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Abstract

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JEL Classification: E32, I10, I18, H1

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Estimating the costs and benefits of mandated business closures in a pandemic

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May 2020

PRELIMINARY AND EVOLVING

Abstract

Typical government responses to pandemics involve social distancing measures implemented to curb disease propagation. We evaluate the impact of state-mandated business closures in the context of the Covid-19 crisis in the US. Using state-level variations in the set of sectors defined as non-essential and forced to shut down, and geographic variations in industry composition, we estimate the effects of business closure decisions on firms' market value, and on infection and death rates. We find that a 10 percentage point increase in the share of restricted labor is associated with a drop by 3 percentage points in April 2020 employment, a 1.87% drop in firms' market value, and 0.15 and 0.011 percentage points lower Covid-19 infection and death rates, respectively. An extrapolation of these preliminary findings suggests that state-mandated business closures might have cost $700 billion and saved 36,000 lives so far.

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1 Introduction

The global health crisis caused by the outbreak of the Covid-19 virus has led many countries to implement drastic measures of social distancing in the absence of a vaccine or a cure. Social distancing measures are meant to limit interactions between people in order to curb the virus' propagation. They include shutting down public spaces and schools, as well as closing restaurants, shops, and certain economic activities. In the US, virtually all states have ordered some economic sectors to close.

Despite their expected benefits for public health, social distancing rules also disrupt economic activities by shrinking consumption, and restricting labor supply. The optimal social distancing policy thus trades off the benefits of limiting infections and saving lives, with the drop in output. This a complicated problem to solve *ex ante*, given the level of uncertainty surrounding the propagation of an unknown virus, and the response of output and consumption to social distancing. A growing stream of papers have incorporated SIR or SEIR contagion models into macroeconomic frameworks to shed light on this question.[2]

In this paper, we focus on state-level decisions to close certain businesses in the US in response to the Covid-19 health crisis, and estimate their *ex post* costs and benefits. More precisely, we analyze the effect of these measures on the contraction of economic activity, and present preliminary findings of their impact on Covid-19-related increase in infection and death rates. To do so, we need to overcome several empirical challenges. One of them is the collection of reliable data on social distancing and its consequences, which are typically observed with a lag.

We rely on various data sources to compute, for each industry, the restricted share of the labor force. This share is higher for industries whose employment is located in states with stricter business closing decisions and lower for industries with a higher propensity to work from home. We check that the share of restricted labor is indeed correlated with changes in employment. We capture the drop in economic activities with the change in firms' market values, and obtain infections and fatalities data from the New York Times Covid-19 database.

Another challenge we need to address is endogeneity. For instance, social distancing policies might be stricter, or more strictly enforced, in states where contagion is more severe, or where the impact of economic activity is expected to be weaker. We use within-state variations in the restricted labor force driven by differential local industry composition to obtain identification. Nonetheless, sectors might be

[2]Those include Berger et al. (2020), Atkeson (2020), Eichenbaum et al. (2020), Alvarez et al. (2020), and Acemoglu et al. (2020) among others.

affected by the Covid-19 crisis in ways that are only spuriously correlated with their restricted labor share. We exploit within-sector variations across states and compare firms in the same sector but located in different states, which are therefore differentially affected by business closures.

Using employment data at the sector and sector×state level, we find that a 10 percentage point increase in the share of restricted labor is associated with a drop by 3 percentage points in April 2020 employment. We next run firm-level analysis and find that a 10 percentage point increase in the share of restricted labor leads to a drop by 1.87% in firms' market value. No effects of the restricted labor share on market values are found in prior periods. We then analyze health outcomes a the commuting-zone level. A 10 percentage points increase in the share of restricted labor is associated with a 0.15 and 0.011 percentage points lower Covid-19 infection and death rates, respectively. Again, we do not find any significant effect of the restricted labor share on 2019 mortality rates. An extrapolation of these preliminary findings suggests that state-mandated business closures might have cost $700 billion and saved 36,000 lives so far.

Our work is related to prior studies on the *ex post* economic consequences of viral diseases and pandemics. Adda (2016) study the effectiveness of closing down schools and shutting down public transportation on the transmission of a number of viruses in France, and the associated economic costs of these measures. Barro et al. (2020) find a death rate of 2% of the population at the time of the 1918 Flu Pandemic, and a cumulative loss in GDP per capita of 6% over 3 years. Correia et al. (2020) show that the 1918 Flu Pandemic led to a 18% in state manufacturing output up to four years after the outbreak of the disease, and that non pharmaceutical interventions, such as schools, theaters, and churches closures, public gathering and funeral bans, quarantine of suspected cases, and restricted business hours, had a positive effect on future economic outcomes. In contrast, we find significant negative effects of social distancing on economic outcomes. This difference can be explained by the fact that social distancing measures implemented in response to the 1928 Flu did not include mandated business closures.

