosure document.

We construct an indicator variable, *Disclose in Lockdown*, to capture whether a firm’s quarterly reporting documents had to be prepared under the state’s SAH directives. We consider a firm’s quarterly filing to be prepared under a state-wide SAH lockdown policy if 30 days after the firm’s quarter-end dates falls within the state’s mandatory SAH order. That is, we set the threshold date as 30 days after the firm’s quarter-end date. We then define *Disclose in Lockdown* to take a value of one if the state’s mandatory SAH order started before the threshold date and ended after the threshold dates. We find that the results are robust when we use 20 or 25 days after the firm’s quarter-end dates as the threshold.

2.1.3 Distribution of *Disclose in Lockdown* across States

When a state’s SAH order lasted for a relatively short and specific period of time, there exists cross-firm variation in terms of whether a firm’s quarterly document was prepared during SAH directives depending on a firm’s quarter-end date. In Figure 3, we show cross-state variation in the proportion of firms affected by the state’s SAH directives.

During the first quarter of 2020, there are some states in which all firms were affected by SAH orders during their preparation of quarterly filings. When a state-wide SAH lasts for a prolonged period, there exists little variation across firms headquartered in the given state. All firm-quarterly filings were prepared under SAH mobility constraints for firms headquartered in California, Delaware, Hawaii, Iowa, Louisiana, Maine, Michigan, New Hampshire, New Jersey, New York, Oregon, South Carolina, Vermont, Washington, and West Virginia. On the other

hand, in some states, no firm was affected by the SAH policy during the first quarter of 2020; i.e., Alaska, Arkansas, Connecticut, Iowa, Kentucky, Massachusetts, Mississippi, Montana, Nebraska, New Mexico, North Dakota, Ohio, Oklahoma, Rhode Island, South Dakota, Tennessee, Texas, and Utah did not impose an SAH order.

2.2 Empirical Design

We examine the change in corporate disclosure quality for firms that had to prepare for their disclosure documents under active state-wide SAH mandates. By exploiting the variation in the timing of corporate quarter-end dates and state-wide SAH orders in the cross-section and time series (i.e., in and out of lockdowns), we implement DiD regressions at the firm-state-year-quarter level.

We compare the extent of voluntary hard information disclosure between firms with quarterly reporting dates that coincide with the lockdown period (Treated) and firms in the same state without such reporting requirements during the lockdown period (Control). We take advantage of the fact that fiscal quarter-end dates are predetermined, and the timing of these dates determines whether a firm must file under SAH orders. It is plausible that the spread of the COVID-19 pandemic was unexpected for most corporations and market participants. As long as quarter-end schedules are not planned in anticipation of the timing of the SAH orders, our estimation strategy isolates the effects of disclosure during the lockdown.

Additionally, we check whether the trends in disclosure quality for firms in the treated group and nontreated group are parallel prior to the lockdown orders to ensure the DiD framework can isolate plausible causal effects of the mobility restrictions on corporate disclosure.⁴ To sharpen the identification, we compare firms within a relatively short sample period. Our sample period spans eight quarters surrounding the onset of the pandemic, the first quarter of 2021.

To test whether firms that had to prepare their disclosure filings during the SAH mobility restrictions adjust their disclosure quality differentially, we start by estimating the following panel regression model:

$$DQ_{i,j,t} = \alpha + \beta * Disclose\ in\ Lockdown_{i,j,t} + \delta * Ctrl_{i,t} + \nu_i + \xi_t + \epsilon_{i,j,t}, \quad (1)$$

where DQ is disclosure quality of firm i in state j at quarter t . The variable *Disclosure in*

⁴We formally test the assumption in 5.4.

Lockdown is an indicator set to one if a company had to prepare their disclosure documents during an SAH mandate because the company domicile has active SAH mandates and is zero otherwise. ν_i denotes firm-level fixed effects. Since headquarters relocation events are rare during the two years, location-level or industry-level fixed effects are subsumed. To ensure that the COVID-19-related variations in economic conditions are not driving our results, we include ξ_t to represent year-quarter fixed effects. $Ctrls_{i,t}$ contains firm-level control variables such as the natural logarithm of the book value of total assets, Tobin’s Q, and leverage ratio. We adjust standard errors for clustering at the state level.

To examine the effects of the information environment on how firms respond to state-wide mobility constraints, we evaluate whether and how the coefficient estimates, β , of our baseline model 1, differ across firms with a heterogeneous degree of informational asymmetry.

To gauge the heterogeneity in the disclosure ambiguity at the firm level, we make use of some firm-level characteristics, tangibility, R&D spending, accounts payable, and accounts receivable. Evaluating the value of intangible assets can be more difficult during a period of high information asymmetry, and companies with abundant intangible assets may have stronger incentives to disclose more disaggregated information to assist external investors. To test the hypothesis, we employ the differences-in-differences-in-differences (DiDiD) regression framework. Specifically, we employ the following regression model:

$$DQ_{i,j,t} = \alpha + \kappa * \text{Disclose in Lockdown}_{i,j,t} * \text{Tangibility}_{i,t} + \gamma * \text{Tangibility}_{i,t} + \beta * \text{Disclose in Lockdown}_{i,j,t} + \delta * \text{Ctrls}_{i,t} + \nu_i + \xi_t + \epsilon_{i,j,t}, \quad (2)$$

Our main variable of interest is the interaction term, and the κ estimate captures whether and how disclosure quality responds to the lockdown mandates.

Next, we replace *Tangibility* with *R&D* spending in model 2 as an alternative measure of disclosure ambiguity for our triple difference specifications. R&D spending is a long-term investment with likely adverse effects on short-term cash flow. Corporate R&D disclosure often exhibits a discretionary and strategic nature. Koh and Reeb (2015) find that firms strategically choose to report R&D and that 10.5% of missing R&D firms file and successfully receive patents. This could be related to the difficulty of communicating the value of R&D investments (e.g., Merkley, 2014b). During times when investors care more about the information for valuing the firm, revealing that the firm is investing in R&D can be beneficial.

Additionally, we replace *Tangibility* with *Accounts Receivable* or *Accounts payable* using

regression model 2. During the pandemic, when investors pay more attention to uncertainties relating to going concern, external investors may demand more detailed information on the value of current assets.

As an alternative way to measure the information environment of firms, we consider the characteristics of a firm’s auditor and institutional investors. We first consider whether a firm’s auditor is one of the Big 4 auditing firms. When the market believes that Big 4 auditors generally deliver higher audit quality than smaller auditors, external investors may have a lower level of demand for more disaggregated disclosure for firms employing Big 4 auditors.

To test these hypotheses, we use the triple difference framework. Using model 2, we replace *Tangibility* with *Big4*, *Industry Leaders*, *IO*, *IO – Indexers*, or *IO – Patient*. *IO*, *IO – Indexers*, and *IO – Patient* denote the proportion of institutional investors, proportion of indexers, and proportion of patient institutional investors, respectively.

