Corporations and COVID-19 in the Workplace*

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Abstract

Using novel workplace COVID infection data, we document large variation in workplace infection rates across industries, firms, and establishments. Firms with higher infection rates experienced larger declines in operating performance in 2020. An employer's 2020 workplace infection rate is positively related to its pre-pandemic workplace injury rate, even across establishments within a firm, but unrelated to financing constraint measures. We conduct extensive tests to allay concerns that unobserved differences across employers drive the COVID - injury rate relation. Firms with higher pre-pandemic injury rates also experienced more COVID-related employee complaints and larger stock price declines early in the pandemic.

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Abstract

Using novel workplace COVID infection data, we document large variation in workplace infection rates across industries, firms, and establishments. Firms with higher infection rates experienced larger declines in operating performance in 2020. An employer's 2020 workplace infection rate is positively related to its pre-pandemic workplace injury rate, even across establishments within a firm, but unrelated to financing constraint measures. We conduct extensive tests to allay concerns that unobserved differences across employers drive the COVID - injury rate relation. Firms with higher pre-pandemic injury rates also experienced more COVID-related employee complaints and larger stock price declines early in the pandemic.

The arrival of COVID-19 in 2020 represented an unprecedented economic shock to businesses throughout the world. In addition to distorting demand, disrupting supply chains, and dislocating capital markets, COVID-19 represented a novel workplace safety hazard — one that is invisible, contagious, and impervious to firm boundaries. While many white collar workers are able to work remotely, most workers require physical presence to perform their jobs. The continued presence of workers in factories, warehouses, medical facilities, and stores throughout the pandemic has exposed these workers and their employers to COVID-19 as a workplace safety threat. Yet, the scope and impact of this threat remain almost completely unexplored. Understanding the impact of COVID in the workplace is crucial for businesses and policymakers still grappling with this pandemic and preparing for future epidemics, which appear increasingly likely (Dodds, 2019; Marani et al., 2021).

This paper introduces novel U.S. establishment-level workplace COVID infection data and uses it to answer three questions. What types of businesses (and workers) faced the greatest workplace infection risk early in the pandemic? Within similar types of business, what made some businesses better able to limit workplace infections? What were the implications of infection rates for operating performance? We conclude that (i) the healthcare industry faced the greatest exposure but agriculture and retail also had high workplace COVID rates, (ii) Blacks and women faced greater exposure than other groups, (iii) overall workplace safety capabilities entering the pandemic were more important for limiting workplace infections than ability to finance investment, (iv) firms with higher infection rates experienced larger declines in profitability and growth, and (v) the stock market priced in the benefit of workplace safety capabilities to firms early in the pandemic. These last three conclusions suggest that one benefit of building workplace safety capabilities during normal times is added resilience to the threat of an unexpected epidemic disease in the workplace.

Our data comes from the Occupational Safety and Health Administration's (OSHA's) Injury Tracking Application (ITA) database, which contains establishment-year records of

work-related employee injuries and illnesses. In 2020, these records covered almost 300,000 unique establishments in the U.S. employing 73 million employees, or nearly half of the U.S. workforce. While the ITA database does not include records of documented workplace COVID infections *per se*, it does provide a close approximation. In April 2020, OSHA ordered employers to record work-related COVID infections in the "respiratory condition" illness category. While other workplace injuries and illnesses declined in 2020, reported respiratory conditions increased from less than 6,000 per year before 2020 to over 200,000 in 2020, suggesting that respiratory conditions in 2020 measure workplace COVID infections with minimal noise.[1] We measure an establishment's 2020 workplace COVID infection rate as its reported 2020 respiratory conditions per 100 full-time equivalent (FTE) employees.

We begin by analyzing variation in 2020 workplace COVID rates across industries. The highest rate by far occurs in the Health Care and Social Assistance sector (NAICS 62), followed by Agriculture, Forestry, Fishing, and Hunting (NAICS 11) and Retail Trade (NAICS 44-45). More generally, 2020 workplace infection rates are higher in industries characterized by greater worker physical proximity, less unionized industries, and officially-designated "essential" industries allowed to continue operating during lockdowns. The variation with unionization could indicate that workers with more bargaining power were able to force employers to take more steps to mitigate COVID risk and/or that the presence of unions made it easier for employers to get workers to buy into the necessary steps to mitigate COVID risk. We also find that imputed workplace COVID rates are 30-40% higher for Blacks than for other races/ethnicities and twice as high for women as for men.[2]

While cross-industry (6-digit NAICS code) variation in workplace COVID rates is substantial, within-industry variation is more than three times as large, suggesting that, even

[1]Notably, reported work-related deaths nearly doubled from 2019 to 2020, and injuries and illnesses requiring days away from worked increased by one-third.

[2]The ITA data does not contain demographic information, so we impute exposures using information about the demographic characteristics of workers at the industry level from the U.S. Census Bureau's Current Population Survey.

among similar businesses, some were significantly better at limiting the spread of COVID-19 in the workplace than others. We consider two broad explanations for these differences. The first is that some businesses were less willing to sacrifice earnings to protect workers and the community than others. The second is that some businesses were better prepared to mitigate workplace COVID infection risk, allowing them to avoid costs associated with COVID outbreaks, remediation, absenteeism, shutdown risk and poor morale. The first explanation generally predicts a positive relationship between 2020 operating performance and COVID rate, while the second generally predicts a negative relationship.

Suggesting that the second explanation is more important than the first, profitability and sales both declined more in 2020 for firms with higher workplace COVID infection rates. For example, a one-standard deviation higher firm-level 2020 COVID workplace infection rate is associated with a 0.92 percentage point larger decline in return-on-assets (46% of the mean decline) and 1.50 percentage point larger decline in sales (25% of the mean decline), controlling for observables and industry fixed effects. In a placebo test, we find that 2020 workplace COVID rates do not explain changes in operating performance from 2018 to 2019 or from 2017 to 2018. These findings point towards differences in preparedness being more important than differences in the way firms trade off profitability and worker well-being in driving within-industry variation in workplace COVID rates.

We next investigate two factors that may have better prepared some businesses to mitigate workplace COVID infection risk than others — workplace safety capabilities at the onset of the pandemic and capacity to finance investment in COVID mitigation. The motivation for the former is that every business has a complex architecture of policies, procedures, practices, and culture that determines its ability to manage workplace safety risk in the course of normal operations. Much of this architecture, which one can think of as a form of organizational capital, is not specific to any particular type of safety risk and is therefore likely to affect a business's ability to manage workplace COVID risk as well. Moreover, like other

forms of organizational capital, safety capabilities may be difficult to adjust quickly, making capabilities at the onset of the pandemic important. The motivation for the latter is the long literature in finance on the effects of financing constraints on investment. We use a firm's or establishment's pre-pandemic (2016-19) workplace injury rate (excluding respiratory conditions) as a proxy for its workplace safety capabilities entering the pandemic and several standard measures of a firm's financing constraints as (inverse) proxies for its capacity to finance investment.

Controlling for industry fixed effects and other observables, firms with higher pre-pandemic workplace injury rates experienced significantly higher 2020 workplace COVID rates. In contrast, there is no evidence of a relationship between 2020 workplace COVID rate and financing constraint proxies. There are two potential explanations for this lack of relationship. The first is that investment in mitigation takes time to become effective and therefore that capacity to finance investment in mitigation does not affect 2020 workplace COVID rates. The second is that firms willing to invest in COVID mitigation were willing to forgo other forms of investment if necessary rather than forgo investment in COVID mitigation. Regardless, the results suggest that differences in workplace safety capabilities entering the pandemic are important in explaining why some firms were better positioned to mitigate workplace COVID risk in 2020 than others.

We further analyze the importance of workplace safety capabilities by examining the relationship between 2020 workplace COVID rate and pre-pandemic workplace injury rate at the *establishment* level, controlling for establishment-specific 6-digit NAICS code industry fixed effects, 3-digit establishment zip code location fixed effects, establishment size, and hours worked per employee. Confirming the conclusions of our firm-level analysis, a one-standard deviation higher pre-pandemic workplace injury rate is associated with a 10.5% higher workplace 2020 COVID infection rate relative to the sample mean. Moreover, this relationship continues to hold without weakening when we control for *firm* fixed effects,

suggesting that establishment-level workplace safety capabilities are important in explaining 2020 workplace COVID cases and helping rule out the possibility that an omitted firm-level variable, such as corporate culture (Li et al., 2021), drives the relationship between workplace COVID infections and pre-pandemic workplace injury rate.

We present several pieces of evidence that validate our interpretation of workplace COVID rate - injury rate relationship. First, the relationship is positive in eight of nine broad industry categories and statistically significant in seven of those eight, suggesting that the relationship is pervasive across industries. Second, the relationship is stronger in industries characterized by greater physical work proximity, where the ability to mitigate COVID risk should be more important. Third, the relationship is, if anything, slightly stronger in relatively homogeneous industries, allaying concerns that even 6-digit NAICS industry fixed effects are too coarse to capture differences in the nature of operations that may drive the relationship. Fourth, the relationship is more than 30 times larger than the relationship between pre-pandemic workplace injury rate and respiratory conditions in any of the years 2016-2019. Fifth, COVID-related complaints to OSHA by employees are also positively related to pre-pandemic workplace injury rate, allaying concerns that the workplace COVID rate - injury rate relationship simply reflects differences in reporting practices.

Finally, we analyze stock returns to investigate whether investors anticipated the role of workplace safety capabilities in allowing firms to mitigate workplace COVID risk. Firms with higher pre-pandemic workplace injury rates experienced larger abnormal stock price declines and larger increases in idiosyncratic return volatility in the period between February 24, 2020, when Italy first announced a lockdown, and April 7, 2020, when the final U.S. state implemented a lockdown. A one-standard deviation higher pre-pandemic workplace injury rate is associated with a 2.4 percentage point lower abnormal return during this period - a relative decline that largely persists in subsequent months as the market recovers.

An emerging finance literature has explored various factors that made organizations re-

silient to the COVID-19 pandemic. Recent papers find smaller stock price declines early in the pandemic for firms with stronger finances (Ramelli and Wagner, 2020; Ding et al., 2021; Fahlenbrach et al., 2021), lower institutional ownership (Glossner et al., 2020), better environmental and social ratings (Albuquerque et al., 2020), and stronger corporate cultures (Li et al., 2021) and for industries more amendable to remote work and social distancing Papanikolaou and Schmidt (2022); Pagano et al. (2020). These studies mostly treat the COVID-19 pandemic as a shock to demand, supply, and financing. We fundamentally extend this literature by examining COVID-19 as a severe workplace health hazard. This health channel was not present in past economic crises such as the 2008 financial crisis. The closest paper to ours is by Begley and Weagley (2021), who find that nursing homes with less liquidity experienced a higher likelihood of COVID infections among residents. In addition to reaching different conclusions about the importance of liquidity, our paper analyzes workplace COVID infections across a broad set of industries and links higher infection rates to worse operating performance outcomes. Li et al. (2021) link operating performance measures to the combination of corporate culture and exposure to COVID based on textual analysis of earnings calls but not to workplace COVID cases.

Our paper also contributes to the literature studying the effects of COVID on workers. This literature has focused almost exclusively on job losses, finding that job losses early in the pandemic are especially high for low-wage workers (Cajner et al., 2020), male immigrants (Borjas and Cassidy, 2020), workers in occupations that do not support remote work (Papanikolaou and Schmidt, 2022), and workers in industries relying heavily on customer contact (Koren and Pető, 2020). One exception is Begley and Weagley (2021), who find evidence of more COVID transmission between nursing home staff and residents in financially-weaker nursing homes. Our paper adds to this literature by focusing on workplace COVID exposure, identifying the types of industry, firm, and establishment where workplace COVID rates are highest, and documenting relatively high rates of exposure for Blacks and women.

1 Data and Sample

This section describes the data and samples that we analyze in the paper. We first describe the data sources. We then explain how we construct the samples we use in our analysis. We next describe the variables that we use in this analysis. Finally, we provide summary statistics.

1.1 Data sources

Our primary data source is OSHA's ITA database. OSHA is authorized to collect data on workplace injuries and illnesses at U.S. work establishments under the Occupational Safety and Health (OSH) Act of 1970. OSHA requires certain employers (i.e., establishments) to record information in Form 300 (Log of Work-Related Injuries and Illnesses) about "every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid," "significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional," and "work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12."[3]

For each recorded case, the employer records the name and job title of the employee involved, the date of the injury or illness, where the event occurred, and a description of the injury or illness, including body parts affected and any objects/substances involved. The employer also classifies the case based on severity — (i) death, (ii) injury or illness requiring days away from work, (iii) injury or illness requiring job transfer or restriction, or (iv) other recordable case — and type — (i) injury, (ii) skin disorder, (iii) respiratory condition, (iv) poisoning, (v) hearing loss, or (vi) all other illnesses. Types (ii) through (vi) are considered

[3]This last category includes work-related needlestick injuries and cuts from sharp objects that are contaminated with another person's blood or other potentially infectious material, cases where an employee is medically removed under the medical surveillance requirements of an OSHA standard, cases involving hearing loss above a given threshold, and tuberculosis infections.

illnesses. Finally, the employer records, if applicable, the number of days the injured or ill employee was away from work and the number of days the employee was on job transfer or restriction.

At the end of the year, the employer records the number of injuries and illnesses in total and for each category of severity and type, number of days away from work, and number of days of job transfer or restriction for the year in OSHA Form 300A (Summary of Work-Related Injuries and Illnesses). In addition, the employer enters the establishment's name, street address, and 6-digit NAICS code industry, as well as average number of employees working at the establishment during the year and total hours worked by all employees at the establishment during the year. See Appendix A for reproductions of OSHA Forms 300 and 300A as well as guidelines for the completion of these forms.

Establishments are required to maintain Forms 300 and 300A onsite and make them available to OSHA inspectors and employees and their representatives if requested. They are also required to post their prior-year Form 300A in the workplace from February 1 through April 30 to keep employees informed. In May 2016, OSHA issued a rule under *Standard 29 CFR Part 1904* requiring establishments with 250 or more employees in a given year, with the exception of a few exempt industries, and establishments with 20-249 employees in a given year in designated industries with historically high rates of injury and illness to submit Form 300A to OSHA electronically via the ITA, starting with the 2016 data year.[4] OSHA requires other establishments to submit Form 300A via ITA if requested. OSHA uses the ITA database to enhance its ability to target enforcement and allocate assistance resources. It also makes the ITA database publicly-available on the OSHA website.[5]

In addition to the information in Form 300A, the ITA database contains a unique iden-

[4]The requirement is based on the peak number of employees at an establishment in the given year.

[5]Between 1996 and 2011, OSHA collected information from a sample of establishments each year through a survey under its Occupational Data Initiative (ODI). The Bureau of Labor Statistics also collects workplace injury data separately via survey through its Survey of Occupational Injuries and Illnesses (SOII).

tifier for each establishment, which allows an establishment to be tracked across years, an establishment type, which can be non-government entity, state-government entity, or local-government entity, and the parent company's name and employer identification number (EIN). These last two items provide a nested structure to the data, with the potential for multiple establishments in a given year to be associated with the same parent firm. They also allow for a crosswalk with other firm-level databases such as Compustat. In total, the ITA database contains records for 1,638,933 establishment-years over the period 2016-2020. Since our focus is on for-profit businesses, we remove state-government and local-government entities and establishments in the Public Administration sector (NAICS 92).[6] We also remove establishments in U.S. territories such as Puerto Rico, since not all federal laws apply to these territories. These exclusions leave 1,282,121 establishment-years, to which we collectively refer as the "ITA data" for the remainder of the paper.

We also collect data from OSHA's COVID-19 Complaints reports. In February 2020, OSHA initiated a program inviting employees to file complaints regarding deficiencies in their employer's COVID-19 safety practices. OSHA uses these complaints to inform decisions about inspections and safety standard enforcement under *Standard 29 CFR Part 1910*. OSHA provides separate listings of open and closed complaints on its website. Identifying information for the establishment involved is only available for closed complaints, so we only use closed complaints in our analysis. The complaints data does not include an establishment-level identifier, making it difficult to link it to the establishment-level ITA injury data. We instead aggregate the 2020 complaints to the parent firm level based on the name of the establishment. We obtain firm-level accounting data for publicly-traded companies from the Compustat database and stock return data from the CRSP database. In addition, we obtain firm-level ESG ratings data from the MSCI KLD database.

[6]Many establishments in the Public Administration sector appear to be government-owned even if the establishment type recorded in the data indicates that they are not.