Other papers have used firm data to assess the economic impact of the Covid-19 crisis. Alfaro et al. (2020) show that unanticipated changes in predicted infections during the SARS and Covid-19 pandemics forecast aggregate equity market returns. Gormsen and Koijen (2020) infer expected annual GDP growth from dividend futures and find it to have declined by 1.5% in the US and 2% in the EU as of March 16 compared to the beginning of the year. Landier and Thesmar (2020) infer the evolution of the discount rate from the difference between forecast-implied and actual returns. Bartik et al. (2020) rely on a small business survey conducted in late March 2020 and find that 43% of businesses are temporarily closed, and that they have laid off 40% of their staff relative to January. Hassan et al. (2020) infer firms' concerns related to the collapse of demand, increased uncertainty, and disruption in supply chains, from the analysis of their earning calls. A series of other work look at financial market reactions to Covid-19. Ramelli and Wagner (2020) and Ding et al. (2020) relate stock returns during the first quarter of 2020 to a battery of firms' characteristics, such as leverage and cash holdings. Albuquerque et al. (2020) find with that firms with high environmental and social ratings fared better during the stock market crash. Gerding et al. (2020) show that stock price reactions are stronger in countries with higher debt-to-GDP ratio. Ru et al. (2020) and Croce et al. (2020) study the diffusion of information and risk in financial markets.

We contribute to a recent stream of new work on the implications of the Covid-19 virus. Berger et al. (2020), Atkeson (2020), Eichenbaum et al. (2020), Acemoglu et al. (2020), Jones et al. (2020) and Alvarez et al. (2020) incorporate epidemiological SIR or SIER models of contagion in macro models. Veronica Guerrieri and Werning (2020) present a theory of Keynesian supply shocks in which supply shocks may trigger changes in aggregate demand larger than the shocks themselves. Hall et al. (2020) provides insights on the tradeoff between consumption and COVID-19 deaths. Greenstone and Nigam (2020) study the implications of social distancing measures whereas Andrew Glover and Rıos-Rull (2020) focuses on the distribution effects of the COVID-19. Another line of research focuses on optimal policies in economies hit by an epidemic, such as optimal fiscal policies Faria-e Castro (2020), and optimal quarantine and testing policies Piguillem and Shi (2020); Gollier and Gossner (2020). Barrot et al. (2020) explore the sectoral effects of social distancing in a production network model. Allcott et al. (2020) use GPS data from a large sample of smartphones to show that more Republican counties engage in less social distancing.

The rest of the paper is structured as follows. Section 2 details the policy background. Section 3 describes the data. Section 4 presents the empirical strategy, Section 5 presents the results and Section 6 concludes.

2 Policy background

The Covid-19 virus first spread to the US in January 2020, and first caused deaths in February 2020. A Public Health Emergency was declared on January 31 by the federal government, and a National Emergency was declared on March 13. On

March 19, the Department of State advised US citizens to avoid all international travels.

In turn, state and local governments took various decisions to limit social interactions. Between February 29 (Washington) and March 16 (Vermont), all states declared a State of Emergency. This usually happens when the governor believes a disaster has occurred or may be imminent that is severe enough to require state aid to supplement local resources in preventing or alleviating damages, loss, hardship or suffering. The declaration authorizes the governor to speed assistance and make resources available to communities in need.

US state governors also issued various Executive Orders restricting social activities. Those vary across states and include stay-at-home orders, bans on public gatherings, out-of-state travel restrictions, and the closures of schools, daycares, bars, sit-down restaurants, and certain business activities. We obtain the dates and length of each of these decisions in each state from Adolph et al. (2020).

We focus on Executive Orders closing businesses deemed as non-essential, aside from restaurants that are closed for dine-in in virtually all states. 45 states issued such orders between March 19 (California) and April 6 (Missouri). 35 five of them had an explicit end date and remained in effect for an average of 23 days. All but three where then extended. States vary significantly in the type of businesses they decide to close. Many of them define essential and non-essential businesses following and adapting the guidelines initially issued on March 19 by the Cybersecurity, Infrastructure and Security Agency (CISA)[3].