We also test whether and how enhanced disclosure quality helps corporations’ longer-run outcomes. We first hypothesize that enhanced disclosure quality helps firms better communicate their value and improve a firm’s overall information environment. To test the hypothesis that the more disaggregated the disclosure is, the easier it is for analysts to forecast the earnings, we run the following regression model:

$$\begin{aligned} \text{Forecast Dispersion}_{i,j,t+1} = & \alpha + \kappa * \text{Disclose in Lockdown}_{i,j,t} * DQ_{i,t} + \gamma * DQ_{i,t} \\ & + \beta * \text{Disclose in Lockdown}_{i,j,t} + \delta * \text{Ctrls}_{i,t} + \nu_i + \xi_t + \epsilon_{i,j,t}, \end{aligned} \quad (3)$$

where *DQ* is the disclosure quality of firm *i* in state *j* at quarter *t*. The variable *Disclosure in Lockdown* is an indicator set to one if a company had to prepare their disclosure documents during SAH mandates because the company domicile has active SAH mandates and zero otherwise. ν_i denotes firm-level fixed effects. We include ξ_t to represent year-quarter fixed effects. *Ctrls*_{*i,t*} contains firm-level control variables such as the natural logarithm of the number of analysts following the firm, the natural logarithm of the book value of total assets, Tobin’s Q, and leverage ratio. We adjust standard errors for clustering at the state level.

Next, we posit that firms may be more likely to survive when they improve their disclosure quality and improve the information environment. Accordingly, we hypothesize that firms that improved their disclosure quality are less likely to exit. To test this hypothesis, we run the

following cross-sectional logit regression model:

$$Exit\ Next\ Year_{i,j} = \alpha + \kappa * DQ_i + \delta * Ctrls_i + \nu_i + \xi_l + \epsilon_{i,j}, \quad (4)$$

where DQ is disclosure quality of firm i in state j and industry l during the four quarters of 2020. The variable $Exit$ is an indicator set to one if a company disappears from the Compustat universe during 2021 and zero otherwise. ν_i denotes firm-level fixed effects. We include ξ_l to account for industry fixed effects. $Ctrls_i$ contains firm-level control variables such as the natural logarithm of the book value of total assets, Tobin’s Q, current assets ratio, and leverage ratio. The independent variables are based on the values in 2020. We adjust standard errors for clustering at the state level.

3 Data and Sample

We start by constructing a firm-quarter panel of publicly traded companies in the U.S. from Compustat during the period 2019Q1-2020Q4 around the lockdown period. We exclude firms incorporated or headquartered in non-U.S. countries and any observations with nonpositive total asset values.

3.1 Lockdown data

We collect state-level social distancing measure information from the National Governors Association and Kaiser Family Foundation and supplement with information from other sources. These databases provide various state-level policy actions in response to the COVID-19 pandemic. We construct *Disclose in Lockdown* to capture whether a firm’s quarterly reporting documents had to be prepared under the state’s SAH directives. Specifically, it is defined as an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide SAH mandates.

3.2 Disclosure Quality

As a primary measure for voluntary disclosure, we adopt the disclosure quality (DQ) measure from Chen, Miao, and Shevlin (2015), which captures the level of disaggregation of accounting data in financial reports. DQ is defined as the number of nonmissing Compustat items and

represents the degree of the granularity of accounting information in the financial statements. The underlying assumption of this measure is that more detailed quantitative items represent higher-quality information provided to the public.

There are several advantages in using DQ as a proxy for disclosure quality compared to alternative disclosure measures constructed from conference calls or analyst ratings. First, there is no selection bias in terms of the coverage because DQ can be calculated for all publicly traded firms in Compustat. Although they are all required to submit financial statements compliant with SEC regulations, DQ still captures managers' voluntary and discretionary decisions on the level of detail in financial statements.

Second, as DQ is calculated based on the comprehensive accounting items that are reported in financial statements, it provides standardized and quantitative scores on disclosure quality. Due to its simplicity, the DQ measure can be readily calculated for a broader range of companies. This enables us to compare DQ across different firms and time periods.

Lastly, DQ represents the granularity of information found in entire 10-Q and 10-K reports, making it a representative measure of a firm's voluntary disclosure. This stands in contrast to indices that rely solely on information from a particular section of financial reports such as Management's Discussion and Analysis section.

We first count the number of nonmissing GAAP items reported in Compustat in the Balance Sheet and Income Statements of 10-Qs and 10-Ks. Then, we aggregate those measures up to broader categories and apply several filtering mechanisms as in Chen, Miao, and Shevlin (2015).⁵ Since our analyses are at the quarterly level, we adjust their measure to the quarterly frequency by using both 10-Qs and 10-Ks.

We separately estimate five measures of DQ – within a different subcategory (GWI DQ , $R\&D$ DQ , $OPEX$ DQ , $Curr$ $Liab$ DQ , and AR DQ) – to examine whether firms have specific needs to change the quality of disclosure on specific items in financial statements. Specifically, GWI DQ counts nonmissing items of receivables which include impairment of pretax goodwill, $R\&D$ DQ for the research and development expenses, $OPEX$ DQ for operating expenses, $CurrLiab$ for current liabilities, and QR DQ for debt in trade receivables.

⁵We follow the procedure in Chen, Miao, and Shevlin (2015) to identify the missing items that are irrelevant to firms' operations from non-reported missing items. For example, inventory items might be missing not because they are intentionally not reported, but because those items do not exist for a lot of internet companies. These steps make sure that any coding schemes in the Compustat database would bias the measure.

3.3 Control Variables

Firm-level financial variables are constructed from Compustat. We also collect the actual filing dates when each financial statement was submitted to the SEC from the WRDS SEC Analytics Suite. Additionally, we obtain auditor information from Audit Analytics and define *Big4* as an indicator variable for the Big 4 auditing companies. Institutional holding data are obtained from the Thomson Reuters Institutional (13F) Holdings database. We categorize institutional investors into transient, quasi-indexers, and dedicated investors using the classification by Bushee (1998). All variable definitions are provided in Appendix 2.

4 Results

4.1 Disclosure Quality, Asset Structure and Working Capital Management

We first examine the disclosure quality of firms during the COVID-19 lockdown. We hypothesize that as channels for soft information transmission were limited during COVID-19 and SAH lockdown orders, external investors and analysts increasingly more relied on public disclosure to learn about firms. Firms may react to such restrictions strategically and decide to enhance the quality of their financial disclosure.

We use the firm-quarter panel spanning from the first quarter of 2019 to the fourth quarter of 2020 and estimate Equation (1). Our baseline result is presented in Table 2. In column (1), we find that the coefficient on *Disclose in Lockdown* is 0.0023, which is positive and statistically significant. This implies that firms increased their disclosure quality when they prepared their quarterly financial statements during the state-level lockdown period. As this regression includes firm and year-quarter fixed effects, the improvement in disclosure quality cannot be explained by firm-specific unobservables, the cyclicity of financial statement information by quarter or time trends in *DQ*. The increase in *DQ* of the quarterly reports disclosed in the lockdown period (0.0023) is equivalent to 1.4% of the standard deviation of *DQ*. This is not in a negligible magnitude if we consider that *DQ* is sticky (i.e., the temporal variation of *DQ* is not large). Chen, Miao, and Shevlin (2015) argue that this is because all firms must report a list of required items under the SEC Regulation S-X requirement.

Next, we test the heterogeneous effects of lockdown on disclosure quality depending on

firms' asset structure. We hypothesize that as information asymmetry widens when social mobility is sharply restricted during lockdown, firms are incentivized to disclose more financial information, especially when they have more intangible assets, including R&D investment, and a large amount of assets and liabilities that are difficult to value from outside investors' perspectives.