We use the occupation-level measure of high physical work proximity from Mongey et al. (2020), along with industry-level occupational mix data from the 2018 version of the Bureau of Labor Statistics' (BLS') Occupational Employment and Wage Statistics (OEWS) data to compute an industry-level measure of physical work proximity.[7] We use industry-level unionization data in the Union Membership and Coverage Database from the U.S. Cenusus Bureau's Current Population Survey (CPS) to compute an industry-level unionization measure.[8] We also use data from the CPS on the demographics of workers by industry to impute workplace COVID exposures for different demographic groups. This data includes the number of individuals surveyed in different industries and the fraction of women, Asian, Black, Latino, and White respondents in each industry.

1.2 Sample construction

Using these data sources, we construct three samples - one at each of the industry, establishment, and firm levels. All three represent cross sections. Our industry-level sample includes all establishments in the ITA data in 2020, aggregated to the 6-digit NAICS code industry level. We use this sample to analyze the industry composition of workplace COVID infections.

Our establishment-level sample includes all establishments in the ITA data with at least ten employees in 2020 and in at least one year in the period 2016-2019. The requirement that an establishment be present in the data between 2016 and 2019 allows us to compute a pre-pandemic workplace injury rate for the establishment. The minimum size requirement filters out small establishments where any workplace COVID infection or injury rate is likely to be highly noisy. The establishment-level sample consists of 174,640 establishments. We use this sample to analyze factors driving 2020 workplace COVID rates at the establishment

[7]OEWS is the new name for the database previously known as Occupational Employment Statistics (OES) data.

[8]Source: www.unionstats.com

level.

We construct three versions of our firm-level sample. For all of them, we first match establishments in the ITA data to publicly-traded parent firms in the Compustat database using EIN where available and then matching additional establishments using a fuzzy match based on parent firm name in the ITA data and firm name in Compustat. We exclude firms in the financial industry (SIC codes 6900-6999). We hand-check all matches and remove any that are erroneous. We restrict the sample to firms with at least five establishment-years in the period 2016-2019 to limit noise when we measure firm-level pre-pandemic workplace injury rate, though results are not sensitive to this threshold.

For the first version of the firm-level sample, which we use to analyze the relationship between 2020 operating performance and 2020 workplace COVID rate as well as the firm-level determinants of 2020 COVID rate, we further restrict the sample to firms with at least five establishments in the 2020 ITA data to reduce noise in the measurement of the 2020 COVID rate. For the second version of the firm-level sample, which we use to analyze the OSHA complaints data, we match the firm-level data to the OSHA complaints data by firm name. We assume that any firm we are not able to match to the complaints data is not the subject of a complaint in 2020. Finally, for the third version of the firm-level sample, which we use to analyze stock returns early in the pandemic, we match the firm-level data to the CRSP database using the Compustat-CRSP merged link file. We also match the firm-level data to the MSCI KLD ESG data using the 6-digit CUSIP provided in both the MSCI data and Compustat.

1.3 Variable definitions

We define $COVIDRate2020$ as the number of recorded respiratory conditions per 100 FTE employees at an establishment in 2020 using the ITA data, where an FTE employee is equivalent to 2,000 hours worked in a year. We define $FirmCOVIDRate2020$ at the firm

level as respiratory conditions per 100 FTE employees across all establishments belonging to a firm. OSHA does not require that employers report workplace COVID-19 infections separately. However, OSHA issued guidance on April 10, 2020 in a memo titled "Enforcement Guidance for Recording Cases of Coronavirus Disease 2019 (COVID-19)" indicating that employers are responsible for recording work-related COVID-19 cases on Form 300. The memo also indicates that "COVID-19 is a respiratory illness and should be coded as such on the OSHA Form 300." OSHA followed up with an additional memo on May 19, 2020 titled "Revised Enforcement Guidance for Recording Cases of Coronavirus Disease 2019 (COVID-19)" that provided further guidance. We reproduce the April 10 and May 19 memos in Appendix A.

Both $COVIDRate2020$ and $FirmCOVIDRate2020$ are approximations of documented workplace COVID infections per 100 FTE employees because reported respiratory conditions include illnesses other than COVID-19. However, the number of respiratory conditions per year is typically small. Figure 1 reports several series by year over the period 2016-2020 based on the ITA data. These include total illnesses in different illness categories (Panel A), illnesses per 100 FTE employees in different illness categories (Panel B), total workplace injuries (Panel C), total workplace deaths (Panel D), total number of days away from work due to injury and illness (Panel E), and total number of days of job transfer or restriction due to injury or illness (Panel F).

[Figure 1 about here]

Total respiratory conditions are less than 6,000 per year in each of the years 2016-19 before increasing to more than 200,000 in 2020. In contrast, injuries and illnesses of all other forms except for "Other Illnesses" decrease from 2019 to 2020, as do total injuries and illnesses (not shown). The number of 2020 respiratory conditions that are not COVID-related then appears likely to be negligible. The increase in Other Illnesses could reflect misclassification

of some COVID cases, which would cause respiratory conditions to undercount documented workplace COVID cases.

Workplace deaths are steady between 2016 and 2019 before approximately doubling in 2020. With overall injuries and illnesses declining in 2020, it is likely that more than 100% of the additional deaths in 2020 are attributable to workplace COVID infections. The number of days away from work due to injury and illness also increases in 2020, while the number of days of job transfer or restriction decline. This pattern is also consistent with the influence of workplace COVID cases in the data. Business policies generally require a worker diagnosed with COVID to be away from work for a period of time and do not allow for the possibility of a job transfer or working with reduced responsibilities.

As with other COVID infection measures, $COVIDRate2020$ and $FirmCOVIDRate2020$ almost surely underestimate the true rate of COVID transmissions. In addition to the fact that some cases may have been misclassified in the ITA data, some are asymptomatic and never detected, some are symptomatic but never diagnosed, and some are diagnosed but not determined to have been work-related even if they are, in fact, a result of workplace transmission. This last cause of under-counting is the most concerning for our empirical analysis. The omission of asymptomatic or undiagnosed cases is likely to be largely idiosyncratic. However, employers might differ in their standards for determining whether a case is work-related. Any correlation of these differences with unobservable employer characteristics could contaminate regression estimates. Alleviating this concern, OSHA provides detailed guidance on reporting and can fine employers for providing false information. In addition, the May 19 memo indicates that "COVID-19 illnesses are likely work-related when several cases develop among workers who work closely together and there is no alternative explanation," so, while some isolated cases might be missing, larger outbreaks are likely to be include in the data. We discuss this concern and how we address it further when we present our empirical analysis.

We also use the ITA data to compute establishment-level pre-pandemic workplace injury rates. For each establishment, we compute the variable $InjRate$2016-19 as the average annual number of injuries and illnesses excluding respiratory conditions per 100 FTE employees over the years 2016-2019. We also use the ITA data to compute 2020 establishment-level measures $LnEmployees$, which is the natural logarithm of the number of employees, and $LnHoursPerEmployee$, which is the natural logarithm of the ratio of the number of hours worked to number of employees. The former measures the size of an establishment, while the latter measures work intensity at the establishment.

We also compute firm-level pre-pandemic workplace injury rates. For each firm, we compute the variable $FirmInjRate$2016-19 as follows. First, we sum all of the injuries and illnesses excluding respiratory conditions for all of the establishments belonging to a firm in a given year. We also sum all of the hours worked for all of the establishments belonging to the firm in the given year. We then compute a firm-year injury rate per 100 FTE employees by dividing the summed injuries and illnesses by the summed hours worked divided by 200,000. Finally, we average the annual rates over the years 2016-2019 to compute $FirmInjRate$2016-19.

We use the OSHA complaints data to construct two firm-level variables. The first is $Complaint$2020, which is an indicator variable that equals one if a firm was the subject of at least one employee COVID-19 complaint in 2020 and zero otherwise. The second variable is $\#Complaints$2020, which is the number of employee COVID-19 complaints to which a firm is subject in 2020.

We compute several firm-level variables for publicly-traded firms using Compustat data. These include $LnAssets$, which is the natural log of 2019 Total Assets (AT); $Cash/Assets$, which is 2019 Cash and Short-Term Investments (CHE) divided by 2019 Total Assets; $Debt/Assets$, which is the sum of 2019 Long-Term Debt ($DLTT$) and Debt in Current Liabilities (DLC), divided by 2019 Total Assets; ROA, which is 2020 Operating Income Before

Depreciation ($OIBDP$) divided by 2019 Total Assets; $Tobin'sQ$, which is 2019 Total Assets minus 2019 Common/Ordinary (i.e., book) Equity (CEQ) plus 2019 market equity, all divided by Total Assets, where market equity is the product of Common Shares Outstanding ($CSHO$) and Fiscal Year Price Close ($PRCC\_F$). We also compute several variables capturing changes in operating performance from 2019 to 2020. These include ΔROA, which is 2020 ROA minues 2019 ROA; ΔROS, which is 2020 ROS minus 2019 ROS, where ROS in a given year is Operating Income Before Depreciation divided by Net Sales ($SALE$); $\Delta COGS/Sales$, which is 2020 $COGS/Sales$ minus 2019 $COGS/Sales$, where $COGS/Sales$ in a given year is Cost of Goods Sold ($COGS$) divided by Net Sales; $\Delta SG\&A/Sales$, which is 2020 $SG\&A/Sales$ minus 2019 $SG\&A/Sales$, where $SG\&A/Sales$ in a given year is SG&A expense ($XSGA$) divided by Net Sales; and $SalesGrowth$, which is the difference between 2020 Net Sales and 2019 Net Sales, divided by 2019 Net Sales. We define ESG as the difference between normalized ESG strength score minus normalized ESG concern score from the MSCI KLD data, where we include six common dimensions — community, diversity, employee relations, environment, human rights, and product.

We compute the buy-and-hold abnormal return ($BHAR$) for each firm in CRSP for the period February 24, 2020, the date that Italy implemented its first lockdown, through April 7, 2020, the date that the last state-wide lockdown order was announced in the U.S., by South Carolina. We compute a firm's $BHAR$ as its compounded daily abnormal return over this period, where we define abnormal return as return less CAPM benchmark return, where we estimate market betas using the daily return from 2016 to 2019 and the excess market return using the CRSP value-weighted index daily return. We compute the idiosyncratic volatility ($IdiosyncVol$) of each firm's stock over this period as the standard deviation of its CAPM-adjusted daily return.

We also use CRSP returns to measure industry homogeneity following the approach of Parrino (1997). We compute $IndHomogeneity$ by separately regressing a firm's monthly

returns on the equal-weighted average monthly return for the firm's 4-digit NAICS code industry and equally-weighted CRSP return using data from 1960 through 2020 separately for each firm and then averaging the coefficients on industry return over all firms in the industry. The rationale behind this measure is that if firms in an industry have similar operations, then industry-wide news should affect their stock prices in a similar manner. We define $HomogeneousInd$ as an indicator variable equal to one for 4-digit NAICS code industries with above median $IndHomogeneity$ and zero for remaining industries.

We define four additional industry-level variables. The first is $IndCOVIDRate2020$, which equals 2020 respiratory conditions per 100 FTE employees aggregated to the 6-digit NAICS code industry level. The second is $WorkProximity$, which captures the extent to which workers in an industry work in close physical proximity to each other. Using O*NET data on work activities, Mongey et al. (2020) construct an occupation-level indicator variable $HighPhysicalProximity$, which equals one for occupations in which workers typically work in close physical proximity to each other. We compute $WorkProximity$ as the occupation-weighted average of the $HighPhysicalProximity$ indicator for each 4-digit NAICS code industry using OEWS data on the mix of occupations in different industries. See Appendix Table C1 for a list of the 20 industries with the highest values of $WorkProximity$. The third variable is $UnionizationRate$, which is the fraction of workers in a 4-digit NAICS code industry represented by unions as reported by the Census. The fourth is $EssentialIndustry$, an indicator variable equal to one for 6-digit NAICS code industries that DHS and CISA designated as essential and zero for all other industries.

We winsorize all continuous variables at the 1st and 99th percentile to reduce the influence of possible outliers. Appendix B provides a complete list of variable definitions. Table 1 summarizes the establishment-, industry- and firm-level variables that we use in our analyses.

[Table 1 about here]

At the establishment level, the mean 2020 workplace COVID rate is 0.399 per 100 FTE employees. Note that this rate is zero for a majority of establishments. While the skewed nature of this distribution potentially creates power concerns, it should not induce any bias in regression estimates. The mean and median $\#Employees$ are 122.3 and 56, respectively, indicating that the size of establishments in the sample is also skewed. The mean $Hours/Employee$ is 1,754, which is approximately 85% of a FTE employee. The mean pre-pandemic workplace injury rate is 5.007 incidents per 100 FTE employees, which is in line with the workplace injury rates reported by Cohn and Wardlaw (2016) and Cohn et al. (2021).

At the firm level, the mean value of $FirmCOVIDRate2020$ is 0.098. The large difference in the mean value of $COVIDRate2020$ and that of $FirmCOVIDRate2020$ is due to differences in the composition of establishments that publicly-traded companies own. While approximately 12% of the establishments in the establishment sample are in 2-digit NAICS code industry 62 (Health Care and Social Assistance), only 2% of the establishments belonging to publicly-traded firms are. As we show in Section 2, COVID rates are considerably higher in this industry category than in other industries. Excluding establishments in NAICS 62, COVID rates in the two samples are almost identical.

2 Workplace COVID Infection Descriptive Analysis

In the first step in our analysis, we use the ITA data to explore the nature of variation in 2020 workplace COVID infection rates. We begin with an establishment-level variance decomposition, where we compare the standard deviation of $COVIDRate2020$ between and within 6-digit NAICS code industry, 3-digit zip code location, and parent firm. This analysis allows us to understand how much of the variation is driven by a business's inherent nature, its location, and its parent firm, and how much is orthogonal to these factors. For context,

we also provide the same comparisons for $InjRate$2016-19. Table 2 presents this analysis.

[Table 2 about here]

The between-industry and between-location standard deviations of workplace COVID rates are material. For example, a one-standard difference in workplace COVID rate between two industries represents a difference of 0.591 cases per 100 FTE employees, which is larger than the mean workplace COVID rate for the full sample of 0.399. However, the within-industry standard deviation is more than three times as large, at 2.034. For comparison, the within-industry standard deviation in workplace injury rates is slightly less than twice the between-industry standard deviation. Thus, it appears that industry explains less of the variation in workplace COVID infection rates than it does the variation in workplace injury rates.

The within-zip code standard deviation of workplace COVID infection rates is more than five times as large as the between-zip code standard deviation. That so much of the variation in workplace COVID infection rate is orthogonal to industry and zip code is useful, as it will allow us to rely on within-industry and within-location variation in our regression analysis by including industry and location fixed effects. In contrast, the within-firm standard deviation in workplace COVID infection rates is less than half of the between-firm standard deviation, though it is still large at 1.082 (more than twice the mean workplace COVID infection rate for the sample). Parent firm then seems to be important in explaining workplace infection rates in establishments. This conclusion helps validate our firm-level analysis.

We next explore the nature of cross-industry variation in workplace COVID rates in 2020. Table 3 presents a breakdown of average workplace COVID infection rates at the industry level. Panel A reports the mean workplace COVID rate by NAICS "sector," with each sector representing one or more 2-digit NAICS codes. Panel B reports the average workplace COVID rate at the more granular 6-digit NAICS code level for the 40 6-digit

NAICS codes with the highest workplace COVID rates.

[Table 3 about here]

Panel A shows that by far the highest workplace COVID infection rate occurs in the Health Care and Social Assistance sector (NAICS 62), with 2.5 cases per 100 FTE employees. This sector includes hospitals, assisted living facilities, and physician's offices. The high rate of workplace infections in healthcare is not surprising and is attributable to at least three factors. First, many workers in this sector were directly exposed to COVID cases early in the pandemic, often without adequate personal protective equipment. Assisted living facilities in particular were sites of large outbreaks in the early stages of the pandemic. Second, the healthcare sector generally lacked the option to shut down even temporarily in response to an outbreak of COVID in the workplace. Third, because infections among workers in this sector often risk exposing sick or elderly patients, who are at high risk of serious disease, testing and contact tracing may have been more stringent in this sector, resulting in more cases being documented. The sectors with the second and third highest rates of workplace COVID infection in 2020 are Agriculture, Forestry, Fishing, and Hunting (NAICS 11) and Retail Trade (NAICS 44-45). Several news articles from 2020 describe COVID outbreaks among agricultural workers.[9]

Panel B shows that 17 of the 40 6-digit NAICS code industries with the highest COVID rates are in the Health Care and Social Assistance sector (NAICS 62). Interestingly, 11 of the 40 are in the Manufacturing sector (NAICS 31-33), despite the fact that Manufacturing is only fifth on the list of sectors with the highest COVID rate in Panel A. Food manufacturing (3-digit NAICS 311) in particular appears to have relatively high workplace COVID rates, with seven of the 11 Manufacturing industries in Panel B lying in this sub-sector. These

[9]See, for example, https://www.usatoday.com/story/opinion/2020/09/03/covid-19-hits-californias-migrant-farm-workers-hard-column/5689601002.

industries include poultry processing, animal slaughtering, and meat processing — industries with well-documented workplace COVID outbreaks in 2020.