3 Data

Restricted labor force Restricted labor is defined as the set of workers in sectors that are closed in accordance with state-level Executive Orders, and that cannot work from home. We read each state's Executive Orders to determine whether non-essential businesses are closed, and how they are defined. For each state, we classify each 4-digit NAICS industry as either essential (i.e., open) or non-essential (i.e. closed). To get the share of workers in closed sectors that can still work from home, we borrow data from Dingel and Neiman (2020) who classify the feasibility of working at home for all occupations based on responses to two Occupational Information Network (O*NET) surveys.[4] To estimate the effects of school closures on the workforce with dependent children and therefore forced into inactivity, we

[3]https://www.cisa.gov/publication/guidance-essential-critical-infrastructure-workforce

[4]See also Barbanchon et al. (2020) and Mongey et al. (2020) for alternative measures of the likelihood that jobs can be conducted from home.

use data from the American Community Survey (ACS). We compute in each state and sector, the share of working people with children under 15.[5]

Economic impact To estimate the economic effect of social distancing, we first use monthly employment data from the Bureau of Labor statistics (BLS), that are available up to April 2020 at the sector level, and up to March 2020 at the sector×state-level. We then retrieve data on monthly stock returns for common shares traded on NYSE, AMEX and NASDAQ from January 1, 2020 through April 30, 2020 from the Compustat Capital IQ North America Daily database (available from Wharton Research Data Services, WRDS). Stock return data have the advantage of being readily available, and forward looking. We retrieve for each of these firms, their headquarter location, investment, cash, total asset value, and earnings in the previous year from Compustat. After removing firms in the finance industry (those with NAICS codes starting with 2-digit "52"), our sample of stocks include 2,657 observations.

Infections and fatalities We retrieve daily county-level counts of infections and fatalities from the New York Times Covid-19 database as of May 10, that covers more than 90% of U.S. counties, and 97% of U.S. total population.

4 Empirical strategy

We aim to estimate the causal effect of state-mandated closures on various outcomes. To do so, we need to overcome several identification challenges. For instance, social distancing policies might be stricter, or more strictly enforced, in states where contagion is more severe, or where the impact of economic activity is expected to be weaker. Additionally, sectors might be affected by the Covid-19 crisis in ways that are only spuriously correlated with their restricted labor share. We use various datasets and levels of aggregation to reach identification.

Sector×state-level analysis We first run sector×stat-level cross-sectional OLS regressions of the form

$$T_{i,s} = \mu + \xi.RestrictedLaborShare_{i,s} + \rho.S_{i,s} + \sigma_i + \tau_s + \omega_{i,s} \quad (1)$$

[5]More specifically, we consider that an active person has dependent children if there is not another inactive person in the household who could take care of them. If there are several active adults in the household, we consider that the lowest earning adult is in charge of childcare.

where $T_{i,s}$ is the outcome variable, such as the employment growth in sector i and state s. $RestrictedLaborShare_{i,s}$ is the share of restricted workers in sector i and state s, which takes the value of zero in sectors that remain open, and $1 - wfh_i$ in closed sectors, where wfh_i is the share of workers in sector i that can work from home. $S_{i,s}$ is a vector of sector×state controls including log employment and the share of workers. σ_i and τ_s are vectors of sector and state fixed effects, respectively. The inclusion of σ_i mitigates the concern that results might be driven by a spurious correlation between sector exposure to the Covid-19 crisis and their propensity to be considered as non-essential by state authorities. τs absorbs any unobserved state-level characteristic that might drive both employment, and the propensity of state authorities to mandate the closure of business sectors. Identification is obtained from within-state variations in the restricted labor share of different industries. The identifying assumption is that in the absence non-essential business closures, the restricted labor share would have had not effect on employment growth.

Firm-level analysis We then run firm-level cross-sectional OLS regressions of the form

$$V_{f,i,s,c} = \zeta + \eta.RestrictedLaborShare_{i,s} + \theta.U_f + \iota_i + \kappa_c + \lambda_{f,i,s,c} \quad (2)$$

where $V_{f,i,s,c}$ is the outcome variable, such as the change in the market value of firm f operating in sector i and located in county c in state s. $RestrictedLaborShare_{i,s}$ is the share of restricted workers in sector i and state s, which takes the value of zero for firms in sectors that remain open, and $1 - wfh_i$ for firms in closed sectors, where wfh_i is the share of workers in sector i that can work from home. U_f is a vector of firm-level controls including log market capitalization, book-to-market ratio (B/M), return on assets (ROA), investment normalized by assets (CAPX/AT), cash normalized by assets (CASH/AT), CAPM β, and leverage (the sum of short term and long term debt, normalized by assets), all measured in 2019. ι_i and κ_c are vectors of sector and county fixed effects, respectively. The inclusion of ι_i mitigates the concern that results might be driven by a spurious correlation between sector exposure to the Covid-19 crisis and their propensity to be considered as non-essential by state authorities. κ_c absorbs any unobserved county-level characteristic that might drive both firms' outcomes, and the propensity of state authorities to close them. Identification is obtained from within-county variations in the restricted labor share of firms in different industries. The identifying assumption is that in the absence of non-essential business closures, the restricted labor share would have had not effect on firms' market value.