We tabulate the results of the estimation of the equation (2) in Columns (2)-(5) in Table 2. We find that the interaction term of *Disclose in Lockdown* with *Tang* in column (2) is -0.0255, which is statistically significant at the 1% level. We also find a significant and positive coefficient on *Disclose in Lockdown* × *R&D* (0.0258). In terms of the economic magnitude, a one-standard-deviation decrease in tangibility leads to an increase in *DQ* by 0.006, explaining 4% of the standard deviation of *DQ*. These results suggest that firms with more intangible assets and high R&D expenses tend to disclose more financial information during the lockdown period. The strategic disclosure of long-term R&D information is consistent with the view that firms with large long-term investments that might press short-term earnings choose to deliver more information about their asset structure to outside investors during times of high uncertainty.

We also examine the differential effects of firms' credit-based sales and purchases on the response of disclosure quality to lockdown constraints. In particular, we use the amount of accounts receivable and payable, scaled by sales, as a proxy for the amount of credit associated with their suppliers and customers that would be realized into profits. The interaction terms of *Disclose in Lockdown* with accounts payable in Column (4) and accounts receivable in Column (5) have positive coefficients with statistical significance at the 1% level. These results suggest that firms that are highly reliant on credit-based sales disclose more information in their quarterly financial statements when it is difficult to disseminate soft information.

4.2 Which Items are More Disclosed during Lockdown?

We take a closer look at which financial statement items the firms additionally disclosed during lockdown to ensure that the improved financial disclosure we observe delivers relevant information about firms' operation. Note that *DQ* is the level of disaggregation of items in firms' financial reports covering the major components in financial statements both in balance sheet and income statement and related footnotes. We estimate *DQ* for subcategories of financial statements and examine whether the specific accounting items additionally reported during SAH

are matched to the types of information that outside investors would care about for firms with specific characteristics. For example, a firm with more accounts receivable might want to convey more granular information about the impairment of credit-based sales, which can be captured by items such as “Receivables-Estimated doubtful” (Compustat item: RECDQ) and “Unbilled receivables” (Compustat item: RECUBQ). As such, we construct five subcomponents of DQ: GQI DQ (impairment of pretax goodwill), R&D DQ (research and development expenses), OPEX DQ (operating expenses), Curr Liab DQ (current liabilities), and AR DQ (debt in trade receivables). Then, we test which parts of DQ drive the increase in disclosure quality during lockdown depending on firms’ asset structure.

We report the results in Table 3. We find that the coefficient on *Disclose in Lockdown* \times *Tang* is negative and statistically significant for GWI DQ, while the interaction terms of *Disclose in Lockdown* with *R&D* have positive coefficients for R&D and OPEX DQs. This implies that firms with more intangible assets reported more information on impairment of pretax goodwill. In particular, firms with high R&D expenses report more items related to research and development expenses and operating expenses. The strategic disclosure of R&D expenses is consistent with Koh and Reeb (2015) who argue that managers have significant discretion in disclosing corporate R&D to intentionally hide information from competitors. Our finding adds to their finding that firms with high R&D expenses disclose more information related to R&D information and operating expenses in financial statements during the lockdown period when the information gap is widened.

We further look at the reporting quality of the items under current liability for firms with high accounts payable. The result in column (4) confirm that firms that rely on credit-based sales intended to deliver more information on their prospects on working capital during the lockdown period. We find consistent evidence for the debt in the trade receivables item in column (5). The disclosure quality of accounts receivable increased during lockdown specifically for firms with a large amount of accounts receivables. Overall, our results regarding disaggregated DQ measures corroborate our argument that firms with different asset structures and concerns with working capital management increasingly disclosed relevant accounting information during lockdown.

4.3 Disclosure Quality and External Financing Demand

In this section, we test whether firms that are more financially constrained with reduced short-term earnings and rely on external financing are more likely to improve disclosure quality during the lockdown. Several accounting studies document that higher reporting quality is associated with lower cost of capital (e.g., Leuz and Verrecchia (2000), Lambert, Leuz, and Verrecchia (2007), Baginski and Rakow (2012), Fu, Kraft, and Zhang (2012)). Chen, Miao, and Shevlin (2015) directly validate the negative relationship between the DQ measure and cost of equity. Thus, we expect that when capital is scarce in an economy with high uncertainty, firms with more external financing needs are the ones who intend to convey more positive information to explain their prospects to maintain access to capital.

We estimate Equation 2 with the interaction term with firm characteristics that capture firms' financing need, including ROE, the issuance of net equity and debt, two indices for financial constraints (Whited-Wu and Hadlock and Pierce indices) and equity dependence. The results are tabulated in Table 4. We find that the interaction terms of *Disclose in Lockdown* with *Ext Fin*, *WW*, *HP* and *Equity Dependence* are all positive and statistically significant at the 1-5% levels. The estimated coefficient on the interaction term with *ROE* is -0.0117 with t-statistic of -2.10. In terms of economic magnitude, a one-standard-deviation decrease in *ROE* is equivalent to an increase in DQ of 0.0018 during lockdown, explaining 1% of the standard deviation of DQ.

Note that *ROE* and *Ext Fin* are contemporaneous measures. Thus, this implies that the improvement in disclosure quality during lockdown period is more pronounced for the firms with poor operating profitability and a need for high external debt and equity capital. Related to firms' long-term asset structure, the result with equity dependence reconfirms that firms that need to rely on external capital for long-term investment, including capital expenditure and R&D expenses, disclose more information publicly.

4.4 Disclosure Quality and External Information Environment

As Bertomeu and Marinovic (2016) argue, a disclosure can be soft, particularly when firms are closely monitored by sophisticated investors, in which case we expect those firms to not need to disclose hard information during the lockdown period. Similarly, we hypothesize that the increased disclosure would be much less for firms audited by Big 4 auditors and for market leaders because they suffer less from information asymmetry.

We test this hypothesis in Table 5. We include indicators for industry leaders, firms audited by Big 4 auditors and the percentage of institutional ownership in the regressions. The interaction terms of *Disclose in Lockdown* with *Ind Leaders* and *Big 4* have negative and significant coefficients. Thus, industry leaders or firms audited by reputable auditors did not increase the disclosure quality as much as did other firms that do not have a proper channel for soft information disclosure. In column (3), we also confirm that when firms are owned by more institutional investors, who are sophisticated and professional in collecting private information, their DQ did not increase as much during the state-level lockdown period. This result holds when we focus on holdings by dedicated institutional investors, who are more likely to closely interact with firms.

The results suggest that firms choose to disclose more information when the information provided by external intermediaries for investors is likely to be scarcer. Earlier studies suggest that complementarity exists between the external information environment and the disclosure quality of firms' filings. Lehavy, Li, and Merkley (2011) find that the information provided by sell-side analysts complements the informativeness of corporate disclosure. Our finding is consistent with Lougee and Marquardt (2004), who document that the informativeness of the pro-forma earnings to investors varies by the types of the investors holding the company.

4.5 Real Effects of Endogenous Information Disclosure

The results documented thus far collectively suggest that firms strategically disclosed more accounting information when uncertainty was heightened during the lockdown to alleviate any adverse consequences of information asymmetry. In this section, we examine whether there are any economic consequences of enhanced disclosure quality during the lockdown in two dimensions.

First, we look at whether the higher disclosure quality during lockdown helps earning forecasts. If detailed financial information additionally disclosed during the lockdown period reduces the uncertainty of the firms' prospects, we expect to see lower disagreement among analysts.