To more systematically identify industry features associated with high workplace COVID infection rates in 2020, we regress $IndCOVIDRate2020$ on $WorkProximity$, $UnionizationRate$, and $EssentialIndustry$. Table 4 presents the results. Columns (1) through (3) in each panel present results where we include the explanatory variables one at a time. Column (4) includes all three explanatory variables.

Workplace COVID infection rates in 2020 are significantly higher in industries characterized by high levels of physical work proximity. This finding is not surprising, since workers in close physical proximity to each other have more opportunities to infect each other, and helps to further validate our measure of COVID infections. Work proximity alone explains more than 4% of the overall variation in $IndCOVID2020$, despite the fact that we measure it at the relatively coarse 4-digit NAICS code level.

[Table 4 about here]

The relationship between infection rates and $UnionizationRate$ is negative but statistically insignificant in column (2), where $UnionizationRate$ is the only explanatory variable. However, the coefficient on $UnionizationRate$ more than quadruples in magnitude and becomes significant in column (4), where we include all three explanatory variables. $WorkProximity$ is positively related to both $IndCOVIDRate2020$ and $UnionzationRate$ (correlation of 0.324), so omitting it as an explanatory variable masks the strength of the negative relationship between $IndCOVIDRate2020$ and $UnionizationRate$. The negative relationship between $IndCOVIDRate2020$ and $UnionizationRate$ may reflect the ability of unions to push for stronger COVID risk mitigation efforts by employers or the role of unions in getting workers to adhere to policies and procedures designed to mitigate COVID risk, though it could also reflect difference in industry fundamentals not captured by $WorkProximity$.[10]

[10]One of the biggest challenges in improving workplace safety in general is getting employees to adhere to

The relationship between infection rates and $EssentialIndustry$ is positive but statistically insignificant in column (3). However, the coefficient on $EssentialIndustry$ becomes significant in column (4), where we include all three explanatory variables. $WorkProximity$ is negatively related to $EssentialIndustry$, so excluding $WorkProximity$ masks the positive relationship between $IndCOVIDRate2020$ and $EssentialIndustry$. Essential industries continued to operate in the early months of the pandemic, when the rest of the U.S. economy was largely shut down. This was a period when knowledge of how to protect individuals against the virus was limited and personal protective equipment was in short supply. This finding adds to the sense of a tradeoff in keeping an industry operating in the early stages of a pandemic, with workers in that industry facing a relatively high risk of workplace COVID infection.

Finally, we provide evidence on the demographic characteristics of workers most exposed to workplace COVID infections. We do so by imputing average workplace COVID rates for different demographic groups using the 2020 CPS data. For each racial/ethnic category and for men and women, we calculate the number of workers in each industry in the survey. We use information at the 3-digit NAICS code level where available and, for the handful of industries where it is not available, we use information at the 2-digit NAICS code level. We then use those counts to compute the weighted average COVID rate by demographic group. Figure 2 reports the breakdown in four bar charts.

[Figure 2 about here]

Panels A and C report the breakdown by racial/ethnic group. Panels B and D report the breakdown by gender. Panels A and B report breakdowns for all industries. Panels C and D report breakdowns excluding the Health Care and Social Assistance sector (NAICS 62), since the workplace COVID rate is so much higher in that sector than in others. When we

new policies and procedures (Clark and Margolis, 2000).

consider all industries, imputed workplace COVID exposure is 30-40% higher among Blacks than among other racial and ethnic groups and twice as high for women as for men. Both of these differences largely disappear when we exclude the Health Care and Social Assistance sector. Intuitively, Blacks and women are both disproportionately represented in healthcare, and the prevalence of Blacks and women in this sector disproportionately exposed workers in these categories to workplace COVID infection risk.[11]

3 Workplace COVID & Operating Performance

In this section, we analyze the relationship between 2020 workplace COVID infection rates and 2020 operating performance for publicly-traded firms using our firm-level sample. The variance decomposition in Section 2 suggests that businesses differ substantially in their workplace COVID infection rates even within industry and location. The analysis in this section allows us to shed light on the explanation for this variation.

We consider two broad explanations. The first is that some businesses are less willing to sacrifice earnings for the well-being of workers and the community than others. While the traditional view in finance is that firms exist to maximize shareholder value, there is increasing pressure on corporations to consider the interests of non-shareholder stakeholders when making decisions (Hart and Zingales, 2022). Firms bear the costs of mitigating workplace COVID infection risk, while at least part of the benefit accrues to workers and the surrounding community. Firms that place more weight on non-shareholder stakeholders' well-being optimally expend more resources on efforts to mitigate workplace COVID risk and potentially forgo more production in the process. This explanation predicts a *positive* relationship between 2020 workplace COVID infection rates and 2020 operating performance,

[11] Blacks represented 12.1% of the total workforce in 2020 but 17.4% of healthcare workers, with the highest representations in home health care services (28.8%), nursing care facilities (27.7%), and residential care facilities (21.7%). Women represented 46.8% of the total workforce but 72.5% of workers in the health care and social assistance sector. See https://www.bls.gov/cps/aa2020/cpsaat18.htm.

all else equal.

The second broad explanation is that some businesses were better prepared to mitigate workplace COVID risk than others. Being able to mitigate this source of risk benefits employers by reducing employee absenteeism, remediation costs, and the risk of shutdown and increasing employee morale. This explanation predicts a *negative* relationship between 2020 workplace COVID infection rates and 2020 operating performance, all else equal. These two explanations are not mutually exclusive, and both probably play some role in driving the variation in workplace COVID infection rates.

We test the relative importance of these two explanations by regressing several measures of change in operating performance from 2019 to 2020 on $FirmCOVIDRate2020$. We are thus implicitly using 2019 as a benchmark and investigating changes in performance in 2020 relative to that benchmark. The outcome variables are ΔROA, ΔROS, $\Delta COGS/Sales$, $\Delta S\&GA/Sales$, and $SalesGrowth$. To account for other fundamental differences that might relate to firm performance in 2020, we control for $LnAssets$, $Debt/Assets$, and $Tobin's Q$ as well as firm-level industry fixed effects, with industries defined at the 48-category Fama-French level. In this analysis, we restrict the sample to firms with fiscal year ends between October and December to ensure that we are comparing firms operating for approximately the same number of pandemic months in fiscal year 2020. Table 5 presents the results.

[Table 5 about here]

ΔROA, ΔROS, and $SalesGrowth$ are all negatively related to $FirmCOVIDRate2020$, while $\Delta COGS/Sales$ is positively related to $FirmCOVIDRate2020$. The relationship between $\Delta SG\&A/Sales$ and $FirmCOVIDRate2020$ is also positive though statistically insignificant. Economy-wide, return-on-assets, return-on-sales, and sales all fell, on average, in 2020, while $COGS/Sales$ increased (see Table 1). The evidence then indicates that firms with lower 2020 workplace COVID rates experienced smaller deterioration in operating per-

formance, on average. From Table 1, the standard deviation of $FirmCOVIDRate2020$ is 0.483. The regression coefficients imply that a one-standard deviation higher firm-level workplace COVID rate in 2020 is associated with 0.92, 1.01, and 1.54 percentage point smaller declines in return-on-assets, in return-on-sales, and sales in 2020, respectively, and a 0.82 percentage point larger increase in cost of goods sold scaled by sales.

Firms with higher 2020 workplace COVID infection rates incur both higher costs and lower revenues. One possible reason for the higher costs is that firms experiencing workplace COVID outbreaks need to spend resources on remediation and experience more labor shortages and downtime. For example, Tyson Foods' poultry processing facilities experienced several high-profile COVID outbreaks in early 2020. According to Tysons's 2020 annual report, the company "incurred direct incremental expenses related to COVID-19 totaling approximately $540 million, which primarily included team member costs associated with worker availability and production facility downtime, and direct costs for personal protective equipment, production facility sanitization, COVID-19 testing, donations, product downgrades, rendered product, professional fees and thank you bonuses to frontline team members." The larger reduction in sales for firms with higher workplace COVID rates is consistent with disruptions to the production process as a result of infections.

We conduct a placebo test to address the concern that workplace COVID rate might proxy for an unobserved firm characteristic, such as management quality, that is correlated with the trend in a firm's operating performance more generally. If such an omitted factor drives the relationships between $FirmCOVIDRate2020$ and measures of operating performance change in 2020 (i.e., if there is nothing special about 2020), then we should observe similar relationships for operating performance changes *prior to* 2020 as well. We therefore regress measures of change in operating performance from 2018 to 2019 and from 2017 to 2018 on $FirmCOVIDRate2020$. The regressions are analogous to those in Table 5. Table 6 presents the results. The coefficients on $FirmCOVIDRate2020$ in these regressions are

all much smaller than those in Table 5 and are statistically insignificant, suggesting that the relationship between changes in operating performance and $FirmCOVIDRate2020$ is unique to 2020 and is unlikely to reflect an omitted variable related to performance trends more generally.

[Table 6 about here]

While open to alternative interpretations, the results in Table 5 suggest that workplace COVID infections impose substantial costs on firms. They also suggest that differences in preparedness are more important than differences in the way firms trade off profitability and worker well-being in explaining the variation in 2020 workplace COVID infection rate. In the next section, we explore specific factors that might explain this variation.

4 Determinants of Workplace COVID Infection Rates

In this section, we present estimates from regressions of workplace COVID infection rates at both the firm- and establishment-level on two factors that may have made some businesses better prepared to prevent COVID infections in the workplace than others. The first factor is a business's baseline workplace safety capabilities entering the pandemic. The second is its capacity to finance investment, which may affect its spending on COVID prevention measures.

We define workplace safety capabilities broadly as a form of organizational capital that allows a business to mitigate the risk of workplace injuries and illnesses. These capabilities arise from specific organizational structures and workplace safety practices that a business implements as well as what the applied psychology literature terms a business's "safety climate."[12] The structures and practices include equipment maintenance, technological currency, regular safety planning, safety policies and procedures, training, supervision, human

[12]See Beus et al. (2010) and Hofmann et al. (2017) for overviews of the safety climate literature.

resource management practices, and reporting systems. In addition to directly contributing to safety capabilities, these structures and practices signal management commitment to workplace safety. Management commitment helps foster a safety climate in which workers actively participate in workplace safety by following safety procedures even when not being monitored, monitoring each other, and reporting potential safety hazards. Evidence that firms bear the cost of higher workplace injury rates (Cohn and Wardlaw, 2016) suggests that this form or organizational capital is valuable.

Well-developed safety structures and a strong safety climate are both likely to be important in allowing a firm to respond to the arrival of a novel safety threat like COVID-19 more efficiently. A strong workplace safety foundation allows an organization to identify a new safety threat and take steps to mitigate the threat quickly. In the context of COVID-19, these steps might include supplying workers with N-95 masks and mandating their use, requiring social distancing, improving ventilation, and reorganizing workflow to reduce close contact between employees and customers and among employees. A strong safety climate ensures that supervisors prioritize employee health in operations and that workers adhere to masking and social distancing policies and help to identify ways to restructure operations to reduce physical contact.

Like other forms of organizational capital, workplace safety capabilities take time and effort to build (Clark and Margolis, 2000). Even if a business can identify actions to mitigate workplace COVID risk quickly, the absence of a well-developed set of structures and practices to roll out and communicate new policies and a strong safety climate to foster active worker participation would make it difficult to implement these actions. Thus, a business's workplace safety capabilities at the onset of the pandemic are plausibly an important factor in determining how quickly and effectively it could implement efforts to mitigate COVID infection risk. Since we cannot measure workplace safety capabilities directly, we use workplace injury rates pre-pandemic to proxy for these capabilities. Meta-analyses by Beus et al.

(2010) and Christian et al. (2009) conclude that workplace injuries and illnesses are strongly associated with an organization's workplace safety climate.

Capacity to finance investment may be important in allowing a business to invest in mitigating workplace COVID risk. Recent research indicates that firms in stronger financial condition (less debt, more cash) experienced smaller declines in stock prices early in the pandemic, suggesting that the market viewed access to financing early in the pandemic as important. We use several proxies for a firm's capacity to finance investment, including measures of financial indebtedness and cash holdings. More indebtedness results in larger interest payments and may make it difficult to raise additional funding, while large cash holdings provide liquidity to finance investment even if external financing is unavailable.

In our firm-level analysis, we regress $FirmCOVIDRate2020$ on $FirmInjRate2016\text{-}19$ and proxies for a firm's capacity to finance investment. We include Fama-French 48-industry effects based on the firm's industry in all regressions. Table 7 presents the results of these regressions. Column (1) presents results where we include $FirmInjRate2016\text{-}19$, $Debt/Assets$, and $Cash/Assets$ as explanatory variables. In column (2), we add $LnAssets$, ROA, and $Tobin's Q$ as control variables. In column (3), we add ESG as an additional control. In columns (4) through (6), we replace $Debt/Assets$ and $Cash/Assets$ with the financing constraints indices of Kaplan and Zingales (1997), Whited and Wu (2006), and Hadlock and Pierce (2010).

[Table 7 about here]

The coefficient on $FirmInjRate2016\text{-}19$ is positive and statistically significant at the one percent level in all six columns. Based on the coefficient in column (2), a one-standard deviation higher pre-pandemic workplace injury rate is associated with a 0.057 higher workplace COVID rate in 2020, which is 53.8% of the mean workplace COVID rate. In contrast, the coefficients on $Debt/Assets$ and $Cash/Assets$ in columns (1) through (3) are statistically

insignificant. Among the financing constraint indices in columns (4) through (6), only the Hadlock and Pierce (2010) index in column (6) is statistically significant, and the negative sign of the coefficient on this index is consistent with more constrained firms having *lower* rather than higher workplace COVID rates.

While open to alternative interpretation, one interpretation of the results in Table 7 is that a firm's workplace safety capabilities entering the pandemic are more important for mitigation efforts than the capacity to finance investment in mitigation. This interpretation coheres with the argument that building mitigation capacity quickly and effectively is challenging, making pre-existing capabilities more important. An alternative interpretation of the lack of a relationship with financing constraints measures is that firms willing to invest in mitigating workplace COVID risk viewed this investment as being so essential that, even if financially constrained overall, they were willing to forgo other forms of investment rather than forgo investment in mitigating workplace COVID risk. Either way, the positive relationship between 2020 workplace COVID rate and pre-pandemic workplace injury rate suggests that one benefit from investing in forms of organizational capital such as workplace safety capabilities is the resilience they provide in the face of unexpected shocks.

We further analyze the relationship between 2020 workplace COVID rate and pre-pandemic workplace injury rate using the establishment-level sample. Specifically, we regress $COVIDRate$2020 on $InjRate$2016-19, controlling for $LnEmployees$ and $LnHoursPerEmployee$ as well as 6-digit NAICS code industry and 3-digit zip code location fixed effects. Sweeping out these fine-grained fixed effects at the establishment level, which is possible because of the relatively large sample size, allows us to account for detailed differences in the nature of operations and location-specific factors, reducing the risk that these factors induce a relationship between 2020 workplace COVID infections and pre-pandemic workplace injuries. Analyzing the establishment-level sample also allows us to use the full sample of establishments, without being restricted to establishments belonging to publicly-traded companies. Table 8 presents

the results. We cluster standard errors in all of our establishment-level regressions at the parent firm level.

[Table 8 about here]

Column (1) presents results without controls. Column (2) presents results where we control for $LnEmployees$ and $LnHoursPerEmployee$. In both columns, the coefficient on $InjRate$2016-19 is positive and statistically significant at then one percent level. The coefficient in column (2) implies that a one-standard deviation higher pre-pandemic injury rate is associated with a 0.042 higher 2020 workplace COVID infection rate, which is 10.5% of mean $COVIDRate$2020.

In column (3), we add *firm* fixed effects to the regression. Doing so allows us to examine whether establishments with higher pre-pandemic workplace injury rates relative to other establishments *within the same firm* also have higher relative 2020 workplace COVID infection rates. Including firm fixed effects limits the usable sample to establishments of firms with at least two establishments in the establishment sample. This restriction reduces the sample size from 174,640 establishments to 107,919 establishments. The coefficient on $InjRate$2016-19 remains positive, statistically significant, and of approximately the same magnitude as in columns (1) and (2). This result suggests that *workplace-level* workplace safety capabilities are important in explaining 2020 workplace COVID infection rates. It also helps to address concerns that unobserved firm-level heterogeneity might drive the relationship between establishment 2020 workplace COVID rates and pre-pandemic workplace injury rates.