County-level analysis We run county-level cross-sectional OLS regressions of the form

$$Y_{c,cz,s} = \alpha + \beta . RestrictedLaborShare_{cz} + \gamma . X_c + \delta_s + \epsilon_{c,s} \tag{3}$$

where $Y_{c,s}$ is the outcome variable, such as infection and mortality rates of county c in state s. $RestrictedLaborShare_{cz}$ is the commuting zone cz share of workers in closed sectors that cannot work from home. X_c is a vector of county-level controls including population density, log population, a dummy indicating whether the county issued a Stay at Home order, and various demographic controls: net migrations in 2019, the share of the population with less than a high school diploma, the share of the population above 65 years old, the logarithm of median household income, the number of ICU beds per inhabitants and the logarithm of one plus the number of hospitals. δ_s is a vector of state fixed effects. δ_s absorbs any unobserved state-level characteristic that might drive both county-level outcomes, and the restricted labor share. Identification is therefore obtained from within-state variations in the restricted labor share. The identifying assumption is that in the absence of non-essential business closures, the restricted labor share would have had not effect on health outcomes. While we cannot formally test this assumption, we can check whether this share is correlated with 2019 death rates.

5 Results

We start by checking whether labor restrictions due to state-mandated business closures are reflected in actual employment growth. Panel A of Table 2 presents the results of an estimation of Equation (1) at the sector level. We find that a 10 percentage point increase in the share of restricted labor is associated with a drop by 3 percentage points in April relative to March employment. This estimate is insensitive to the inclusion of various sector-level controls. It suggests that state-mandated business closures are a strong determinant of actual employment: one standard deviation in the restricted labor share explains half of the cross-sectional variation in employment growth. One valid concern is that business closures are endogenously determined, and that states close sectors that would have been affected by the Covid-19 crisis irrespective of labor restrictions. In Panel B, we use sector×state-level employment data available until March 2020. We interact the restricted labor share variable with a dummy indicating whether states mandated closures in March. For these states, we find that a 10 percentage points increase in the share of restricted labor is associated with a drop by 0.15 percentage points in

March employment, after controlling for sector and state fixed effects. The coefficient is lower than in Panel A because March employment was much less affected than April employment. Yet the magnitude remains substantial large: one standard deviation in the restricted labor share explains 20% of the cross-sectional variation in employment growth.

We then turn to the analysis of the impact of labor restrictions on firms' market value. Table 3 estimates Equation (2) on a sample of publicly listed firms. We find a statistically significant relationship between labor restrictions and drop in market value, even after including county and sector fixed effects. A 10 percentage point increase in the share of restricted labor is associated with a 1.87% decline in firm's market value of the months of March and April 2020. One standard deviation in the restricted labor share explains 14% of the cross-sectional variation in the change in firms' market value. One concern may be that, even after controlling for county and sector effects, firms may be on different trends such that their market values would have evolved irrespective of business closures. In Table 4, we replicate our analysis of the effects of the restricted labor share on firms cumulative change in market value over January and February 2020 and find no effect.

We next study the effect of state-mandated business closures on health outcomes. Table 5 presents the results of an estimation of Equation (3). We find that a 10 percentage point increase in the share of restricted labor is associated with an increase by 0.15 percentage points in the rate of Covid-19 infections (Panel A) and by 0.011 percentage points in the mortality rate (Panel B). One standard deviation in the restricted labor share explains 27% and 36% of the cross-sectional variation in infection and mortality rates, respectively. These point estimates hold after controlling for a variety of commuting-zone-level controls for demographic and public health infrastructure. They are obtained after including state fixed effects, so that they are identified off of within-state variations in commuting zone industry composition. A concern may be that differential mortality outcomes might only be spuriously correlated with local industry composition. We check in Table 6 whether the share of restricted labor correlates with 2019 death rates and fail to find any evidence that this is the case.

Armed with these estimates, we undertake a preliminary account of the costs and benefits of state-mandated business closures. Applying the coefficients estimated in Table 3 to the total market value of public companies in the US ($37.7 trillion as of December 31, 2019) suggests that a 10 percent increase in the share of labor restricted by state-mandated business closures leads to a loss of $700 billion in market value. Applying the coefficients from Table 5 to the US population (328.2

million as of 2019), we find that a 10 percentage points increase in the share of restricted labor leads to a decline in the death count by approximately 36,000.