To test this idea, we construct an analysts' forecast dispersion variable and estimate Equation (3) in Table 6. We include *Num of Analysts*, *Size* and *Leverage* as controls. Note that we include firm and year-quarter fixed effects; thus the coefficient of the interaction term between *Disclose in Lockdown* and *DQ* indicates the incremental impact of disclosure quality during

lockdown holding time-invariant firm characteristics and any seasonal macroeconomic factors constant.

We find that analysts' forecast precision improves for firms with higher disclosure quality. The positive impact of higher DQ on forecast accuracy holds both for the dispersion in column (1) and the dispersion scaled by the stock price in column (2). An increase of one standard deviation in DQ improves analyst forecast accuracy by 0.019 for firms that filed their financial statements during lockdown, which is equivalent to 20.1% increase at the mean. Similarly, an increase of one standard deviation in DQ improves the price-adjusted analyst forecast accuracy by 0.0008 for firms that filed their financial statements during lockdown, which is equivalent to a 16.6% of increase at the mean. The results are consistent with earlier findings that analysts who extensively use the public information available via EDGAR show smaller forecasting errors compared to those of their peers (e.g., Gibbons, Iliev, and Kalodimos (2021)).

Second, we look at survival rates. We estimate the likelihood of exiting the exchange markets and Compustat annual tape as a function of the disclosure quality during the lockdown period. The results are presented in Table 6. We estimate cross-sectional logits as in Equation (4). The dependent variable is an indicator variable equal to one if the firm disappears from the Compustat universe in 2021. We find that firms that strategically disclose more information to the public were less likely to exit the market. The economic magnitude of the impact is not trivial. A one-standard-deviation increase in DQ reduced the probability of exit by 0.002 which is equivalent to a 7.8% decrease in exit likelihood.

Overall, our findings in this section suggests that the improved disclosure quality during the lockdown period had material economic consequences. In particular, firms that strategically communicated financial information to outside investors experienced less analyst forecast dispersion and were more likely to survive during COVID-19.

5 Robustness Checks

We conduct an analysis to corroborate the main findings. We find that firms choose to improve their disclosure quality when the physical mobility is severely restricted.

5.1 Excluding States with No Lockdown Mandates

In our first set of robustness tests, we narrow down the control firms by excluding states that never issued lockdown mandates during the sample period. We compare firms required to prepare and file their annual reports under SAH orders to those that happened to file either immediately before the implementation of SAH orders or after their termination. We make use of the fact that the fiscal quarter-end dates are predetermined, and the timing of the quarter-end date determines whether a firm must file under SAH orders. Our identification assumption is that as long as the quarter-end schedules are not planned in anticipation of the timing of the SAH orders, our estimation strategy isolates the effects of disclosure during the lockdown. We present the results in Table 7. The results show that the findings remain robust even after we further balance the sample.

5.2 Comparison to Neighboring States

We proceed to refine our set of control firms by considering those located in neighboring states. As adjacent states tend to have similar economic conditions, we can compare the disclosure quality of firms with comparable local economic environments, except for the differences in stay-at-home order mandates. We present the results in Table 8. By contrasting firms in neighboring states, we assess the differential impacts of disclosure during the lockdown period. Our analysis shows that the primary results are both quantitatively and qualitatively consistent.

5.3 Within State-Year-Quarter Variations

Finally, we incorporate state-year-quarter fixed effects in the estimation model to account for the time-varying state-specific economic conditions. We report the results in Table 9. We find that within the same state-year-quarter, the disclosure quality is higher for firms with high intangibility, R&D, and payables or receivables when firms were required to prepare and file their disclosure document during SAH orders. This suggests that these firms enhanced their disclosure quality under SAH orders, making it unlikely that changes in disclosure quality are driven by differences in state-level local conditions during the pandemic.

5.4 Dynamics of the Effects

Our identification assumption for the DiD setting is that in the absence of the COVID-19 mobility restrictions, the average DQ measure for firms that filed under mandated SAH orders (Treated) and firms that filed outside of the SAH lockdown period (Control) would have followed parallel paths over time. To check the parallel trend assumptions, we investigate the dynamics of firms' DQ surrounding the mobility shocks driven by SAH orders.

We present the results in Table 10. To test whether this is the case, we regress the firm's DQ on indicator variables denoting whether a firm filed under the SAH order in each of the current and the previous three quarters. Pre^4 , Pre^3 , Pre^2 , and Pre^1 are dummy variables indicating whether it is four, three, two, and one quarters before a firm's filing of disclosure document was hit by an SAH order, respectively. *Disclose in Lockdown* indicates a firm filed under SAH order in the current quarter. *Disclose in Lockdown*¹ is an indicator measuring whether the firm filed disclosure documents under the SAH order shock in the previous quarter.

The results show that no effect on firms' DQ is found prior to the Covid-19 mobility shock. This confirms that the change in DQ does not capture preexisting differences between firms hit by SAH order shocks and firms not hit by SAH order shocks that are unrelated to the mobility restrictions of SAH orders, and it is likely to be caused by the mobility shock due to SAH mandates.

6 Conclusion

We investigate whether and how the limited soft information sharing during the Covid-19 lockdown period impacted firms' decisions to voluntarily disclose hard information. We hypothesize that with the reduced social mobility during the lockdown, information agents are constrained in their ability to disseminate soft information about firms to external investors. Under such circumstances, we expect firms to be more likely to voluntarily disclose granular information on their operations.

We employ the disclosure quality measure from Chen, Miao, and Shevlin (2015) to capture disaggregation levels of accounting items in financial reports. Our findings show that firms whose quarterly reporting dates fall into the lockdown period (Treated) increase their hard information disclosure. Relative to the firms in the same state without such reporting requirements during the lockdown period (Control), treated firms disclose more financial accounting

information about items that are generally perceived more difficult for external investors to comprehend, such as intangible assets, R&D activities, and accrual accounts. Firms that need external funding during the lockdown period are also more likely to disclose these items in order to demonstrate their long-term commitment to the outside investors.

We show that this responsive information disclosure policy is effective in helping firms enjoy more accurate future earnings forecasts by sell-side analysts, thereby increasing survival likelihood in the postlockdown period. Overall, our results suggest that soft information subject to social networks and geographic proximity versus hard information verifiable without social interactions, are viable substitutes under the conditions of severe information asymmetry. Strategic disclosure by firms appears key to success during time of increasing economic uncertainty and information frictions.

Our work contributes to the literature on information friction and corporate financial policies, which highlights the significant home bias and limited economic transactions that result from severe information asymmetry. We show that corporate disclosure policy, when it is interactive with the external information environment, could alleviate such friction. It empowers firms to maintain access to external capital markets through the support of external information agents to more accurately predict firms' operations using valuable, strategically fed hard information. In this regard, we provide novel evidence that soft information can be effectively substituted by hard information when the overall information quality is poor and its quantity is scarce.

We further show that such close communication between firms and capital markets could lead to efficient financing and firm survival in the long run. For example, firms that have aggressively invested in long-term innovative projects and therefore could suffer from weak near-term earnings could continue their innovative activities by gaining external investor support. If no other external validators of their inside information exist (e.g., Big 4 auditors and sophisticated institutional investors), their own discretion to disclose a finer breakdown of their operations would help alleviate adverse selection by outsiders. This eventually strengthens firms' competitive position in product markets.

Using the sharp SAH order as a novel identification strategy, we also uncover novel impacts of the COVID-19 pandemic on the overall U.S. economy. By focusing on the firms' strategic reactions to the COVID-19 pandemic, we are the first to identify strategic disclosure changes in the U.S. corporate sector and capital markets caused by the exogenous global health shock, which is a novel result that has been unaddressed by contemporaneous research on COVID-

19's impact on corporate finance and valuation. In subsequent research, we hope to evaluate the broader impact of these findings by extending these analyses to capital markets and firms around the globe.