We further explore the distinct contributions of establishment- and firm-level workplace safety capabilities in columns (4) and (5). In column (4), we exclude firm fixed effects and substitute $FirmInjRate$2016-19 for $InjRate$2016-19. The coefficient on $FirmInjRate$2016-19 is positive and statistically significant at the one percent level. In column (5), we include

both $InjRate$2016-19 and $FirmInjRate$2016-19 as separate explanatory variables. The coefficient on $InjRate$2016-19 is positive and statistically significant at the five percent level. The coefficient on $FirmInjRate$2016-19 remains positive but shrinks in magnitude and becomes statistically insignificant. This result suggests that workplace-level workplace safety capabilities may be more important than parent-firm capabilities in explaining which establishments are more resilient to COVID-19 as a workplace safety hazard than others.

For both the firm- and establishment-level analysis, we estimate several alternative regression models as robustness checks. These can be found in Appendix C and include models where the dependent variable is the change in respiratory conditions from 2016-2019 to 2020 per 100 FTE employees (Tables C2 and C5), which effectively use the pre-pandemic period as a benchmark to account for the fact that some respiratory conditions in 2020 are not COVID-related, models where the dependent variable is 2020 respiratory conditions per employee rather than per 100 FTE employee (Tables C3 and C6), and Poisson models where the dependent variable is the number of 2020 respiratory conditions (Tables C4 and C7). These tables all show results similar to those shown in Tables 7 and 8.[13] In Appendix Table C8, we report estimates from alternative establishment-level regressions where we include only essential industries, drop establishments with large reductions in employment or hours worked in 2020, and use different minimum establishment size thresholds.

Overall, it appears that workplace safety capabilities entering the pandemic are an important attribute in mitigating workplace COVID infection risk. We conduct four additional sets of tests to further validate this conclusion. First, we estimate the regression in column (2) of Table 8 separately for establishments in nine different high-level sector categories. This analysis allows us to assess whether a single sector is driving the results in Table 8. Table 9 presents the results.

[13]Note that the establishment-level Poisson model with firm fixed effects fails to converge and is therefore omitted in Table C7.

[Table 9 about here]

The coefficient on $InjRate$2016-19 is positive for eight of the nine sectors. It is statistically significant for seven of those eight. Thus, it does not appear that any one sector is responsible for the results in Table 8. The coefficient is largest for the Health Care and Social Assistance sector. This finding is comforting, as preparedness to mitigate workplace COVID infection risk seem likely to be most important in healthcare and healthcare-related services. It also suggests that the resiliency benefits of investing in building workplace safety capabilities are especially important in the healthcare sector.[14]

The second set of tests we undertake to validate the results in Table 8 involves examining variation in sensitivity across industries with different characteristics. We estimate two regressions. First, we estimate the regression in column (2) of Table 8 adding the interaction $InjuryRate$ and $WorkProximity$ (demeaned for ease of interpretation) as an additional covariate. The importance of workplace safety capabilities in allowing a business to mitigate workplace COVID infection risk should plausibly be larger when employees work in close physical proximity. Note that the main effect of $WorkProximity$ is fully absorbed by the industry fixed effects.

Second, we estimate the regression in column (2) of Table 8, restricting the sample to establishments in relatively homogeneous industries ($HomogeneousInd = 1$). This test helps to address concerns that even 6-digit NAICS code industry fixed effects may be too coarse to filter out unobserved operational characteristics that might be correlated with both pre-pandemic workplace injury rates and 2020 COVID rates. If these differences drive the relationship between $COVIDRate$2020 and $InjRate$2016-19, then the relationship should

[14]The negative and statistically significant coefficient for Retail Trade is driven by the Supermarkets and Other Grocery (except Convenience) industry (NAICS code 445110) specifically, which contains approximately one-third of the establishments in the Retail Trade sector. While we refrain from speculating about why the relationship between 2020 workplace COVID rate and pre-pandemic workplace injury rate is negative for the Supermarkets and Other Grocery industry, we note that this could happen in one industry by chance since we estimate these regressions for many industries. However, it is worth noting that the coefficient becomes *positive* and significant in this industry when we include firm fixed effects.

weaken when we restrict the sample to relatively homogeneous industries, where differences should be smaller. Table 10 presents the results of these regressions.

[Table 10 about here]

Column (1) shows that 2020 COVID workplace rates are, indeed, more sensitive to pre-pandemic workplace injury rates in industries characterized by greater physical proximity. A one-standard deviation increase in $WorkProximity$ is associated with a 65% ($.065 \times 0.09/0.009$) larger relationship between $COVIDRate$2020 and $InjRate$2016-19. Comparing column (2) to the coefficient in column (2) of Table 8 shows that the coefficient on $InjRate$2016-19 increases slightly rather than decreasing when we restrict the sample to relatively homogeneous industries. This finding helps mitigate concerns about unobserved operational differences not fully captured by establishment-level 6-digit NAICS code industry fixed effects driving the results in Table 8.

The third set of tests we undertake to validate the results in Table 8 involves examining COVID-related OSHA complaints. One concern with the analysis in Table 8 is that both $COVIDRate$2020 and $InjRate$2016-19 are based on information that employers report to OSHA. It is possible that differences in reporting practices could drive a relationship between the two variables. One advantage of examining OSHA complaints rather than COVID cases is that the complaints are generated by *employees* and not by the *employer*. As noted in Section 1.1, we analyze complaints at the firm level because of the lack of an establishment identifier in the complaints data. We regress the complaints measures $Complaint$2020 and $\#Complaints$2020 on $FirmInjRate$2016-19, including Fama-French 48 industry fixed effects in all regressions. Table 11 presents the results.

[Table 11 about here]

The dependent variable in columns (1) and (2) is the indicator variable $Complaint$2020, which we model using a linear probability model. The dependent variable in columns (3)

and (4) is the count measure $\#Complaints$2020, which we model using Poisson regressions. In columns (1) and (3), $FirmInjRate$2016-19 is the only explanatory variable. Columns (2) and (4) include control variables. The coefficient on $FirmInjRate$2016-19 is positive in all four columns and statistically significant in three of the four, indicating that firms with higher pre-pandemic workplace injury rates are subject to more COVID-related OSHA complaints.

The fourth and final set of tests we undertake to validate the results in Table 8 involves a placebo test. Here, we estimate five regressions. For each regression, we estimate the regression in column (2) of Table 8 using respiratory conditions per 100 FTE employees for one of the years 2016 through 2020 as the dependent variable. Note that when we use this variable for 2020 as the dependent variable, we replicate the regression in column (2) of Table 8. If workplace safety capabilities as measured by $InjRate$2016-19 drive workplace COVID infections specifically beyond any general relationship with respiratory conditions, then the coefficient for 2020 should be substantially larger than the coefficient in prior years. Figure 3 presents a bar graph of the coefficient on $InjRate$2016-19 for each of the years 2016 through 2020.

[Figure 3 about here]

The coefficient on $InjRate$2016-19 ranges from 0.000193 to 0.000245 for the 2016-2019 period. It then rises to 0.008 in 2020, more than 30 times the largest coefficient in the 2016-2019 period. Thus, it does not appear that the relationship between $COVIDRate$2020 and $InjRate$2016-19 reflects a more general relationship between respiratory condition illnesses and other types of workplace injuries and illnesses.

5 Stock Returns and Pre-pandemic Workplace Injuries

The results in Section 3 suggest that high workplace COVID infection rates in 2020 are associated with increased costs and decreased sales in 2020. The results in Section 4 suggest that better workplace safety capabilities at the onset of the pandemic are associated with a higher rate of workplace COVID infections in 2020. We next examine whether the stock market priced in the benefits of workplace safety capabilities early in the pandemic. We begin by estimating a series of cross-sectional regressions of buy-and-hold stock returns for each trading day between January 1, 2020 through June 1, 2020. The dependent variable in the regression for a given day is the buy-and-hold abnormal return from January 1, 2020 through that day for each firm in our sample. The explanatory variable of interest is $FirmInjRate$2016-19. The coefficient on $FirmInjRate$2016-19 for a given day captures the partial correlation of the buy-and-hold abnormal return from January 1, 2020 through that day with pre-pandemic workplace injury rate. Figure 4 plots the daily coefficients.[15]

[Figure 4 about here]

The coefficient changes little from January 1 through approximately February 24, 2020, the day that Italy implemented its first lockdown. This date was significant, as it suggested that COVID was spreading rapidly outside of China. The coefficient then declines from February 24 through April 7, 2020, the date that the last state-wide lockdown order was announced in the U.S., by South Carolina. This period coincides with a flow of bad news about the likely severity of the pandemic in the U.S. The declining coefficient on $FirmInjRate$2020 during this five-week period indicates that stock prices of firms with high workplace injury rates pre-pandemic declined by more than those of firms with low workplace injury rates pre-pandemic as the market digested bad news. Quantitatively, since the coefficient decreases by approximately 1.2 between February 24 and April 7 and is denominated in percentage

[15] We normalize the figure so that the value is zero on February 24, 2020.

points, a one-standard deviation (2.054) higher value of $FirmInjRate$2016-19 is associated with approximately a 2.4% larger decline in stock price over this period.

The stock market recovered much of its lost value between April 7, 2020 and June 1, 2020. However, the coefficient on $FirmInjRate$2016-19 in the cumulative return regressions recovers by only about one-third between April 7 and June 1, 2020 from its decline starting on February 24. Thus, some of the additional decline in the market valuation of firms with high pre-pandemic workplace injuries appears to have persisted even as the market recovered. This pattern suggests that the market viewed ongoing exposure to workplace COVID risk as costly, even though its assessment of overall economic fundamentals appeared to improve.

We more formally test the relationship between stock returns over the period February 24 through April 7, 2020 and pre-pandemic workplace injury rate by regressing buy-and-hold abnormal return ($BHAR$) for this period on $FirmInjRate$2016-19. We also regress idiosyncratic volatility ($IdiosyncraticVol$) for this period on $FirmInjRate$2016-19. Substantial quantities of news about the economic consequences of COVID arrived during this window. If pre-pandemic workplace injury rates played an important role in shaping the market's response to this news for different firms, then a firm's idiosyncratic stock price volatility during this period should increase with its pre-pandemic workplace injury rate. Table 12 presents the results from these regressions.

[Table 12 about here]

Columns (1) through (3) present results where $BHAR$ is the dependent variable. Columns (4) through (6) present results where $IdiosyncraticVol$ is the dependent variable. Columns (1) and (4) include no control variables. Columns (2) and (5) include several control variables from Compustat. In columns (3) and (6), we add ESG as an additional control variable.

The coefficient on $FirmInjRate$2016-19 is negative and statistically significant in all three regressions where the dependent variable is $BHAR$. Its magnitude is similar to the

magnitude of the change in the coefficient for the period from February 24 to April 7, 2020 in Figure 4. The coefficient on $FirmInjRate$2016-19 is negative and statistically significant in all three regressions where the dependent variable is $IdiosyncraticVol$. Both of these findings suggest that the market conditioned on pre-pandemic workplace injury rate when incorporating news early in the pandemic.[16]

6 Conclusion

This paper uses novel establishment-level data on workplace COVID infections to reach several new conclusions about COVID-19 in the workplace and its implications for businesses. Workplace COVID rates are especially high in health care, agriculture, retail trade, and food manufacturing. Because of their disproportionate representation in healthcare, Blacks and women were likely disproportionately exposed to workplace COVID infection risk early in the pandemic. More generally, COVID rates are higher in industries where employees work in close physical proximity to one another and in those with low union coverage. These results should help inform policymakers and businesses about where the risks of an airborne epidemic diseases are likely to be the greatest, which will be important to understand if and when another epidemic like COVID-19 occurs.

While workplace COVID rates vary in predictable ways across industry, there is a surprisingly large amount of variation in workplace COVID rates within industry. The evidence suggests that this variation appears to be more of a function of differences in preparedness entering the pandemic than in the deliberate choice of how to trade off profitability and employee exposure to COVID risk, with operating performance in 2020 declining with workplace COVID rates. Based on multiple pieces of evidence, differences in overall workplace safety capabilities entering the pandemic appear to contribute to differences in prepared-

[16]We present alternative sets of return regressions where we use the Fama-French 3- and 4-factor models as benchmarks in Appendix Table C9.

ness. This conclusion suggests that capabilities that allow businesses to prevent workplace injuries in the course of normal operations potentially help them prevent workplace COVID infections as well. From a prescriptive standpoint, this conclusion suggests that promoting workplace safety more generally may be a useful step in "hardening" the economy against future epidemics and enabling businesses to remain open.

Our paper points toward fruitful directions for future research on COVID in the workplace, which would benefit from combining the establishment-level workplace COVID infection data from the ITA that this paper analyzes with other fine-grained data. For example, data on specific steps that businesses took to mitigate COVID risk would be useful for assessing what specific approaches were most effective and why workplace safety capabilities entering the pandemic might have been important. Detailed business-unit level productivity and cost data would be useful for understanding the specific mechanisms through which workplace COVID infections depressed operating performance. Worker-level data would provide a more detailed sense of the specific types of workers who were most exposed. Overall, we believe that this paper represents a useful first step towards understanding COVID-19 in the workplace and its implications for businesses.

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Figure 1: The Evolution of U.S. Workplace Injuries and Illnesses Over 2016-2020

This chart displays trends in establishment-level workplace injuries and illnesses in the ITA database over the period 2016-2020. Panels A and B present annual number and rate per 100 full-time equivalent employees of establishment illnesses in the five categories defined by OSHA, including respiratory conditions, which we use to measure workplace COVID cases in 2020. Panels C through F present the number of workplace injuries, workplace deaths, days away from work due to workplace injury and illness, and days of job transfer or restriction due to workplace injury and illness.

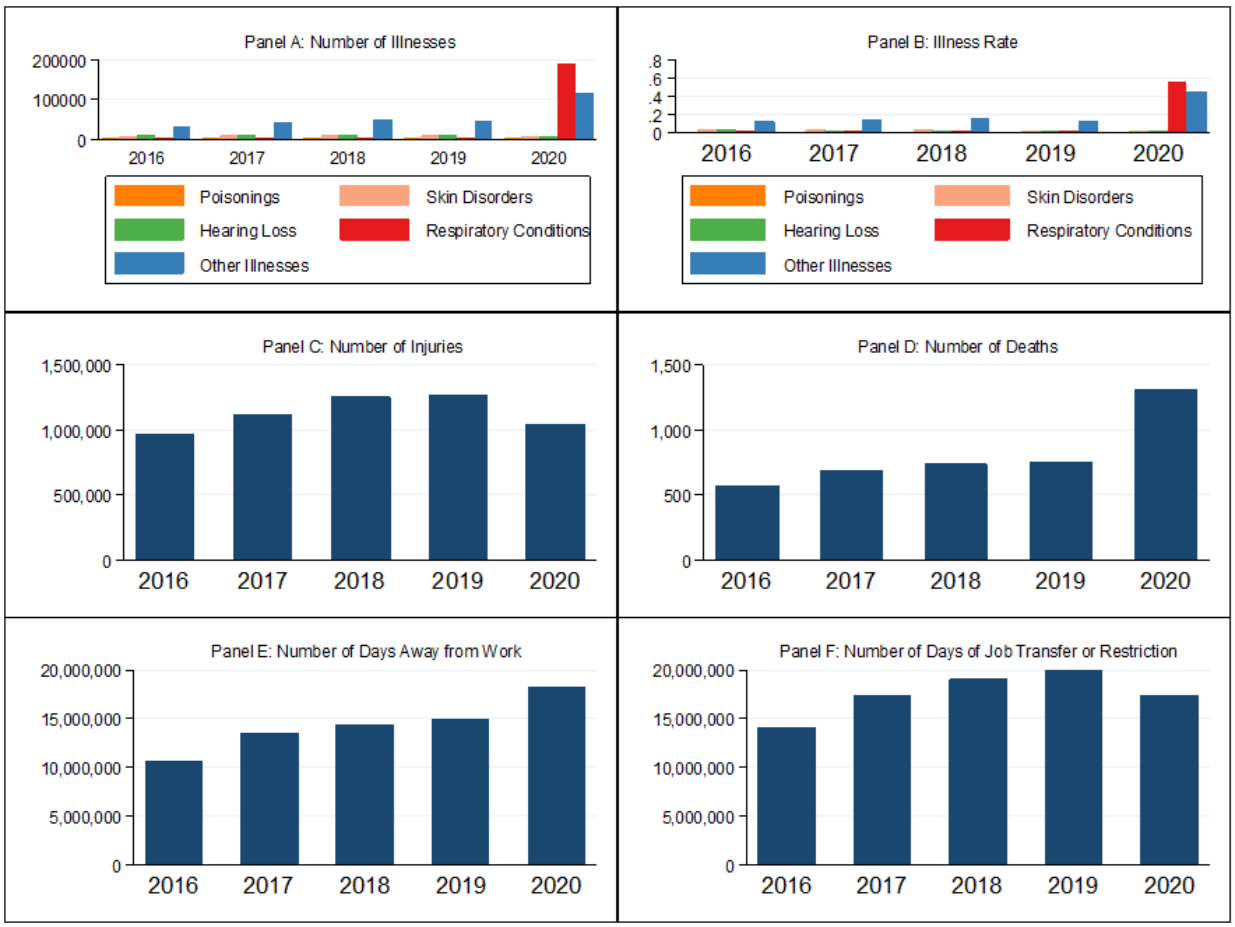

Figure 2: Imputed 2020 Workplace COVID-19 Infection Rate by Demographic

This figure presents the mean imputed 2020 workplace COVID-19 infection rate per 100 full-time equivalent employees by race/ethnicity (Panels A and B) and by gender (Panels C and D). Imputed rates for a group are the weighted average workplace COVID rate in the ITA data across all industries, weighted by the fraction of workers in that group who work in the given industry based on the Census Consumer Population Survey. Panels A and C use all industries, while Panels B and D exclude the Health Care and Social Assistance sector (NAICS 62).