6 Conclusion

Typical government responses to pandemics involve social distancing measures implemented to curb disease propagation. We explore the impact of state-mandated business closures in the context of the Covid-19 crisis in the US. Using state-level variations in the set of sectors defined as non-essential and forced to shut down, and county-level variations in industry composition, we estimate the effects of business closure decisions on firms' market value, and on infection and death rates.

We find that a 10 percentage point increase in the share of restricted labor is associated with a drop by 3 percentage points in April 2020 employment, a 1.87% drop in firms' market value, and 0.15 and 0.011 percentage points lower Covid-19 infection and death rates, respectively. An extrapolation of these preliminary findings suggests that state-mandated business closures might have cost $700 billion and saved 36,000 lives so far.

Our ultimate goal is to compare the *ex post* costs and benefits of state mandated business closures. We intend to refine our analyzes of the costs as more data becomes available on firms' economic performance. The estimation of benefits will require an exhaustive account of Covid-19 related infections and deaths. More work is needed to understand the trade-off associated with other social distancing policies that we leave for future research.

References

Acemoglu, D., V. Chernozhukov, I. Werning, and M. D. Whinston (2020, May). A multi-risk sir model with optimally targeted lockdown. Working Paper 27102, National Bureau of Economic Research.

Adda, J. (2016). Economic activity and the spread of viral diseases: Evidence from high frequency data. *Quarterly Journal of Economics 131*(2), 891–941.

Adolph, C., K. Amano, B. Bang-Jensen, N. Fullman, and J. Wilkerson (2020). Pandemic politics: Timing state-level social distancing responses to covid-19. *medRxiv*.

Albuquerque, R., Y. Koskinen, S. Yang, and C. Zhang (2020). Love in the time of covid-19: The resiliency of environmental and social stocks. *Working Paper*.

Alfaro, L., A. Chari, A. N. Greenland, and P. K. Schott (2020, April). Aggregate and firm-level stock returns during pandemics, in real time. (26950).

Allcott, H., L. Boxell, J. C. Conway, M. Gentzkow, M. Thaler, and D. Y. Yang (2020, April). Polarization and public health: Partisan differences in social distancing during the coronavirus pandemic. (26946).

Alvarez, F. E., D. Argente, and F. Lippi (2020, April). A simple planning problem for covid-19 lockdown. (26981).

Andrew Glover, Jonathan Heathcote, D. K. and J.-V. Rıos-Rull (2020). Health versus wealth: On the distributional effects of controlling a pandemic. *Working Paper*.

Atkeson, A. (2020). What will be the economic impact of covid-19 in the us? rough estimates of disease scenarios. *NBER Working Paper*.

Barbanchon, T. L., L. Hensvik, and R. Rathelot (2020). Which jobs are done from home? evidence from the american time-use survey. *Working Paper*.

Barro, R., J. F. Ursua, and J. Weng (2020). The coronavirus and the great influenza pandemic: Lessons from the "spanish flu" for the coronavirus's potential effects on mortality and economic activity. *NBER Working Paper*.

Barrot, J.-N., B. Grassi, and J. Sauvagnat (2020). Sectoral effects of social distancing. *Working paper*.

Bartik, A. W., M. Bertrand, Z. B. Cullen, E. L. Glaeser, M. Luca, and C. T. Stanton (2020, April). How are small businesses adjusting to covid-19? early evidence from a survey. (26989).

Berger, D., K. Herkenhoff, and S. Mongey (2020). An seir infectious disease model with testing and conditional quarantine. *Working Paper*.

Correia, S., S. Luck, and E. Verner (2020). Pandemics depress the economy, public health interventions do not: Evidence from the 1918 flu. *Working Paper*.

Croce, M., P. Farroni, and I. Wolfskeil (2020). When the markets get covid: Contagion, viruses, and information diffusion. *Working Paper*.

Ding, W., R. Levine, C. Lin, and W. Xie (2020). Corporate immunity to the covid-19 pandemic. *Working Paper*.

Dingel, J. I. and B. Neiman (2020, April). How many jobs can be done at home? (26948).

Eichenbaum, M. S., S. Rebelo, and M. Trabandt (2020). The macroeconomics of epidemics. *Working Paper*.

Faria-e Castro, M. (2020). Fiscal policy during a pandemic. *Working Paper*.

Gerding, F., T. Martin, and F. Nagler (2020). The value of fiscal capacity in the face of a rare disaster. *Working Paper*.

Gollier, C. and O. Gossner (2020). Group testing against covid-19. *Working Paper*.

Gormsen, N. J. and R. Koijen (2020). Coronavirus: Impact on stock prices and growth expectations. *University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2020-22.*.

Greenstone, M. and V. Nigam (2020). Does social distancing matter? *Working Paper*.