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Figure 1: Duration of Covid-19 Stay-at-home Lockdown Mandatory Order by State
 This figure shows a map of the duration of COVID-19 stay-at-home lockdown mandatory orders by state.

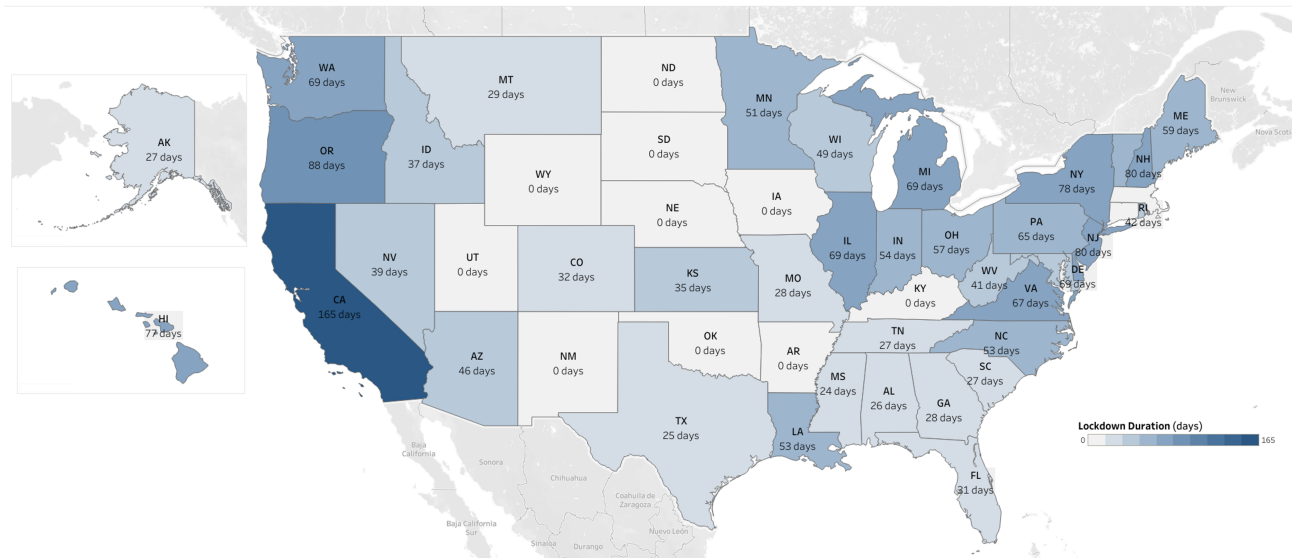
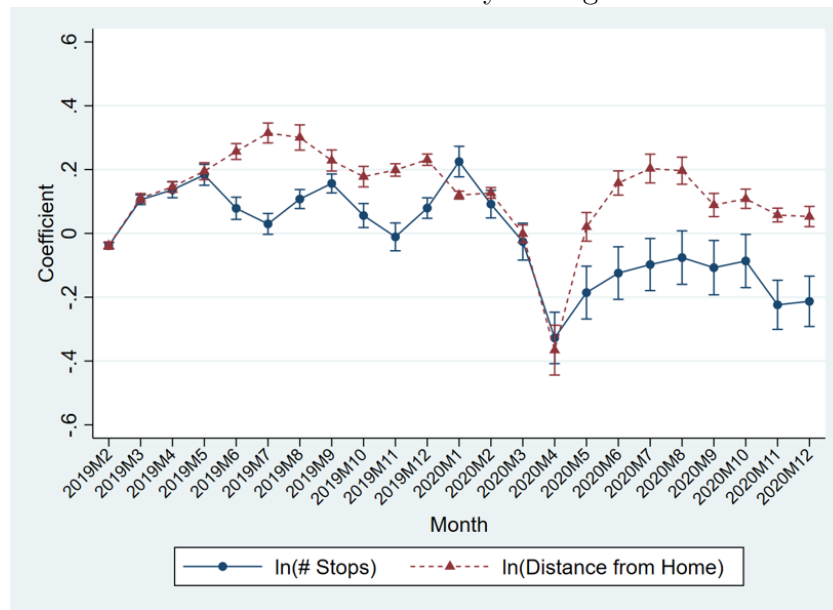


Figure 2: Mobility Change after Stay-at-home Lockdown Order

These figures show the changes in social mobility after COVID-19 lockdown orders. We obtain from Safegraph monthly data on social mobility on the number of stops in the area and average distance from home of the devices visiting in the area at the census block group level from January 2019 to December 2020 from Safegraph. Panel A plots the monthly log change in the number of stops and the distance from home (baseline = January 2019) from a regression with census-block-group fixed effects. Panel B plots the log change in the number of stops as in Panel B but separately for states with lockdown duration less than 30 days and the others with lockdown duration longer than 20 days.

Panel A. Mobility Change



Panel B. Mobility Change by Lockdown Duration

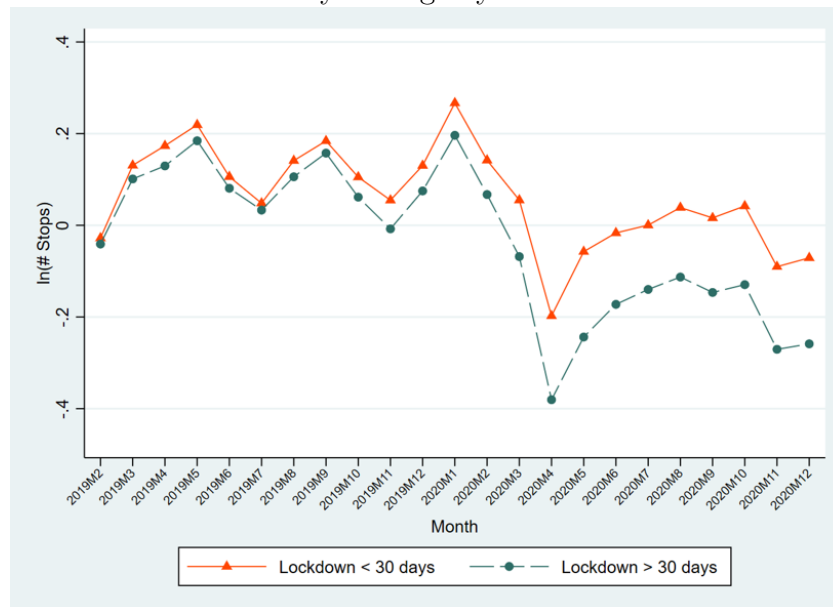


Figure 3: Proportion of Firms Affected by Covid-19 Stay-at-home Lockdown Mandatory Order

This figure shows a map of the distribution of firms that had to prepare their quarterly filings under a state's mandatory COVID-19 stay-at-home lockdown mandatory orders in the first quarter of 2020.