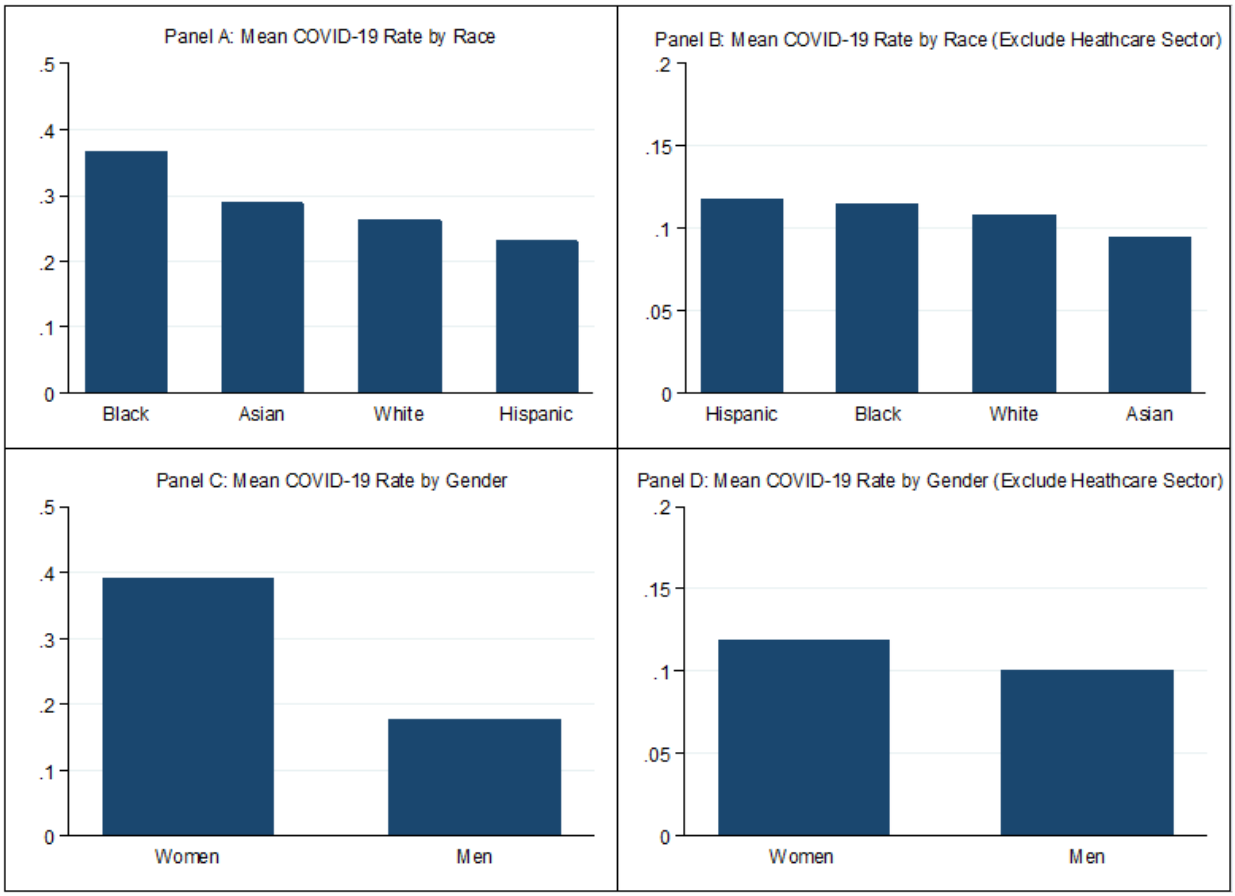

Figure 3: Placebo Test: Pre-Pandemic Workplace Injury Rate & Respiratory Conditions by Year

This figure presents coefficients from OLS regressions of annual establishment-level respiratory condition rate per 100 full-time equivalent employees for different years on establishment-level pre-pandemic workplace injury rate ($InjRate$2016-19). Each bar represents the coefficient using respiratory condition rate for a different year. Each regression includes 6-digit NAICS code industry and 3-digit zip code location fixed effects as well as $LnEmployees$ and $LnHoursPerEmp$ as control variables. The respiratory condition rate for 2020 is equivalent to $COVIDRate$2020, and the coefficient depicted by the bar for 2020 is the same as the coefficient on $InjRate$2016-19 in column (2) of Table 8. See Appendix B for variable definitions.

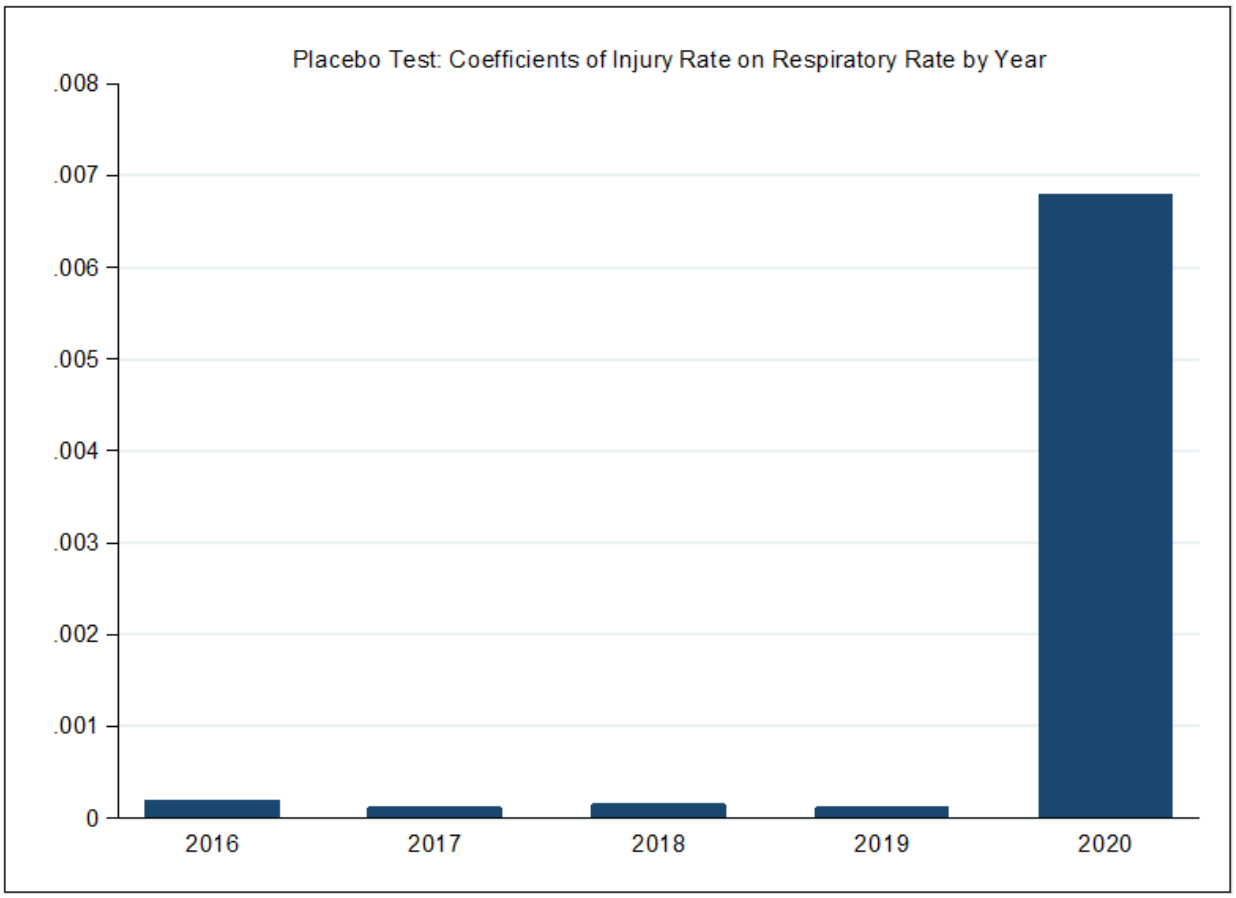

Figure 4: Dynamic Coefficients on Pre-Pandemic Firm Workplace Injury Rate from Moving Buy-and-hold Return Regressions

This figure plots coefficients from daily regressions of buy-and-hold abnormal returns on firm-level pre-pandemic (2016-2019) workplace injury rate ($FirmInjRate$2016-19), controlling for Fama-French 48-category industry fixed effects. The sample is the junction of the ITA, CRSP, and Compustat databases. The coefficient for a given day is the coefficient from a regression where the dependent variable is the buy-and-hold abnormal return from January 1, 2020 through that day. The first red line depicts the date of the first lockdown in Italy. The second red line depicts the date that the final U.S. state (South Carolina) implemented a shutdown. See Appendix B for variable definitions.

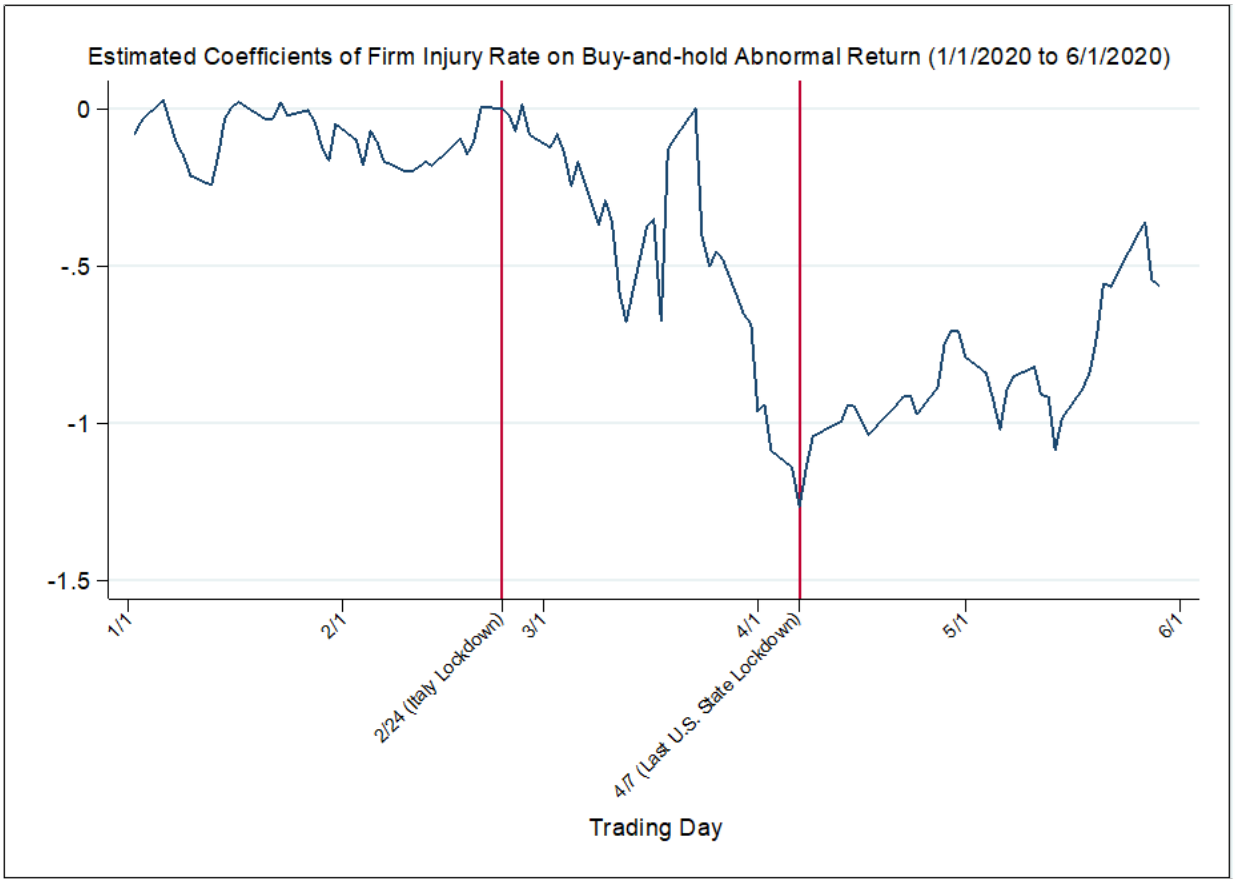

Table 1: Summary Statistics

This table reports summary statistics of the main variables used in the analyses. Establishment injury and illness data from 2016 to 2019 are from the OSHA ITA database. COVID-19 employee complaint data are from the OSHA COVID-19 Complaint Data. Accounting characteristics data are from the Compustat database. Stock return data are from the CRSP database. All continuous variables are winsorized at 1% and 99%. See Appendix B for variable definitions.

Variable	N	Mean	S.D.	25%	Median	75%
Panel A: Establishment-level Variables for COVID-19 Infection Analysis						
$COVIDRate2020$	174,640	0.399	2.283	0.000	0.000	0.000
$InjRate2016\text{-}19$	174,640	5.007	5.119	1.373	3.791	6.970
$Employees$	174,640	122.303	199.998	28.000	56.000	127.000
$LnEmployees$	174,640	4.168	1.038	3.332	4.025	4.844
$HoursPerEmployee$	174,640	1754.306	487.621	1470.247	1810.342	2054.200
$LnHoursPerEmployee$	174,640	7.422	0.334	7.293	7.501	7.628
Panel B: Industry-level Variables for COVID-19 Infection Analysis						
$IndCOVIDRate2020$	815	0.146	0.408	0.000	0.015	0.086
$WorkProximity$	815	0.522	0.090	0.467	0.500	0.574
$UnionziationRate$	815	0.082	0.085	0.021	0.048	0.108
$EssentialIndustry$	815	0.679	0.467	0.000	1.000	1.000
Panel C: Firm-level Variables for Main Firm-Level Analysis						
$FirmCOVIDRate2020$	488	0.110	0.483	0.000	0.000	0.023
ΔROA	488	-0.020	0.056	-0.037	-0.013	0.004
ΔROS	488	-0.014	0.089	-0.018	0.001	0.015
$\Delta COGS/SALES$	488	0.010	0.077	-0.015	-0.001	0.013
$\Delta SGA/SALES$	436	0.004	0.023	-0.005	0.002	0.011
$SalesGrowth$	488	-0.061	0.189	-0.139	-0.044	0.036
Panel D: Firm-level Variables for COVID-19 Employee Complaint Analysis						
$FirmInjRate2016\text{-}19$	813	2.536	2.000	0.995	1.923	3.577
$Complaint2020$	813	0.237	0.426	0.000	0.000	0.000
$\#Complaints2020$	813	2.098	7.352	0.000	0.000	0.000
Panel E: Firm-level Variables for Stock Return Analysis						
$FirmInjRate2016\text{-}19$	690	2.629	2.054	1.023	2.069	3.702
$BHAR$	690	-12.026	20.120	-24.749	-9.774	2.485
$IdiosyncraticVol$	690	5.463	2.732	3.565	4.733	6.568
$Ln(Assets)$	690	8.503	1.578	7.398	8.404	9.546
$Debt/Assets$	690	0.324	0.192	0.193	0.314	0.422
$Cash/Assets$	690	0.086	0.090	0.023	0.056	0.122
$Tobin'sQ$	690	1.852	1.071	1.163	1.463	2.108
ROA	690	0.146	0.086	0.097	0.137	0.180
ESG	619	0.392	0.378	0.063	0.420	0.611

Table 2: Variance Statistics

This table presents a summary of the relative variation of 2020 workplace COVID rate ($COVIDRate2020$) and pre-pandemic (2016-2019) workplace injury rate ($InjRate2016\text{-}19$) between and within industry, zip code, and firm groups. See Appendix B for variable definitions. The first pair of rows report the mean and standard deviation of each variable for the full establishment sample. The second pair of rows report the standard deviation between and within each 6-digit NAICS industry. The third pair of rows report the standard deviation between and within each 3-digit zip codes. The fourth pair of rows report the standard deviation between and within each parent firm.