Hall, R. E., C. I. Jones, and P. J. Klenow (2020). Trading off consumption and covid-19 deaths. *Working Paper*.

Hassan, T. A., S. Hollander, L. van Lent, and A. Tahoun (2020, April). Firm-level exposure to epidemic diseases: Covid-19, sars, and h1n1. (26971).

Jones, C. J., T. Philippon, and V. Venkateswaran (2020, April). Optimal mitigation policies in a pandemic: Social distancing and working from home. (26984).

Landier, A. and D. Thesmar (2020). Earnings expectations in the covid crisis. *Available at SSRN*.

Mongey, S., L. Pilossoph, and A. Weinberg (2020). Which workers bear the burden of social distancing policy? *Working Paper*.

Piguillem, F. and L. Shi (2020). The optimal covid-19 quarantine and testing policies. *Working Paper*.

Ramelli, S. and A. F. Wagner (2020). Feverish stock price reactions to covid-19. *Swiss Finance Institute Research Paper No. 20-12*.

Ru, H., E. Yang, and K. Zou (2020). What do we learn from sars-cov-1 to sars-cov-2: Evidence from global stock markets. *Working Paper*.

Veronica Guerrieri, Guido Lorenzoni, L. S. and I. Werning (2020). Macroeconomic implications of covid-19: Can negative supply shocks cause demand shortages? *Working Paper*.

7 Figures and tables

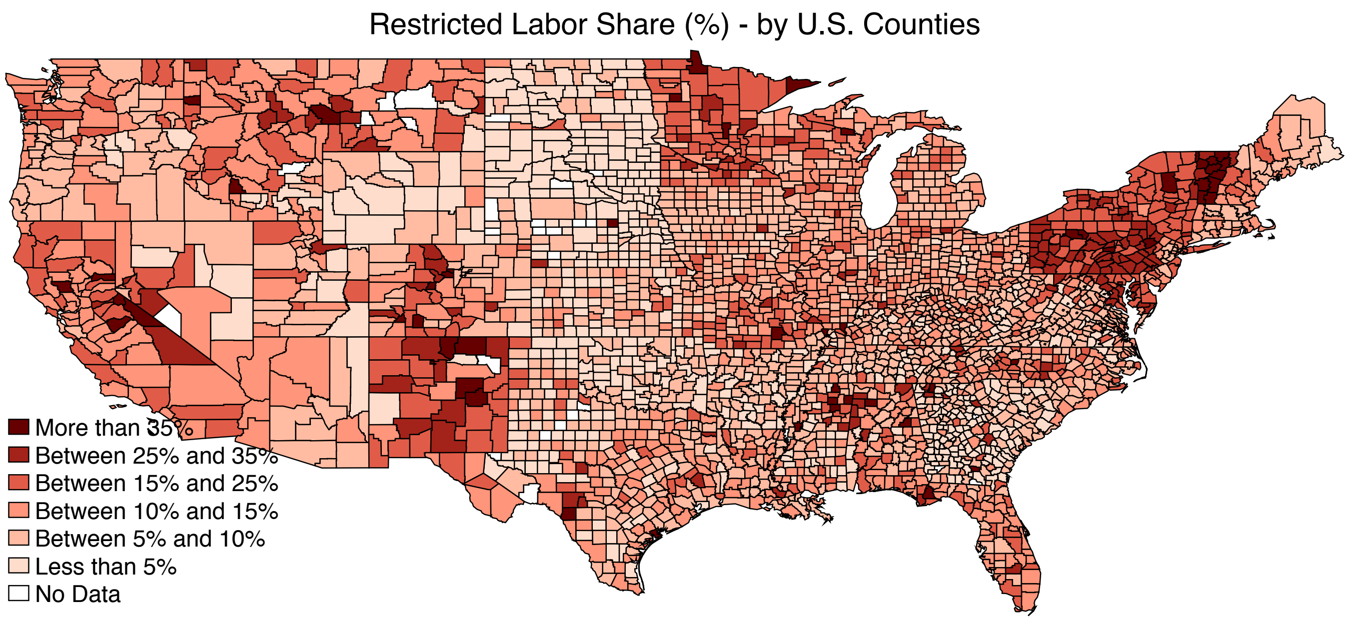

Figure 1

Note: This map presents the fraction of restricted workers in each U.S. county due to Executive Orders of each US state restricting business activities. $\text{RestrictedLaborShare}_c$ is the share of restricted workers in county c.

Table 1
Summary statistics

This table presents the summary statistics for BLS data (Panels A and B), firm-level sample which consists of 2657 U.S. publicly listed firms, traded on the NYSE/AMEX or NASDAQ excluding financial firms (NAICS codes starting with 2-digit ”52”) (Panel C), and U.S. counties sample, which consists of 2877 observations (Panel D).