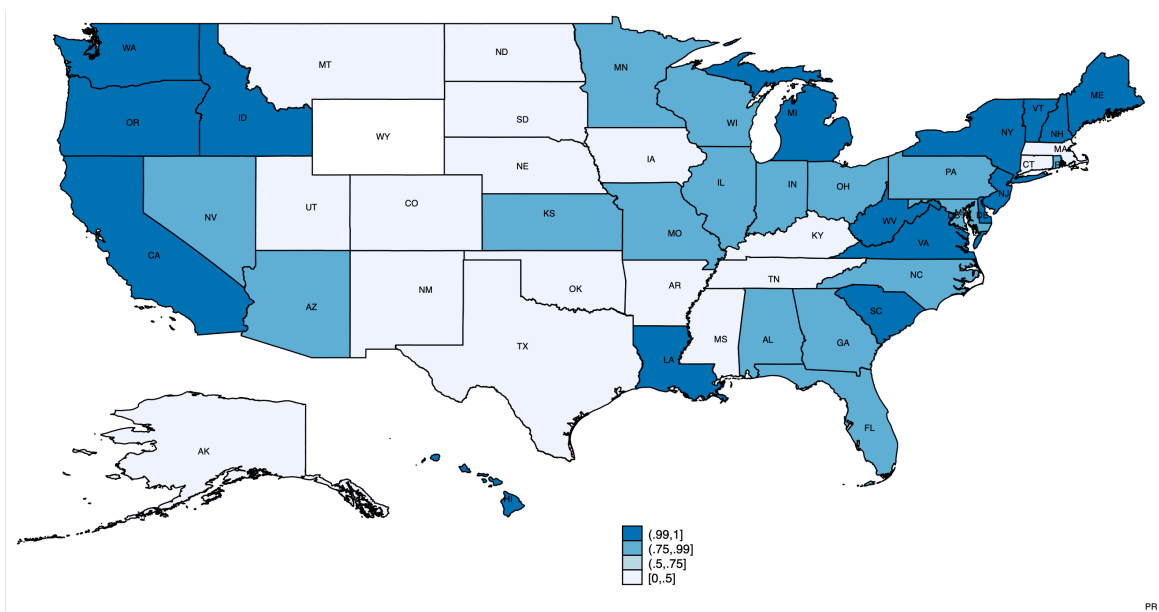


Table 1: Summary Statistics

We report summary statistics for the sample of firm- year-quarter observations from the first quarter of 2019 to the fourth quarter of 2020. We report the variable construction in Appendix B.

	(1)				
	mean	sd	p10	p50	p90
DQ	0.8426	0.1600	0.4802	0.9017	0.9678
Tangibility	0.2220	0.2459	0.0103	0.1253	0.6505
R&D	0.0141	0.0355	0.0000	0.0000	0.0438
Size	6.9320	2.2942	3.7159	7.1485	9.7409
Leverage	0.4393	0.5822	0.0279	0.4157	0.8721
Q	1.8275	1.2629	0.9244	1.3326	3.4705
ROE	-0.0287	0.1517	-0.0979	0.0028	0.0299
Ext Fin	0.0206	0.1008	-0.0279	-0.0000	0.0660
WW	-0.3172	0.1203	-0.4691	-0.3262	-0.1503
HP	-3.6959	0.8472	-4.8234	-3.6671	-2.6828
Accounts Payable (AP)	2.2505	5.6599	0.0202	0.0832	14.4206
Accounts Receivable (AR)	1.9964	4.8823	0.0386	0.1643	12.0502
Equity Dependence	2.8547	11.2266	0.0000	0.0938	4.9429
GWIDQ	0.4945	0.5000	0.0000	0.0000	1.0000
R&D DQ	0.4502	0.4975	0.0000	0.0000	1.0000
OPEX DQ	0.7039	0.1707	0.4000	0.8000	1.0000
CurrLiab DQ	0.8778	0.1681	0.5000	1.0000	1.0000
AR DQ	0.8278	0.3775	0.0000	1.0000	1.0000
Disclose in Lockdown	0.1099	0.3128	0.0000	0.0000	1.0000
Observations	26185				

Table 2: Heterogeneous Effects of Lockdown on Disclosure Quality - Asset, Investment, and Sales Opacity

The table presents the differential effects of firm characteristics on the response of disclosure quality to lockdown constraints. We examine the differential effects of asset, investment, and sales opacity. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. Column (1) presents the effects of lockdown on firm-level quarterly disclosure quality. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	DQ	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0023*** (3.51)	0.0073*** (11.34)	0.0018** (2.43)	0.0008 (1.05)	0.0008 (1.07)
Disclose in Lockdown×Tang		-0.0255*** (-8.28)			
Disclose in Lockdown×R&D			0.0258** (2.46)		
Disclose in Lockdown×AP				0.0004*** (4.42)	
Disclose in Lockdown×AR					0.0006*** (6.92)
Tang		-0.0205 (-1.34)			
R&D			-0.0037 (-0.20)		
AP				-0.0004 (-1.38)	
Receivable					-0.0011*** (-3.27)
Size	-0.0011 (-0.85)	-0.0008 (-0.60)	-0.0011 (-0.82)	-0.0024 (-1.62)	-0.0021 (-1.43)
Q	0.0006 (0.90)	0.0006 (0.97)	0.0006 (0.97)	0.0005 (0.61)	0.0004 (0.50)
Leverage	0.0000 (0.00)	0.0000 (0.03)	0.0002 (0.18)	-0.0007 (-0.81)	-0.0007 (-0.82)
Observations	22973	22461	22856	21028	20940
R-Squared	0.9585	0.9593	0.9588	0.9618	0.9620
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes	Yes

Table 3: Response of Different Parts of the DQ

The table presents the differential effects of lockdown on specific parts of disclosure quality depending on firm characteristics. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. *GWIDQ* is DQ measured for the parts of the disclosure of impairment of pretax goodwill. *R&D DQ* is DQ measured for the parts of the disclosure of research and development expenses. *OPEX DQ* is DQ measured for the parts of disclosure of operating expenses. *CurrLiab* is DQ measured for the parts of disclosure of current liabilities. *AR DQ* is DQ measured for the parts of disclosure of debt in trade receivables. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	GWIDQ	R&D DQ	OPEX DQ	Curr Liab DQ	AR DQ
Disclose in Lockdown	0.0112 (1.41)	0.0024 (0.34)	0.0034 (1.05)	-0.0006 (-0.38)	0.0002 (0.13)
Disclose in Lockdown×Tang	-0.0445* (-1.81)				
Disclose in Lockdown×R&D		0.0940** (2.06)	0.0692** (2.48)		
Disclose in Lockdown×AP				0.0011*** (4.29)	
Disclose in Lockdown×AR					0.0002** (2.62)
Tang	0.4727*** (7.34)				
R&D		0.9925*** (3.54)	0.2393*** (3.33)		
AP				-0.0004 (-0.90)	
Receivable					-0.0016* (-1.75)
Size	-0.0147 (-0.70)	0.0069 (1.45)	-0.0040 (-1.09)	-0.0021 (-0.77)	-0.0018 (-0.59)
Q	-0.0065 (-0.90)	0.0025 (0.93)	0.0005 (0.36)	-0.0005 (-0.65)	0.0011 (1.14)
Leverage	-0.0014 (-0.16)	-0.0017 (-0.57)	0.0013 (0.63)	-0.0005 (-0.51)	-0.0014 (-1.59)
Observations	22461	22856	22856	21028	20940
R-Squared	0.4902	0.9140	0.8624	0.9013	0.9630
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes	Yes