Variable	$COVIDRate2020$	$InjRate2016\text{-}19$
Overall Mean	0.399	5.007
Overall Std. Dev.	2.283	5.119
Between Industry Std. Dev.	0.591	2.513
Within Industry Std. Dev.	2.034	4.746
Between Zip codes Std. Dev.	0.422	1.223
Within Zip codes Std. Dev.	2.266	5.037
Between Firm Std. Dev.	2.288	4.905
Within Firm Std. Dev.	1.082	3.056

Table 3: 2020 Workplace COVID-19 Rate by Industry

This table presents the mean establishment 2020 COVID rate for different industries. Panel A presents the mean for each broad NAICS industry sector, from highest to lowest. Panel B presents the mean for the 40 6-digit NAICS code industries with the highest mean COVID rates, from highest to lowest.

Panel A: Highest COVID Rate by broad NAICS sector			
Rank	NAICS Code(s)	NAICS Sector	Mean COVID Rate
1	62	Health Care and Social Assistance	2.5409
2	11	Agriculture, Forestry, Fishing and Hunting	0.4350
3	44-45	Retail Trade	0.1897
4	53	Real Estate and Rental and Leasing	0.1406
5	31-33	Manufacturing	0.1329
6	52	Finance and Insurance	0.1050
7	55	Management of Companies and Enterprises	0.1047
8	22	Utilities	0.0954
9	42	Wholesale Trade	0.0946
10	54	Professional, Scientific, and Technical Services	0.0839
11	72	Accommodation and Food Services	0.0776
12	56	Administrative and Support and Waste Management and Remediation Services	0.0766
13	71	Arts, Entertainment, and Recreation	0.0713
14	48-49	Transportation and Warehousing	0.0698
15	51	Information	0.0676
16	23	Construction	0.0666
17	81	Other Services (except Public Administration)	0.0572
18	61	Educational Services	0.0539
19	21	Mining, Quarrying, and Oil and Gas Extraction	0.0434

Panel B: Highest COVID-19 Rate by NAICS 6-digit

Rank	NAICS Code	6-digit NAICS Industry	Mean COVID-19 Rate
1	621110	Offices of Physicians	10.0155
2	623110	Nursing Care Facilities	5.5624
3	621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists	5.0861
4	621492	Kidney Dialysis Centers	5.0460
5	112519	Other Aquaculture	4.6714
6	316110	Leather and Hide Tanning and Finishing	4.5490
7	621910	Ambulance Services	4.0476
8	115210	Support Activities for Animal Production	3.4352
9	112340	Poultry Hatcheries	3.0833
10	623311	Continuing Care Retirement Communities	3.0002
11	311615	Poultry Processing	2.7925
22	813311	Human Rights Organizations	2.7608
12	511120	Motion Picture and Video Distribution	2.1935
13	311611	Animal (except Poultry) Slaughtering	2.1585
14	623312	Assisted Living Facilities for the Elderly	2.1501
15	622210	Psychiatric and Substance Abuse Hospitals	1.8887
16	622310	Specialty (except Psychiatric and Substance Abuse) Hospitals	1.8178
17	622110	General Medical and Surgical Hospitals	1.8081
18	311830	Tortilla Manufacturing	1.6385
19	621999	All Other Miscellaneous Ambulatory Health Care Services	1.5043
20	311612	Meat Processed from Carcasses	1.4666
21	112310	Chicken Egg Production	1.2865
23	335121	Electric Lighting Equipment Manufacturing	1.2845
24	623220	Residential Mental Health and Substance Abuse Facilities	1.2660
25	623990	Other Residential Care Facilities	1.1936
26	541430	Graphic Design Services	1.0877
27	311712	Seafood Product Preparation and Packaging	1.0825
28	711190	Other Performing Arts Companies	1.0666
29	621610	Home Health Care Services	1.0306
30	311412	Frozen Specialty Food Manufacturing	1.0294
31	624230	Emergency and Other Relief Services	0.9833
32	327213	Glass Container Manufacturing	0.9685
33	522298	International, Secondary Market, and All Other Credit Intermediation	0.9625
34	813110	Religious Organizations	0.9084
35	621399	Offices of All Other Miscellaneous Health Practitioners	0.8953
36	212325	Kaolin, Clay, and Ceramic and Refractory Minerals Mining	0.8786
37	315110	Apparel Knitting Mills	0.8275
38	624120	Residential Intellectual and Developmental Disability Facilities	0.8012
39	517911	All Other Telecommunications	0.7868
40	311340	Nonchocolate Confectionery Manufacturing	0.7640

Table 4: Industry-level Analysis of Workplace COVID-19 Infections

This table presents results from OLS regressions of industry 2020 workplace COVID-19 rate per 100 full-time equivalent employees ($IndCOVIDRate2020$) on industry-level work proximity ($WorkProximity$), unionization rate ($UnionziationRate$), and an an essential industry indicator ($EssentialIndustry$). The unit of observation is a 6-digit NAICS code industry. $WorkProximity$ is employment-weighed occupation work proximity measured at the 4-digit NAICS code level. $UnionziationRate$ is the percentage of workers in the 4-digit NAICS code who are unionized. $EssentialIndustry$ is an indicator variable that equals one if a 6-digit NAICS code industry was designated an essential industry by DHS or CISA. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$IndCOVIDRate2020$			
	(1)	(2)	(3)	(4)
$WorkProximity$	0.937***			1.151***
	(0.240)			(0.269)
$UnionizationRate$		-0.127		-0.557***
		(0.135)		(0.174)
$EssentialIndustry$			0.043	0.075**
			(0.030)	(0.031)
Adjusted R^2	0.041	0.000	0.001	0.056
Observations	815	815	815	815

Table 5: Workplace COVID-19 Infections and Operating Performance

This table presents results from OLS regressions of changes in firm-level operating performance from 2019 to 2020 on firm-level 2020 workplace COVID rate ($FirmCOVIDRate2020$). The sample consists of firms in the junction of the ITA data and Compustat data in 2020. ΔROA is the change in return on assets from 2019 to 2020. ΔROS is the change in return on sales from 2019 to 2020. $\Delta COGS/Sales$ is the change in cost of goods sold divided by sales from 2019 to 2020. $\Delta SGA/Sales$ is the change in selling, general, and administrative expenses divided by sales from 2019 to 2020. $SalesGrowth$ is the percentage change in sales from 2019 to 2020. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Period	From 2019 to 2020				
Dependent Variable	ΔROA	ΔROS	$\Delta COGS/Sales$	$\Delta SGA/Sales$	$SalesGrowth$
	(1)	(2)	(3)	(4)	(5)
$FirmCOVIDRate2020$	-0.019***	-0.021***	0.017***	0.002	-0.032**
	(0.007)	(0.007)	(0.006)	(0.003)	(0.016)
$LnAssets$	-0.003	-0.008***	0.006**	0.002***	-0.016***
	(0.002)	(0.003)	(0.003)	(0.001)	(0.006)
$Debt/Assets$	0.019	0.026	-0.018	-0.010	-0.007
	(0.015)	(0.022)	(0.019)	(0.006)	(0.050)
$Tobin's Q$	-0.002	0.005**	-0.002	-0.003***	0.046***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.008)
Industry FE	Y	Y	Y	Y	Y
Adjusted R^2	0.225	0.235	0.218	0.197	0.257
Observations	488	488	488	434	488

Table 6: Placebo: Workplace COVID-19 Infections and Operating Performance

This table presents results from OLS regressions of changes in firm-level operating performance from 2018 to 2019 and from 2017 to 2018 on firm-level 2020 workplace COVID rate ($FirmCOVIDRate2020$). The sample consists of firms in the junction of the ITA data and Compustat data in 2020. ΔROA is the change in return on assets over the given period. ΔROS is the change in return on sales over the given period. $\Delta COGS/Sales$ is the change in cost of goods sold divided by sales over the given period. $\Delta SGA/Sales$ is the change in selling, general, and administrative expenses divided by sales over the given period. $SalesGrowth$ is the percentage change in sales over the given period. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Period	From 2018 to 2019				
Dependent Variable	ΔROA	ΔROS	$\Delta COGS/Sales$	$\Delta SGA/Sales$	$SalesGrowth$
	(1)	(2)	(3)	(4)	(5)
$FirmCOVIDRate2020$	-0.000	0.001	-0.000	-0.001	0.009
	(0.004)	(0.004)	(0.004)	(0.001)	(0.010)
$Ln(Assets)$	0.002*	0.001	-0.001	-0.000	-0.010*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)
$Debt/Assets$	0.017	0.007	-0.005	-0.002	-0.000
	(0.013)	(0.010)	(0.009)	(0.005)	(0.047)
$Tobin'sQ$	-0.004*	-0.000	-0.001	0.001	0.017***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.007)
Industry FE	Y	Y	Y	Y	Y
Adjusted R^2	0.082	0.055	0.031	0.036	0.070
Observations	491	491	491	437	491
Period	From 2017 to 2018				
Dependent Variable	ΔROA	ΔROS	$\Delta COGS/SALES$	$\Delta SGA/SALES$	$SalesGrowth$
	(1)	(2)	(3)	(4)	(5)
$FirmCOVIDRate2020$	0.004	0.001	-0.004	0.002	-0.006
	(0.006)	(0.004)	(0.003)	(0.002)	(0.012)
$Ln(Assets)$	0.000	-0.001	0.000	0.001	-0.012**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)
$Debt/Assets$	0.022*	-0.000	0.000	-0.003	0.043
	(0.011)	(0.009)	(0.007)	(0.008)	(0.045)
$Tobin'sQ$	-0.008***	0.000	0.000	-0.000	0.028***
	(0.003)	(0.002)	(0.001)	(0.002)	(0.008)
Industry FE	Y	Y	Y	Y	Y
Adjusted R^2	0.108	0.055	0.050	-0.014	0.154
Observations	489	489	489	434	489

Table 7: Firm-level Analysis of 2020 Workplace COVID-19 Infections

This table presents results from OLS regressions of 2020 firm-level workplace COVID rate ($FirmCOVIDRate2020$). The sample consists of public firms in the junction of the ITA and Compustat data in 2020. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$FirmCOVIDRate2020$					
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjRate2016\text{-}19$	0.029***	0.030***	0.026**	0.026**	0.028**	0.029***
	(0.009)	(0.010)	(0.011)	(0.011)	(0.011)	(0.011)
ROA		0.111	0.002	-0.002	-0.014	0.010
		(0.271)	(0.292)	(0.305)	(0.297)	(0.296)
$Tobin'sQ$		-0.021	-0.027	-0.023	-0.022	-0.019
		(0.017)	(0.020)	(0.019)	(0.019)	(0.019)
ESG			0.025	0.028	0.010	0.015
			(0.033)	(0.034)	(0.036)	(0.034)
$Debt/Assets$	0.134	0.142	0.056			
	(0.110)	(0.119)	(0.139)			
$Cash/Assets$	0.042	0.137	0.158			
	(0.156)	(0.199)	(0.235)			
$KZIndex$				0.000		
				(0.001)		
$WWIndex$					-0.311	
					(0.210)	
$HPIndex$						-0.397**
						(0.176)
Industry FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.326	0.328	0.341	0.342	0.344	0.344
Observations	701	635	550	549	550	550

Table 8: Establishment-Level Analysis of 2020 Workplace COVID-19 Infections

This table presents results from OLS regressions of 2020 establishment-level workplace COVID rate ($COVIDRate2020$). All specifications include establishment-level 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$COVIDRate2020$				
	(1)	(2)	(3)	(4)	(5)
$InjRate$2016-19	0.006***	0.007***	0.007**		0.006**
	(0.002)	(0.002)	(0.003)		(0.003)
$FirmInjRate$2016-19				0.007***	0.001
				(0.003)	(0.004)
$LnEmployees$		0.052***	0.048***	0.052***	0.052***
		(0.011)	(0.016)	(0.011)	(0.011)
$LnHoursPerEmployee$		0.007	-0.064	0.006	0.007
		(0.044)	(0.046)	(0.043)	(0.043)
Establishment Industry FE	Y	Y	Y	Y	Y
Establishment Zipcode FE	Y	Y	Y	Y	Y
Parent Firm FE	N	N	Y	N	N
Adjusted R^2	0.209	0.209	0.554	0.209	0.209
Observations	174,640	174,640	101,972	174,640	174,640

Table 9: 2020 Workplace COVID Infections and Pre-Pandemic Workplace Injury Rate by NAICS Sector

This table presents results from OLS regressions of 2020 establishment-level workplace COVID rate ($COVIDRate2020$) for subsamples based on NAICS industry sector. All specifications include 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects as well as $LnEmployees$ and $LnHoursPerEmployee$ as control variables. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Sector	Agriculture, Mining, and Utilities (11, 21, 22)	Construction (23)	Manufacturing (31-33)	Wholesale Trade (42)	Retail Trade (44-45)
Dependent Variable			$COVIDRate2020$		
	(1)	(2)	(3)	(4)	(5)
$InjRate$2016-19	0.002	0.006***	0.005**	0.005**	-0.006***
	(0.005)	(0.002)	(0.003)	(0.003)	(0.002)
Establishment Controls	Y	Y	Y	Y	Y
Establishment Industry FE	Y	Y	Y	Y	Y
Establishment Zip code FE	Y	Y	Y	Y	Y
Adjusted R^2	0.144	-0.003	0.079	0.028	0.073
Observations	6,805	18,827	36,475	12,439	35,207
Sector	Transportation (48-49)	Information, Finance, Waste, and Education Services (51-61)	Health Care and Social Assistance (62)	Recreation, Food, and Other Services (71-81)	
Dependent Variable			$COVIDRate2020$		
	(6)	(7)	(8)	(9)	
$InjRate$2016-19	0.004**	0.005***	0.024**	0.004*	
	(0.002)	(0.002)	(0.010)	(0.002)	
Establishment Controls	Y	Y	Y	Y	
Establishment Industry FE	Y	Y	Y	Y	
Establishment Zip code FE	Y	Y	Y	Y	
Adjusted R^2	0.039	0.029	0.173	0.002	
Observations	20,834	13,131	19,877	10,579	

Table 10: Cross-sectional Variation: Work Proximity and Production Homogeneity

This table presents results from analysis of cross-sectional variation in the dependence of establishment-level workplace COVID rate ($COVIDRate2020$) on pre-pandemic workplace injury rate ($InjRate2016\text{-}19$). $WorkProximity$ is 4-digit NAICS code industry-level work proximity, computed as the industry employement-weighted average of occupational work proximity from Mongey et al. (2020), and demeaned for ease of interpretation. The high-industry homogeneity subsample analyzed in column (2) includes establishments in 4-digit NAICS code industries with above-median homogeneity, where industry homogeneity is calculated as the mean partial correlation coefficients across all firms within each 4-digit NAICS code industry based on the model of Parrino (1997). Both regressions include 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$COVIDRate2020$	
	(1)	(2)
$InjRate2016\text{-}19$	0.009***	0.009**
	(0.002)	(0.004)
$InjRate2016\text{-}19 * WorkProximity$	0.065*	
	(0.036)	
Sample	Full Sample	Subsample: High Industry Homogeneity
Establishment Controls	Y	Y
Establishment Industry FE	Y	Y
Establishment Zipcode FE	Y	Y
Adjusted R^2	0.222	0.237
Observations	122,223	67,550

Table 11: COVID-19 Safety Employee Complaints

This table presents results from regressions of 2020 firm-level COVID-related employee OSHA complaints. The sample consists of public firms with at least five establishment-years in the ITA data between 2016 and 2019. The dependent variable $Complaint2020$ is an indicator variable that equals one if a firm has at least one COVID-19 safety employee complaint case in the Weekly OSHA COVID-19 Complaint Database in 2020, and zero otherwise. The dependent variable $\#Complaints2020$ is the number of 2020 COVID-19 safety employee complaint cases. The regression model is OLS when the dependent variable is $Complaint(0/1)$ and Poisson when the dependent variable is $\#Complaints$. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$Complaint2020)$		$\#Complaints2020$	
	(1)	(2)	(3)	(4)
$FirmInjRate2016\text{-}19$	0.012	0.026***	0.106*	0.116**
	(0.010)	(0.010)	(0.058)	(0.053)
$LnAssets$		0.074***		0.642***
		(0.010)		0.060)
$Debt/Assets$		-0.037		0.009
		(0.079)		(0.387)
ROA		0.227		4.281***
		(0.191)		(1.632)
$Tobin'sQ$		0.017		-0.018
		(0.016)		(0.111)
Model	OLS	OLS	Poisson	Poisson
Industry FE	Y	Y	Y	Y
Adjusted (Pesudo) R^2	0.097	0.147	0.320	0.520
Observations	813	813	759	759

Table 12: Injury and Stock Returns During 2020 Stock Market Crash

This table presents results from OLS regressions of stock return and return volatility over the period from February 24, 2020 to April 7, 2020. The sample consists of publicly-traded firms with at least five establishment-years in the ITA data for the period of 2016-2019. $BHAR$ is the buy-and-hold abnormal return from February 24, 2020 to April 7, 2020 based on CAPM-adjusted daily returns, where market beta is estimated using daily returns from 2016 to 2019. $IdiosyncraticVol$ is the standard deviation of CAPM-adjusted daily return from February 24, 2020 to April 7, 2020. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Accumulation Period	02/24/20 - 04/07/20					
Dependent Variable	$BHAR$			$IdiosyncraticVol$		
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjRate$2016-19	-1.309***	-0.813**	-0.870*	0.216***	0.114**	0.125**
	(0.428)	(0.412)	(0.454)	(0.064)	(0.055)	(0.054)
$LnAssets$		2.324***	1.996***		-0.561***	-0.538***
		(0.473)	(0.533)		(0.057)	(0.064)
$Debt/Assets$		-19.699***	-20.179***		4.223***	3.954***
		(4.226)	(4.447)		(0.560)	(0.587)
$Cash/Assets$		-9.224	-1.015		4.178***	3.603***
		(8.850)	(9.226)		(1.095)	(1.147)
$Tobin'sQ$		4.806***	4.443***		-0.680***	-0.628***
		(0.901)	(0.892)		(0.119)	(0.121)
ROA		16.247	6.105		-2.445	-1.509
		(11.697)	(11.944)		(1.711)	(1.770)
ESG			0.478			0.016
			(1.972)			(0.237)
Industry FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.215	0.337	0.316	0.161	0.371	0.349
Observations	690	690	619	690	690	619

Appendices

A OSHA Forms and Memos

The *Log of Work-Related Injuries and Illnesses* is used to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the *Log* to record specific details about what happened and how it happened.