	Obs.	Mean	SD	p1	p50	p99
Panel A: Sector-level sample						
February-April emp. growth	147	-0.127	0.142	-0.577	-0.084	0.046
Restricted Labor	147	0.118	0.232	0.000	0.021	0.860
February emp. growth	147	0.002	0.016	-0.044	0.002	0.057
Log January emp.	147	6.662	1.371	3.135	6.773	9.707
Work-at-home share	147	0.322	0.247	0.028	0.227	0.880
Emp. share with kids	147	0.114	0.032	0.060	0.110	0.169
Panenl B: State×sector-level sample						
March emp. growth	2893	-0.001	0.019	-0.059	0.000	0.061
Restricted Labor	2893	0.112	0.265	0.000	0.000	0.942
Closure in March	2893	0.728	0.445	0.000	1.000	1.000
Log January emp.	2893	3.646	1.144	1.163	3.605	6.518
Work-at-home share	2893	0.310	0.254	0.016	0.205	0.880
Emp. share with kids	2893	0.121	0.054	0.000	0.118	0.282
Panel C: Firm-level sample						
Cumulative Returns (January-February)	2657	-0.064	0.642	-0.600	-0.119	1.204
Cumulative Returns (March-April)	2657	-0.087	0.321	-0.662	-0.096	0.996
Restricted Labor	2657	0.077	0.236	0.000	0.000	0.947
Work-at-home share	2657	0.393	0.233	0.016	0.349	0.926
Ln(Market Cap)	2657	6.661	2.360	1.697	6.771	11.881
B/M	2657	0.483	0.670	-1.747	0.349	3.588
ROA	2657	-0.065	0.394	-1.983	0.076	0.358
CAPX/AT	2657	0.038	0.043	0.000	0.023	0.228
CASH/AT	2657	0.247	0.281	0.000	0.121	0.965
β	2657	1.119	0.758	-0.490	1.063	3.517
Leverage	2657	0.296	0.249	0.000	0.268	1.160
Panel D: County-level sample						
Covid-19 Infected/Pop (×100)	2877	0.207	0.332	0.006	0.091	2.185
Deaths/Pop (×100)	2877	0.009	0.018	0.000	0.002	0.105
2019 Deaths/Pop (×100)	2877	1.044	0.254	0.425	1.051	1.618
Restricted Labor (cz level)	2877	0.108	0.060	0.000	0.097	0.311
work-at-home share (cz level)	2877	0.243	0.049	0.159	0.233	0.360
Drop in Workplace Mobility (×100)	2649	-36.727	9.283	-63.000	-36.000	-19.000
Ln(Pop)	2877	10.461	1.375	7.692	10.298	14.051
Pop Density (Pop in ’000s per square miles)	2877	0.167	0.370	0.001	0.048	2.423
Stay At Home Dummy	2877	0.857	0.350	0.000	1.000	1.000
Net Migration 2019	2877	0.001	0.012	-0.031	0.000	0.031
Share Less High School Diploma 2018	2877	0.092	0.042	0.025	0.084	0.207
Share 65+ Years Old	2877	0.190	0.045	0.096	0.187	0.315
Ln(Median HH Income 2018)	2877	10.849	0.239	10.311	10.836	11.522
ICU beds/Pop	2877	0.000	0.001	0.000	0.000	0.001
Ln(1+NbHospitals)	2877	0.882	0.666	0.000	0.693	3.091

Table 2
Employment growth

Standard errors are presented in parentheses are clustered at the State level in Panel B. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Panel A: sector-level			
	February-April employment growth			
Restricted Labor	-0.347***	-0.371***	-0.326***	-0.326***
	(0.056)	(0.053)	(0.054)	(0.053)
February emp. growth		-1.757**	-2.168***	-2.014**
		(0.822)	(0.813)	(0.813)
Log January emp.		-0.016**	-0.013**	-0.007
		(0.007)	(0.006)	(0.005)
Work-at-home share			0.151***	0.147***
			(0.033)	(0.032)
Emp. share with kids				-0.828***
				(0.301)
Observations	147	147	147	147
R^2	0.322	0.388	0.449	0.478

	Panel B: sector×state-level			
	March employment growth			
Closure in March x Restricted Labor	-0.014**	-0.015**	-0.015**	-0.015**
	(0.007)	(0.007)	(0.007)	(0.007)
Restricted Labor	0.011	0.011	0.013	0.013
	(0.008)	(0.008)	(0.008)	(0.008)
Log January emp.		-0.001*		-0.002**
		(0.001)		(0.001)
Emp. share with kids		-0.009		-0.013
		(0.008)		(0.009)
Sector FE	Y	Y	Y	Y
State FE	N	N	Y	Y
Observations	2893	2893	2893	2893
R^2	0.331	0.334	0.365	0.367