Table 4: Differential Effects of External Financing Needs

The table presents the differential effects of lockdown on disclosure quality depending on firms' profitability and needs for external financing. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. *ExtFin* is the amount of net equity and net debt issuance. *WW* is the Whited Wu financial constraint measure. *HP* is a financial constraint measure based on size and age. *Equity Dep* is the proportion of capital investment and R&D expenses financed by equity financing. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
	DQ	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0017** (2.53)	0.0029*** (4.19)	0.0051*** (3.31)	0.0152*** (4.91)	0.0031*** (4.01)
Disclose in Lockdown×ROE	-0.0117** (-2.10)				
Disclose in Lockdown×Ext Fin		0.0086** (2.11)			
Disclose in Lockdown×WW			0.0104** (2.56)		
Disclose in Lockdown×HP				0.0035*** (4.46)	
Disclose in Lockdown×Equity Dependence					0.0002*** (3.84)
ROE	0.0151*** (4.50)				
Ext Fin		-0.0059** (-2.16)			
WW			-0.0013 (-0.11)		
HP				-0.0021 (-0.38)	
Equity Dependence					-0.0001 (-1.56)
Size	-0.0015 (-1.05)	-0.0004 (-0.19)	-0.0018 (-1.19)	-0.0009 (-0.62)	-0.0000 (-0.01)
Q	0.0006 (0.93)	0.0013 (1.42)	0.0002 (0.31)	0.0008 (1.20)	0.0013 (1.33)
Leverage	0.0001 (0.06)	0.0002 (0.16)	-0.0005 (-0.64)	0.0000 (0.01)	0.0002 (0.17)
Observations	22671	19790	20246	22646	19076
R-Squared	0.9605	0.9567	0.9576	0.9593	0.9623
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes	Yes

Table 5: Differential Effects of Information Environment

The table presents the differential effects of lockdown on disclosure quality depending on firms' external information environment. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. *IO* is the proportion of institutional ownership. *IONon – transient* is the proportion of dedicated institutional stockholders and indexers. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0027*** (3.73)	0.0047*** (4.61)	0.0052*** (3.61)	0.0055*** (3.98)
Disclose in Lockdown×Ind Leaders	-0.0057*** (-2.74)			
Disclose in Lockdown×Big 4		-0.0040*** (-2.98)		
Disclose in Lockdown×IO			-0.0054** (-2.01)	
Disclose in Lockdown×IO - Nontransient				-0.0077** (-2.31)
Ind Leaders	-0.0048 (-0.91)			
Big 4		0.0057*** (3.28)		
IO			-0.0024* (-1.95)	
IO - Nontransient				-0.0030* (-1.91)
Size	-0.0011 (-0.83)	-0.0011 (-0.88)	0.0003 (0.22)	0.0005 (0.29)
Q	0.0006 (0.96)	0.0006 (0.96)	0.0003 (0.48)	0.0003 (0.49)
Leverage	0.0000 (0.00)	-0.0000 (-0.00)	-0.0005 (-0.49)	-0.0005 (-0.44)
Observations	22953	22953	20110	20110
R-Squared	0.9586	0.9586	0.9609	0.9609
Firm FE	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes

Table 6: Effects of Disclosure Quality on Analysts' Forecast Accuracy and Firm-level Survival

The table presents the economic consequences of enhanced disclosure quality on analysts' forecast accuracy and firm-level survival. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Forecast Accuracy		Survival	
	(1) Dispersion	(2) Dispersion/Price	(3) Exit in 2021	(4) Exit in 2021
Disclose in Lockdown \times DQ	-0.1184*** (-4.12)	-0.0055*** (-4.12)		
DQ	0.0031 (0.08)	0.0010 (0.43)	-4.3804** (-2.32)	-4.8637** (-2.47)
Disclose in Lockdown	0.0841*** (3.25)	0.0029** (2.25)		
Num of Analysts	-0.0121 (-1.24)	-0.0002 (-0.44)		
Size	0.0024 (0.15)	-0.0027*** (-5.18)	-0.1632*** (-3.87)	-0.1931*** (-4.79)
Leverage	0.0465** (2.59)	0.0021** (2.59)	-0.4701 (-0.89)	-0.3422 (-0.65)
Current Asset Ratio			-0.4548 (-0.85)	-0.3392 (-0.65)
Net Income			-0.0199*** (-3.39)	-0.0148*** (-2.90)
Q	0.0149** (2.30)	-0.0011*** (-3.80)		-0.1326 (-1.26)
Observations	15953	15845	2358	2102
R-Squared	0.4970	0.6376	0.1259	0.1247
Firm FE	Yes	Yes		
Year-Qtr FE	Yes	Yes		
Ind FE			Yes	Yes
State Cluster	Yes	Yes	Yes	Yes

Table 7: Robustness - Excluding Never Lockdown States

The table presents the differential effects of firm characteristics on the response of disclosure quality to lockdown constraints using an alternative sample. We exclude states that never issued stay-at-home orders. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0076*** (9.96)	0.0021** (2.65)	0.0011 (1.48)	0.0011 (1.50)
Disclose in Lockdown×Tang	-0.0255*** (-8.29)			
Disclose in Lockdown×R&D		0.0253** (2.41)		
Disclose in Lockdown×AP			0.0005*** (4.69)	
Disclose in Lockdown×AR				0.0006*** (7.19)
Tang	-0.0180 (-1.02)			
R&D		0.0046 (0.23)		
AP			-0.0005** (-2.24)	
AR				-0.0013*** (-4.16)
Size	-0.0002 (-0.12)	-0.0006 (-0.41)	-0.0018 (-1.14)	-0.0016 (-0.98)
Q	0.0006 (0.81)	0.0005 (0.73)	0.0000 (0.02)	-0.0000 (-0.04)
Leverage	0.0011 (1.16)	0.0013 (1.08)	0.0001 (0.12)	0.0001 (0.11)
Observations	19591	19927	18471	18390
R-Squared	0.9591	0.9585	0.9615	0.9617
Firm FE	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes

Table 8: Robustness - Only Adjacent States

The table presents the differential effects of firm characteristics on the response of disclosure quality to lockdown constraints using an alternative sample. We keep states that are adjacent to states that are under stay-at-home orders. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0075*** (10.23)	0.0022** (2.48)	0.0013 (1.64)	0.0013* (1.77)
Disclose in Lockdown×Tang	-0.0251*** (-6.86)			
Disclose in Lockdown×R&D		0.0247** (2.34)		
Disclose in Lockdown×AP			0.0004*** (3.99)	
Disclose in Lockdown×AR				0.0005*** (6.61)
Tang	-0.0217 (-1.24)			
R&D		-0.0111 (-0.58)		
AP			-0.0003 (-0.97)	
AR				-0.0010** (-2.69)
Size	-0.0009 (-0.69)	-0.0012 (-0.84)	-0.0021 (-1.32)	-0.0021 (-1.39)
Q	0.0007 (1.02)	0.0006 (0.96)	0.0006 (0.64)	0.0005 (0.49)
Book Leverage	0.0002 (0.20)	0.0005 (0.35)	-0.0006 (-0.57)	-0.0007 (-0.60)
Observations	17936	18254	16600	16518
R-Squared	0.9686	0.9683	0.9706	0.9708
Firm FE	Yes	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes

Table 9: Robustness - Alternative Specifications

The table presents the within state-year-quarter estimates of differential effects of firm characteristics on the response of disclosure quality to lockdown constraints. *Disclose in Lockdown* is an indicator that takes a value of one when a firm has to prepare their disclosure filing during the state-wide stay-at-home mandates. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	DQ	DQ	DQ	DQ
Disclose in Lockdown	0.0055 (1.45)	-0.0015 (-0.41)	-0.0014 (-0.41)	-0.0028 (-0.72)
Disclose in Lockdown×Tang	-0.0258*** (-8.29)			
Disclose in Lockdown×R&D		0.0256** (2.34)		
Disclose in Lockdown×AP			0.0004*** (4.46)	
Disclose in Lockdown×AR				0.0006*** (7.25)
Tang	-0.0223 (-1.44)			
R&D		-0.0080 (-0.44)		
AP			-0.0004 (-1.43)	
AR				-0.0011*** (-3.39)
Size	-0.0004 (-0.27)	-0.0007 (-0.51)	-0.0017 (-1.18)	-0.0016 (-1.06)
Q	0.0005 (0.78)	0.0005 (0.78)	0.0005 (0.59)	0.0004 (0.44)
Leverage	0.0000 (0.01)	0.0002 (0.17)	-0.0009 (-0.95)	-0.0009 (-0.95)
Observations	22461	22856	21028	20940
R-Squared	0.9594	0.9589	0.9618	0.9621
Firm FE	Yes	Yes	Yes	Yes
State-Year-Qtr FE	Yes	Yes	Yes	Yes
State Cluster	Yes	Yes	Yes	Yes

Table 10: DQ Dynamics

We investigate the dynamics of firms' *DQ* surrounding the mobility shocks driven by stay-at-home orders. Pre^4 , Pre^3 , Pre^2 , and Pre^1 are dummy variables indicating whether it is four, three, two, or one quarters before a firm was hit by a stay-at-home order, respectively. *Disclose in Lockdown* indicates that a firm filed under a stay-at-home order in the current quarter. *Disclose in Lockdown*¹ is an indicator measuring whether the firm filed its financial statements under the mandated SAH order in the previous quarter. The standard errors are adjusted for clustering at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	DQ	DQ	DQ	DQ
Pre^4	0.0002 (0.15)	0.0003 (0.15)	0.0006 (0.36)	0.0007 (0.40)
Pre^3	0.0014 (1.24)	0.0012 (0.98)	0.0017 (1.53)	0.0016 (1.34)
Pre^2	-0.0003 (-0.37)	-0.0005 (-0.47)	-0.0001 (-0.09)	-0.0002 (-0.20)
Pre^1	-0.0001 (-0.10)	0.0000 (0.07)	-0.0003 (-0.34)	-0.0001 (-0.18)
Disclose in Lockdown	0.0015* (1.99)	0.0014* (1.80)	0.0018** (2.59)	0.0017** (2.42)
Disclose in Lockdown ¹	0.0017** (2.49)	0.0016** (2.51)	0.0019*** (3.02)	0.0019*** (3.10)
Size	0.0007 (0.57)	0.0009 (0.76)	0.0008 (0.64)	0.0011 (0.86)
Q	0.0008 (1.40)	0.0008 (1.41)	0.0006 (1.03)	0.0006 (1.03)
Leverage	-0.0003 (-0.26)	-0.0003 (-0.25)	0.0006 (0.45)	0.0006 (0.45)
Fiscal Year-end	0.0244*** (18.48)	0.0244*** (18.47)	0.0252*** (16.62)	0.0251*** (16.58)
Observations	26564	26564	23184	23184
R-Squared	0.9597	0.9597	0.9593	0.9593
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes		Yes	
State-Year FE		Yes		Yes
State Cluster	Yes	Yes	Yes	Yes

Appendix A

Table A1: Changes in Mobility during the COVID-19 Lockdown Period

This table describes the effect of COVID-19 lockdown orders on social mobility measures, using the census-block-group-month panel during the period of January, 2018 – April, 2021. The estimates are from OLS regressions, where the dependent variable is the log number of the stops in columns 1 and 2 and the log number of the distance from home of the devices visiting the area in columns 3 and 4. All regressions include year, month, and census-block-group fixed effects. We report coefficient estimates and their t -statistics. Standard errors are clustered at the state level. * $p < .1$; ** $p < .05$; *** $p < .01$

Dependent Var.	(1) Ln(# Stops)	(2) Ln(# Stops)	(3) Ln(Distance from home)	(4) Ln(Distance from home)
Lockdown	-0.383*** (-5.77)	-0.281*** (-9.84)	-0.318*** (-5.58)	-0.164*** (-10.39)
Observations	8,827,031	8,827,030	8,822,219	8,822,209
R-squared	0.0234	0.890	0.0138	0.854
Year FE	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes
CBG FE	No	Yes	No	Yes
State cluster	Yes	Yes	Yes	Yes

Appendix B: Variable construction

- *Size* is the natural logarithm of total assets (atq)
- R&D is research and development spending (xrd) divided by beginning-of-the-year book value of assets (at).
- *Tangibility* is the value of plant property and equipment ($ppent$) scaled by total assets.
- *AR* is receivables ($rect$) scaled by (annualized) sales ($sale * 4$).
- *AP* is payables (apq) scaled by (annualized) sales ($sale * 4$).
- *ROE* is net income scaled by beginning-of-the-quarter stockholder equity (seq).
- *Tobin's Q* is defined as the market-to-book ratio, where the numerator equals the market value of equity ($prcc * csho$) plus the book assets (at) minus the sum of the book value of common equity (ceq) and deferred taxes and investment credit ($txdb$), and the denominator is $(0.9 * \text{book value of assets } (at) + 0.1 * \text{market value of assets})$ (Duchin, Ozbas, and Sensoy (2010)).
- *GWIDQ* is disclosure quality measured for the parts of the disclosure of impairment of pretax goodwill.
- *R&D DQ* is disclosure quality measured for the parts of the disclosure of research and development expenses.
- *OPEX DQ* is disclosure quality measured for the parts of disclosure of operating expenses.
- *CurrLiab DQ* is disclosure quality measured for the parts of disclosure of current liabilities - total.
- *ARDQ* is disclosure quality measured for the parts of disclosure of debt in trade receivables.
- *Leverage* is the ratio of total debts ($dltt + dlc$) to the sum of total debts and the book value of equity ($dlc + dltt + ceq$).

- *Ext Fin* is the ratio of net issuance (sum of net equity issuance ($sstk - prstk$) and net debt issuance ($dltis - dltr$)) to total assets (at).
- Equity dependence (*Equity Dep*) is defined as the ratio of the net amount of equity issued (sale of common and preferred stock ($sstk$)-purchase of common and pref. stock ($prstk$)) to the sum of capital expenditures ($capx$) and research and development expenses (xrd).
- Whited-Wu (2006) index $= -0.091*cf - 0.062*divpos + 0.021*tltd - 0.044*size + 0.102*isg - 0.035*sg$, where cf denotes the ratio of cash flow to total assets; $divpos$ is an indicator that takes a value of one if the firm pays cash dividends; $tltd$ is the ratio of the long-term debt to total assets; $size$ is the value of the natural logarithm of total assets; isg is the firm's three-digit sic industry sales growth; and sg is firm sales growth (Whited and Wu (2006)).
- HP index $= (0.737 size) + (0.043 size^2) - (0.040 age)$, where $size$ equals the value of the natural logarithm of total assets, and age is the number of years the firm has been listed since it first appeared on Compustat. $size$ is capped at (the log of) \$4.5 billion, and age is capped at 37 years (Hadlock and Pierce (2010)).
- *IO* is the proportion of institutional ownership.
- *IO Non – transient* is the proportion of ownership held by dedicated institutional stockholders and indexers.