If your company has more than one establishment or site, you must keep separate records for each physical location that is expected to remain in operation for one year or longer.

If you need additional copies of the *Log*, you may photocopy the printout or insert additional form pages in the PDF, and then use as many as you need.

The *Summary* — a separate form — shows the work-related injury and illness totals for the year in each category. At the end of the year, count the number of incidents in each category and transfer the totals from the *Log* to the *Summary*. Then post the *Summary* in a visible location so that your employees are aware of injuries and illnesses occurring in their workplace.

You don't post the Log. You post only the Summary at the end of the year.

OSHA's Form 300 (Rev. 04/2004)

Log of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader. In addition, the forms are programmed to auto-calculate as appropriate.

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

Please Record:

- *Information about every work-related death and about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid.*
- *Significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional.*
- *Work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR Part 1904.8 through 1904.12.*

Reminders:

- *Complete an Injury and Illness Incident Report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.*
- *Feel free to use two lines for a single case if you need to.*
- *Complete the 5 steps for each case.*

Establishment name ______________________

City ______________ *State* ________

	Step 1. Identify the person			Step 2. Describe the case			Step 3. Classify the case — SELECT ONLY ONE circle based on the most serious outcome:				Step 4. Enter the number of days the injured or ill worker was:		Step 5. Select one column: (M)					
								Remained at Work						Illness				
	(A) Case no.	(B) Employee's name	(C) Job title (e.g., Welder)	(D) Date of injury or onset of illness (e.g., 2/10)	(E) Where the event occurred (e.g., Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g., Second degree burns on right forearm from acetylene torch)	(G) Death	(H) Days away from work	(I) Job transfer or restriction	(J) Other record-able cases	(K) Away from work	(L) On job transfer or restriction	(1) Injury	(2) Skin disorder	(3) Respiratory condition	(4) Poisoning	(5) Hearing loss	(6) All other illnesses
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
Reset				/ month / day							days	days						
						Page totals ▶							(1) Injury	(2) Skin disorder	(3) Respiratory condition	(4) Poisoning	(5) Hearing loss	(6) All other illnesses

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Add a Form Page

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

OSHA's Form 300A (Rev. 04/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 ___

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
_____	_____	_____	_____
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
_____	_____
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	_____	(4) Poisonings	_____
(2) Skin disorders	_____	(5) Hearing loss	_____
(3) Respiratory conditions	_____	(6) All other illnesses	_____

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Establishment information

Your establishment name _____

Street _____

City _____ State _____ Zip _____

Industry description (*e.g., Manufacture of motor truck trailers*)

_____

North American Industrial Classification (NAICS), if known (e.g., 336212)

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees _____

Total hours worked by all employees last year _____

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

_____ _____
Company executive Title

Phone _____ Date _____

April 10, 2020

FOR:
REGIONAL ADMINISTRATORS
STATE DESIGNEES

THROUGH:
AMANDA EDENS
Deputy Assistant Secretary

FROM:
LEE ANNE JILLINGS, Acting Director
Directorate of Technical Support and Emergency Management

PATRICK J. KAPUST, Acting Director
Directorate of Enforcement Programs

SUBJECT:
Enforcement Guidance for Recording Cases of Coronavirus Disease 2019 (COVID-19)

This memorandum provides interim guidance to Compliance Safety and Health Officers (CSHOs) for enforcing the requirements of 29 CFR Part 1904 with respect to the recording of occupational illnesses, specifically cases of Coronavirus Disease 2019 (COVID-19). This memorandum will take effect immediately and remain in effect until further notice. This guidance is intended to be time-limited to the current public health crisis. Please frequently check OSHA's webpage at www.osha.gov/coronavirus for updates.

Under OSHA's recordkeeping requirements, COVID-19 is a recordable illness, and employers are responsible for recording cases of COVID-19, if: (1) the case is a confirmed case of COVID-19, as defined by Centers for Disease Control and Prevention (CDC);[1] (2) the case is work-related as defined by 29 CFR § 1904.5;[2] and (3) the case involves one or more of the general recording criteria set forth in 29 CFR § 1904.7.[3] On March 11, the World Health Organization (WHO) declared COVID-19 a global pandemic, and the extent of transmission is a rapidly evolving issue.

In areas where there is ongoing community transmission, employers other than those in the healthcare industry, emergency response organizations (e.g., emergency medical, firefighting, and law enforcement services), and correctional institutions may have difficulty making determinations about whether workers who contracted COVID-19 did so due to exposures at work. In light of those difficulties, OSHA is exercising its enforcement discretion in order to provide certainty to the regulated community.

Employers of workers in the healthcare industry, emergency response organizations (e.g., emergency medical, firefighting, and law enforcement services), and correctional institutions must continue to make work-relatedness determinations pursuant to 29 CFR § 1904. Until further notice, however, OSHA will not enforce 29 CFR § 1904 to require other employers to make the same work-relatedness determinations, except where:

1. There is objective evidence that a COVID-19 case may be work-related. This could include, for example, a number of cases developing among workers who work closely together without an alternative explanation; and
2. The evidence was reasonably available to the employer. For purposes of this memorandum, examples of reasonably available evidence include information given to the employer by employees, as well as information that an employer learns regarding its employees' health and safety in the ordinary course of managing its business and employees.

This enforcement policy will help employers focus their response efforts on implementing good hygiene practices in their workplaces, and otherwise mitigating COVID-19's effects, rather than on making difficult work-relatedness decisions in circumstances where there is community transmission.

CSHOs will generally refer to CPL 02-00-135, *Recordkeeping Policies and Procedures Manual* (Dec. 30, 2004) and CPL 02-00-163, *Field Operations Manual (FOM)* (Sept. 13, 2019), Chapters 3 and 6, as applicable.[4],5] The following additional specific enforcement guidance is provided for CSHOs:

> COVID-19 is a respiratory illness and should be coded as such on the OSHA Form 300. Because this is an illness, if an employee voluntarily requests that his or her name not be entered on the log, the employer must comply as specified under 29 CFR § 1904.29(b)(7)(vi).

If you have any questions regarding this policy, please contact Elizabeth Grossman, Director of the Office of Statistical Analysis, at (202) 693-2225.

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[1] A confirmed case of COVID-19 means an individual with at least one respiratory specimen that tested positive for SARS-CoV-2, the virus that causes COVID-19. *See* www.cdc.gov/coronavirus/2019-ncov/php/reporting-pui.html. Back to Text

[2] Under 29 CFR § 1904.5, an employer must consider an injury or illness to be work-related if an event or exposure in the work environment (as defined by 29 CFR § 1904.5(b)(1)) either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the work environment, unless an exception in 29 CFR § 1904.5(b)(2) specifically applies. *See* www.osha.gov/laws-regs/regulations/standardnumber/1904/1904.5. Back to Text

[3] Under 29 CFR § 1904.7, an employer must consider an injury or illness to meet the general recording criteria, and therefore to be recordable, if it results in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. An employer must also consider a case to meet the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness. *See* www.osha.gov/laws-regs/regulations/standardnumber/1904/1904.7. Back to Text

[4] www.osha.gov/enforcement/directives/cpl-02-00-135. Back to Text

[5] www.osha.gov/enforcement/directives/cpl-02-00-163. Back to Text

May 19, 2020

MEMORANDUM FOR:

REGIONAL ADMINISTRATORS
STATE PLAN DESIGNEES

THROUGH:
AMANDA EDENS
Deputy Assistant Secretary

FROM:

LEE ANNE JILLINGS, Acting Director
Directorate of Technical Support and Emergency Management

PATRICK J. KAPUST, Acting Director
Directorate of Enforcement Programs

SUBJECT:

Revised Enforcement Guidance for Recording Cases of Coronavirus Disease 2019 (COVID-19)

This memorandum provides updated interim guidance to Compliance Safety and Health Officers (CSHOs) for enforcing the requirements of 29 CFR Part 1904 with respect to the recording of occupational illnesses, specifically cases of COVID-19. On May 26, 2020, the previous memorandum on this topic[1] will be rescinded, and this new memorandum will go into and remain in effect until further notice. This guidance is intended to be time-limited to the current COVID-19 public health crisis. Please frequently check OSHA's webpage at *www.osha.gov/coronavirus* for updates.

Under OSHA's recordkeeping requirements, COVID-19 is a recordable illness, and thus employers are responsible for recording cases of COVID-19, if:

1. The case is a confirmed case of COVID-19, as defined by the Centers for Disease Control and Prevention (CDC);[2]
2. The case is work-related as defined by 29 CFR § 1904.5;[3] and
3. The case involves one or more of the general recording criteria set forth in 29 CFR § 1904.7.[4]

Confirmed cases of COVID-19 have now been found in nearly all parts of the country, and outbreaks among workers in industries other than healthcare, emergency response, or correctional institutions have been identified. As transmission and prevention of infection have become better understood, both the government and the private sector have taken rapid and evolving steps to slow the virus's spread, protect employees, and adapt to new ways of doing business. As the virus's spread now slows in certain areas of the country, states are taking steps to reopen their economies and workers are returning to their workplaces. All these facts—incidence, adaptation, and the return of the workforce—indicate that employers should be taking action to determine whether employee COVID-19 illnesses are work-related and thus recordable. Given the nature of the disease and ubiquity of community spread, however, in many instances it remains difficult to determine whether a COVID-19 illness is work-related, especially when an employee has experienced potential exposure both in and out of the workplace.

In light of these considerations, OSHA is exercising its enforcement discretion in order to provide certainty to employers and workers. Accordingly, until further notice, OSHA will enforce the recordkeeping requirements of 29 CFR 1904 for employee COVID-19 illnesses for all employers according to the guidelines below. Recording a COVID-19 illness does not, of itself, mean that the employer has violated any OSHA standard. And pursuant to existing regulations, employers with 10 or fewer employees and certain employers in low hazard industries have no recording obligations; they need only report work-related COVID-19 illnesses that result in a fatality or an employee's in-patient hospitalization, amputation, or loss of an eye.[5]

* * *

Because of the difficulty with determining work-relatedness, OSHA is exercising enforcement discretion to assess employers' efforts in making work-related determinations.

In determining whether an employer has complied with this obligation and made a reasonable determination of work-relatedness, CSHOs should apply the following considerations:

- *The reasonableness of the employer's investigation into work-relatedness*. Employers, especially small employers, should not be expected to undertake extensive medical inquiries, given employee privacy concerns and most employers' lack of expertise in this area. It is sufficient in most circumstances for the employer, when it learns of an employee's COVID-19 illness, (1) to ask the employee how he believes he contracted the COVID-19 illness; (2) while respecting employee privacy, discuss with the employee his work and out-of-work activities that may have led to the COVID-19 illness; and (3) review the employee's work environment for potential SARS-CoV-2 exposure. The review in (3) should be informed by any other instances of workers in that environment contracting COVID-19 illness.
- *The evidence available to the employer.* The evidence that a COVID-19 illness was work-related should be considered based on the information reasonably available to the employer at the time it made its work-relatedness determination. If the employer later learns more information related to an employee's COVID-19 illness, then that information should be taken into account as well in determining whether an employer made a reasonable work-relatedness determination.
- *The evidence that a COVID-19 illness was contracted at work.* CSHOs should take into account all reasonably available evidence, in the manner described above, to determine whether an employer has complied with its recording obligation. This cannot be reduced to a ready formula, but certain types of evidence may weigh in favor of or against work-relatedness. For instance:
  - COVID-19 illnesses are likely work-related when several cases develop among workers who work closely together and there is no alternative explanation.
  - An employee's COVID-19 illness is likely work-related if it is contracted shortly after lengthy, close exposure to a particular customer or coworker who has a confirmed case of COVID-19 and there is no alternative explanation.
  - An employee's COVID-19 illness is likely work-related if his job duties include having frequent, close exposure to the general public in a locality with ongoing community transmission and there is no alternative explanation.
  - An employee's COVID-19 illness is likely not work-related if she is the only worker to contract COVID-19 in her vicinity and her job duties do not include having frequent contact with the general public, regardless of the rate of community spread.
  - An employee's COVID-19 illness is likely not work-related if he, outside the workplace, closely and frequently associates with someone (e.g., a family member, significant other, or close friend) who (1) has COVID-19; (2) is not a coworker, and (3) exposes the employee during the period in which the individual is likely infectious.
  - CSHOs should give due weight to any evidence of causation, pertaining to the employee illness, at issue provided by medical providers, public health authorities, or the employee herself.

If, after the reasonable and good faith inquiry described above, the employer cannot determine whether it is more likely than not that exposure in the workplace played a causal role with respect to a particular case of COVID-19, the employer does not need to record that COVID-19 illness. In all events, it is important as a matter of worker health and safety, as well as public health, for an employer to examine COVID-19 cases among workers and respond appropriately to protect workers, regardless of whether a case is ultimately determined to be work-related.

CSHOs will generally refer to CPL 02-00-135, *Recordkeeping Policies and Procedures Manual* (Dec. 30, 2004), [6] and CPL 02-00-163, *Field Operations Manual* (Sept. 13, 2019),[7] Chapters 3 and 6, as applicable. The following additional specific enforcement guidance is provided for CSHOs:

- COVID-19 is a respiratory illness and should be coded as such on the OSHA Form 300. Because this is an illness, if an employee voluntarily requests that his or her name not be entered on the log, the employer must comply as specified under 29 CFR § 1904.29(b)(7)(vi).

If you have any questions regarding this policy, please contact Elizabeth Grossman, Director of the Office of Statistical Analysis, at (202) 693-2225.

cc: DCSP
DSG

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[1] Memorandum from Lee Anne Jillings & Patrick J. Kapust, OSHA, “Enforcement Guidance for Recording Cases of Coronavirus Disease 2019 (COVID-19),” Apr. 10, 2020, www.osha.gov/memos/2020-04-10/enforcement-guidance-recording-cases-coronavirus-disease-2019-COVID-19. Back to text

[2] A confirmed case of COVID-19 means an individual with at least one respiratory specimen that tested positive for SARS-CoV-2, the virus that causes COVID-19. *See* www.cdc.gov/coronavirus/2019-ncov/php/reporting-pui.html. Back to text

[3] Under 29 CFR § 1904.5, an employer must consider an injury or illness to be work-related if an event or exposure in the work environment (as defined by 29 CFR § 1904.5(b)(1)) either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the work environment, unless an exception in 29 CFR § 1904.5(b)(2) specifically applies. *See* www.osha.gov/laws-regs/regulations/standardnumber/1904/1904.5. As discussed below, OSHA is exercising enforcement discretion regarding work-relatedness in the context of employee COVID-19 illness. Back to text

[4] Under 29 CFR § 1904.7, an employer must consider an injury or illness to meet the general recording criteria, and therefore to be recordable, if it results in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. An employer must also consider a case to meet the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it does not result in death, days away from work, restricted work or job transfer, medical treatment beyond first aid, or loss of consciousness. *See* www.osha.gov/laws-regs/regulations/standardnumber/1904/1904.7. Back to text

[5] *See* 29 CFR §§ 1904.1(a)(1), 1904.2. Back to text

[6] www.osha.gov/enforcement/directives/cpl-02-00-135. Back to text

[7] www.osha.gov/enforcement/directives/cpl-02-00-163. Back to text

B Variable Definitions

Establishment-level Variables	
$COVIDRate$2020	200,000 times 2020 respiratory illnesses divided by total hours worked
$InjRate$2016-19	200,000 times number of injuries and illnesses (except respiratory illnesses) divided by total hours worked, averaged over 2016-2019
$LnEmployees$	Natural logarithm of the number of employees in 2020
$LnHoursPerEmployee$	Natural logarithm of the number of hours worked divided by number of employees in 2020
Industry-level Variables	
$IndCOVIDRate$2020	200,000 times number of 2020 respiratory illnesses divided by total hours worked for all establishments in a 6-digit NAICS code industry
$WorkProximity$	4-digit NAICS code employment-weighted average of occupational work proximity based on the occupation-level work proximity measure of Mongey et al. (2021)
$UnionziationRate$	Fraction of employees in a 4-digit NAICS code industry who are members of a union obtained from http://www.unionstats.com
$EssentialIndustry$	Indicator variable that equals one if a 6-digit NAICS code industry is classified as an essential industry and zero otherwise
Firm-level Variables	
$FirmCOVIDRate$2020	200,000 times number of respiratory illnesses divided by total hours worked across all establishments belonging to a firm
$FirmInjRate$2016-19	200,000 times number of injuries and illnesses (except respiratory illnesses) divided by total hours worked for all establishments belonging to a firm, averaged over 2016-2019
$Complaint$2020	Indicator variable that equals one if a firm has at least one COVID-19 safety-related employee complaint case in 2020 from Weekly OSHA COVID-19 Complaint Database and zero otherwise
$\#Complaints$2020	Number of COVID-19 safety-related employee complaint cases in 2020 from Weekly OSHA COVID-19 Complaint Database

Firm-level Variables continued	
ΔROA	Change in operating income divided by lagged total assets from 2019 to 2020
ΔROS	Change in operating income divided by lagged sales from 2019 to 2020
$\Delta COGS/SALES$	Change in cost-of-goods-sold expenses divided by sales from 2019 to 2020
$\Delta SGA/SALES$	Change in selling, general, and administrative expenses divided by sales from 2019 to 2020
$SalesGrowth$	Ratio of sales in 2020 divided to sales in 2019 minus one
$BHAR$	Buy-and-hold abnormal return from February 24, 2020 to April 7, 2020, based on compounded daily abnormal (CAPM-adjusted) returns
$IdiosyncraticVol$	Standard deviation of CAPM-adjusted daily return from February 24, 2020 to April 7, 2020.
$Ln(Assets)$	Natural logarithm of total assets in 2019
$Debt/Assets$	Ratio of long-term and short-term debt over total assets in 2019
$Cash/Assets$	Ratio of cash and short-term investment over total assets in 2019
$Tobin'sQ$	Sum of book value of total assets minus book value of equity plus market value of equity over book value of total assets in 2019
ROA	Ratio of 2019 operating income to 2018 total assets
$KZIndex$	-1.001909 * (Cash Flows/Tangible Assets) + 0.2826389 * Tobin's q +3.139193 * (Total Debt/Total Capital) - 39.3678 * (Total Dividents/Tangible Assets) - 1.314759 * (Cash/Tangible Assets) in 2019 (Kaplan and Zingales, 1997)
$WWIndex$	-0.091 * Cash Flows / Total Assets - 0.062 * Cash Dividend Dummy + 0.021 * Long-term Debt / Total Assets - 0.044 * Log(Total Assets) + 0.102 * 3-digit SIC Industry Sales Growth - 0.035 * Sales Growth in 2019 (Whited and Wu, 2006)
$HPIndex$	-0.737 * Total Assets + 0.043 * Total Assets * Total Assets - 0.040 * Age in 2018 (Hadlock and Pierce, 2010)
ESG	Normalized CSR strength score minus normalized CSR concern score in MCSI KLD database in 2019, based on six dimensions: community, diversity, employee relations, environment, human rights, and product

C Additional Tables

Table C1: Work Proximity and Unionization by Industry

This table reports the 20 4-digit NAICS code industries with the highest values of $WorkProximity$, which measures the extent to which workers in an industry work in close physical proximity to each other, and the value of $WorkProximity$ for these industries.

Rank	NAICS 4-digit Code	NAICS 4-digit Industry	Work Proximity
1	8121	Personal Care Services	0.814
2	6212	Offices of Dentists	0.803
3	6216	Home Health Care Services	0.795
4	6231	Nursing Care Facilities (Skilled Nursing Facilities)	0.761
5	6219	Other Ambulatory Health Care Services	0.751
6	4854	School and Employee Bus Transportation	0.737
7	6241	Individual and Family Services	0.731
8	6233	Continuing Care Retirement Communities and Assisted Living Facilities for the Elderly	0.730
9	4811	Scheduled Air Transportation	0.724
10	4852	Interurban and Rural Bus Transportation	0.724
11	6223	Specialty (except Psychiatric and Substance Abuse) Hospitals	0.723
22	6232	Residential Intellectual and Developmental Disability, Mental Health, and Substance Abuse Facilities	0.723
12	6244	Child Day Care Services	0.722
13	7224	Drinking Places (Alcoholic Beverages)	0.721
14	4851	Urban Transit Systems	0.719
15	6221	General Medical and Surgical Hospitals	0.718
16	4859	Other Transit and Ground Passenger Transportation	0.713
17	4855	Charter Bus Industry	0.710
18	6213	Offices of Other Health Practitioners	0.704
19	6222	Psychiatric and Substance Abuse Hospitals	0.692
20	7131	Amusement Parks and Arcades	0.681

Table C2: Firm-level Analysis: Alternative COVID-19 Measure I

This table presents results from OLS regressions of 2020 firm-level workplace COVID rate. The dependent variable is $\Delta FirmRespCondRate$, which is firm-level respiratory conditions per 100 FTE employees in 2020 minus average firm-level respiratory conditions per 100 FTE from 2016 through 2019. The sample consists of public firms in the junction of the ITA and Compustat data in 2020. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$\Delta FirmRespCondRate$					
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjRate$2016-19	0.026***	0.027***	0.023**	0.023**	0.025**	0.026**
	(0.009)	(0.010)	(0.011)	(0.010)	(0.011)	(0.010)
ROA		0.149	0.044	0.043	0.031	0.055
		(0.264)	(0.285)	(0.298)	(0.290)	(0.289)
$Tobin'sQ$		-0.021	-0.027	-0.025	-0.023	-0.021
		(0.016)	(0.019)	(0.019)	(0.018)	(0.018)
ESG			0.023	0.026	0.008	0.013
			(0.033)	(0.033)	(0.035)	(0.033)
$Debt/Assets$	0.130	0.136	0.051			
	(0.106)	(0.115)	(0.134)			
$Cash/Assets$	0.006	0.093	0.105			
	(0.149)	(0.190)	(0.225)			
$KZIndex$				0.000		
				(0.001)		
$WWIndex$					-0.312	
					(0.204)	
$HPIndex$						-0.388**
						(0.169)
Industry FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.324	0.326	0.340	0.341	0.343	0.343
Observations	701	635	550	549	550	550

Table C3: Firm-level Analysis: Alternative COVID-19 Measure II

This table presents results from OLS regressions of 2020 firm-level workplace COVID rate. The dependent variable is $FirmCOVIDCases/Emp2020$, which is number of reported respiratory conditions divided by the number of employees for a firm in 2020. The sample consists of public firms in the junction of the ITA and Compustat data in 2020. All specifications include Fama-French 48-industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$FirmCOVIDCases/Emp2020$					
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjCases/Emp2016\text{-}19$	0.015**	0.015**	0.012*	0.012*	0.014*	0.014*
	(0.006)	(0.006)	(0.007)	(0.007)	(0.008)	(0.008)
ROA		0.001	0.001	0.001	0.001	0.001
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$Tobin'sQ$		-0.000	-0.000	-0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ESG			0.000	0.000	-0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
$Debt/Assets$	0.001	0.001	0.000			
	(0.001)	(0.001)	(0.001)			
$Cash/Assets$	0.000	0.001	0.001			
	(0.001)	(0.001)	(0.001)			
$KZIndex$				0.000		
				(0.000)		
$WWIndex$					-0.002	
					(0.002)	
$HPIndex$						-0.003**
						(0.001)
Industry FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.319	0.322	0.333	0.334	0.337	0.336
Observations	701	635	550	549	550	550

Table C4: Firm-level Analysis: Alternative Model - Poisson

This table presents results from Poisson regressions of 2020 firm-level workplace COVID cases ($FirmCOVIDCases2020$). The sample consists of public firms in the junction of the ITA and Compustat data in 2020. All specifications include Fama-French 48-industry fixed effects. We set hours worked at the firm-level in 2020 as an exposure variable. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$FirmCOVIDCases2020$					
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjRate$2016-19	0.239***	0.361***	0.350***	0.388***	0.411***	0.378***
	(0.086)	(0.086)	(0.099)	(0.095)	(0.094)	(0.091)
ROA		2.400	-1.112	-1.306	-3.366	-1.259
		(2.175)	(3.335)	(3.763)	(3.790)	(3.333)
$Tobin's Q$		-0.821***	-0.594***	-0.602***	-0.653***	-0.561***
		(0.235)	(0.214)	(0.206)	(0.227)	(0.188)
ESG			0.893**	0.751	0.731	0.933**
			(0.405)	(0.556)	(0.534)	(0.432)
$Debt/Assets$	-0.384	-0.344	-1.394			
	(0.852)	(0.630)	(1.163)			
$Cash/Assets$	-2.368	1.447	1.121			
	(2.599)	(3.553)	(3.542)			
$KZIndex$				0.002		
				(0.036)		
$WWIndex$					-5.458**	
					(2.643)	
$HPIndex$						7.142
						(4.453)
Industry FE	Y	Y	Y	Y	Y	Y
Pseudo R^2	0.712	0.76	0.758	0.749	0.761	0.757
Observations	682	616	529	528	529	529

Table C5: Establishment-level Analysis: Alternative COVID-19 Measure I

This table presents results from OLS regressions of 2020 establishment-level workplace COVID rate. The dependent variable is $\Delta RespCondRate$, which is establishment-level respiratory conditions per 100 FTE employees in 2020 minus average establishment-level respiratory conditions per 100 FTE from 2016 through 2019. All specifications include establishment-level 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$\Delta RespCondRate$				
	(1)	(2)	(3)	(4)	(5)
$InjRate$2016-19	0.006***	0.007***	0.007**		0.006**
	(0.002)	(0.002)	(0.003)		(0.003)
$FirmInjRate$2016-19				0.007***	0.001
				(0.003)	(0.004)
$LnEmployees$		0.051***	0.046***	0.051***	0.051***
		(0.011)	(0.016)	(0.011)	(0.011)
$LnHoursPerEmployee$		0.008	-0.065	0.007	0.008
		(0.043)	(0.046)	(0.043)	(0.043)
Establishment Controls	N	Y	Y	Y	Y
Establishment Industry FE	Y	Y	Y	Y	Y
Establishment Zipcode FE	Y	Y	Y	Y	Y
Parent Firm FE	N	N	Y	N	N
Adjusted R^2	0.209	0.209	0.554	0.209	0.209
Observations	174,640	174,640	101,972	174,640	174,640

Table C6: Alternative COVID-19 Measure II

This table presents results from OLS regressions of 2020 establishment-level workplace COVID rate. The dependent variable is $COVIDCases/Emp2020$, which is number of reported respiratory conditions divided by the number of employees for an establishment in 2020. All specifications include establishment-level 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$COVIDCases/Emp2020$				
	(1)	(2)	(3)	(4)	(5)
$InjCases/Emp$2016-19	0.009***	0.009***	0.008**		0.007**
	(0.002)	(0.002)	(0.003)		(0.003)
$FirmInjCases/Emp$2016-19				0.010***	0.004
				(0.003)	(0.004)
$LnEmployees$		0.000***	0.000***	0.000***	0.000***
		(0.000)	(0.000)	(0.000)	(0.000)
$LnHoursPerEmployee$		0.002***	0.001***	0.002***	0.002***
		(0.000)	(0.000)	(0.000)	(0.000)
Establishment Controls	N	Y	Y	Y	Y
Establishment Industry FE	Y	Y	Y	Y	Y
Establishment Zipcode FE	Y	Y	Y	Y	Y
Parent Firm FE	N	N	Y	N	N
Adjusted R^2	0.215	0.216	0.618	0.216	0.216
Observations	174,640	174,640	101,972	174,640	174,640

Table C7: Establishment-level Analysis: Alternative Model - Poisson

This table presents results from Poisson regressions of 2020 establishment-level workplace COVID cases ($COVIDCases2020$). The sample consists of public firms in the junction of the ITA and Compustat data in 2020. All specifications include establishment-level 6-digit NAICS code industry fixed effects and 3-digit zip code fixed effects. We set hours worked at the establishment-level in 2020 as an exposure variable. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors clustered at the parent firm level are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable	$COVIDCases2020$			
	(1)	(2)	(3)	(4)
$InjRate$2016-19	0.017***	0.014***		0.014***
	(0.004)	(0.003)		(0.005)
$FirmInjRate$2016-19			0.014***	0.000
			(0.004)	(0.007)
$LnEmployees$		-0.222***	-0.222***	-0.222***
		(0.026)	(0.026)	(0.026)
$LnHoursPerEmployee$		-0.855***	-0.860***	-0.855***
		(0.082)	(0.082)	(0.082)
Establishment Controls	N	Y	Y	Y
Establishment Industry FE	Y	Y	Y	Y
Establishment Zipcode FE	Y	Y	Y	Y
Pseudo R^2	0.513	0.521	0.521	0.521
Observations	161,187	161,187	161,187	161,187

Table C8: Establishment-level Analysis: Alternative Samples

This table presents results from robustness tests of establishment COVID-19 infection rate in 2020 on establishment injury rate within different subsamples. The sample consists of establishments in the ITA survey data in 2020. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are clustered at the parent firm level and shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Essential Industry	Drop >= 10% Employees Reduction	Drop >= 10% Hours Worked Reduction	Keep >= 50 Employees	Keep >= 100 Employees	Keep >= 200 Employees
Dependent Variable			$COVIDRate2020$			
	(1)	(2)	(3)	(4)	(5)	(6)
$InjRate$2016-19	0.007***	0.006***	0.006***	0.007**	0.010**	0.022***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.006)
Establishment Controls	Y	Y	Y	Y	Y	Y
Establishment Industry FE	Y	Y	Y	Y	Y	Y
Establishment Zipcode FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.212	0.202	0.199	0.241	0.231	0.188
Observations	155,178	115,678	123,619	95,247	55,128	25,290

Table C9: Injury and Stock Returns: Fama-French Factors

This table presents results from OLS regressions of cumulative stock returns on prior firm incident rate during the stock market crash of 2020. The sample consists of firms in the ITA survey data for the period of 2016-2019. $BHAR(FF\text{-}nFactors)$ is the holding period abnormal return from 02/24/20 to 04/07/2020, where daily abnormal return is Fama-French-factors-adjusted daily return and betas are estimated based on daily return from 2016 to 2019. All specifications include Fama-French 48 industry fixed effects. See Appendix B for variable definitions. Heteroscedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Accumulation Period	02/24/20 - 04/07/20					
Dependent Variable	$BHAR(FF\text{-}3Factors)$			$BHAR(FF\text{-}4Factors)$		
	(1)	(2)	(3)	(4)	(5)	(6)
$FirmInjRate$2016-19	-0.952**	-0.865*	-1.033**	-0.901**	-0.814*	-0.962**
	(0.445)	(0.457)	(0.488)	(0.445)	(0.452)	(0.484)
$LnAssets$		0.237	-0.399		0.075	-0.610
		(0.536)	(0.582)		(0.535)	(0.587)
$Debt/Assets$		-19.390***	-21.188***		-21.663***	-23.211***
		(4.774)	(4.909)		(4.718)	(4.861)
$Cash/Assets$		-11.429	-1.914		-14.602	-4.969
		(9.818)	(9.849)		(9.974)	(10.004)
$Tobin'sQ$		0.356	-0.047		1.163	0.736
		(0.982)	(0.951)		(0.976)	(0.942)
ROA		33.063**	21.358		32.097**	19.293
		(13.030)	(13.109)		(12.803)	(12.790)
ESG			0.483			0.028
			(2.144)			(2.130)
Industry FE	Y	Y	Y	Y	Y	Y
Adjusted R^2	0.175	0.212	0.213	0.167	0.219	0.219
Observations	690	690	619	690	690	619