Table 3
Firm value: baseline

Regressions are weighted by each stock total market capitalization as of December 2019. Standard errors presented in parentheses are clustered at the NAICS industry-state level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Cumulative Returns (March - April)			
Restricted Labor	-0.152***	-0.139***	-0.131***	-0.187***
	(0.032)	(0.030)	(0.027)	(0.061)
Work-at-home share	-0.024			
	(0.035)			
Ln(Market Cap)			0.015***	0.013***
			(0.004)	(0.005)
B/M			-0.000	0.020
			(0.045)	(0.048)
ROA			0.055	0.009
			(0.060)	(0.067)
CAPX/AT			-0.092	-0.069
			(0.219)	(0.271)
CASH/AT			0.061	0.059
			(0.047)	(0.060)
β			-0.034**	-0.030**
			(0.014)	(0.015)
Leverage			0.009	0.016
			(0.048)	(0.051)
State FE	Y	Y	Y	
County FE				Y
Sector FE		Y	Y	Y
Observations	2657	2657	2657	2657
R^2	0.307	0.547	0.568	0.621

Table 4
Firm value: placebo

Regressions are weighted by each stock total market capitalization as of December 2019. Standard errors presented in parentheses are clustered at the NAICS industry-state level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Cumulative Returns (January - February)			
Restricted Labor	-0.020	0.036	0.036	-0.024
	(0.020)	(0.037)	(0.034)	(0.027)
Work-at-home share	0.063*			
	(0.036)			
Ln(Market Cap)			0.001	-0.002
			(0.003)	(0.004)
B/M			-0.097***	-0.099***
			(0.023)	(0.018)
ROA			-0.036	0.007
			(0.045)	(0.053)
CAPX/AT			0.004	0.055
			(0.125)	(0.141)
CASH/AT			0.015	-0.004
			(0.031)	(0.038)
β			-0.003	-0.001
			(0.014)	(0.015)
Leverage			-0.014	-0.001
			(0.028)	(0.029)
State FE	Y	Y	Y	
County FE				Y
Sector FE		Y	Y	Y
Observations	2657	2657	2657	2657
R^2	0.198	0.474	0.493	0.575

Table 5
Infections and deaths: baseline

Regressions are weighted by county total population as of 2019. Variables are windsorized at the first and ninety-ninth percentiles. Covid-19 Infections and Covid-19 Deaths are measured as of May 10 using data from the New York Times Covid-19 database and scaled by 2019 total county population. Standard errors presented in parentheses are clustered at State Level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Panel A: Covid-19 Infections/Pop (%)			
Restricted Labor (cz level)	-2.067***	-2.068***	-1.794***	-1.575***
	(0.642)	(0.641)	(0.612)	(0.540)
Work-at-home share	-0.861**	-0.861**	-0.945*	-1.172***
	(0.353)	(0.353)	(0.473)	(0.362)
Pop Density	0.153***	0.153***	0.122**	0.151***
	(0.052)	(0.052)	(0.048)	(0.038)
Ln(Pop)	0.020	0.020	0.036	0.008
	(0.019)	(0.019)	(0.022)	(0.018)
Stay At Home Dummy		0.015	-0.070	0.747***
		(0.049)	(0.082)	(0.116)
State FE	Y	Y	Y	Y
Demographics controls			Y	Y
Hospital controls			Y	Y
Days from first Covid-19 case FE				Y
Observations	2877	2877	2877	2877
R^2	0.625	0.625	0.674	0.699

	Panel B: Covid-19 Deaths/Pop (%)			
Restricted Labor (cz level)	-0.121**	-0.121**	-0.116**	-0.113**
	(0.049)	(0.049)	(0.048)	(0.045)
Work-at-home share	-0.044**	-0.044**	-0.049**	-0.065***
	(0.021)	(0.021)	(0.024)	(0.019)
Pop Density	0.008**	0.008**	0.007**	0.009***
	(0.003)	(0.003)	(0.003)	(0.002)
Ln(Pop)	0.002	0.002	0.004**	0.002
	(0.001)	(0.001)	(0.001)	(0.001)
Stay At Home Dummy		-0.006*	-0.010**	0.004
		(0.003)	(0.004)	(0.007)
State FE	Y	Y	Y	Y
Demographics controls			Y	Y
Hospital controls			Y	Y
Days from first Covid-19 case FE				Y
Observations	2877	2877	2877	2877
R^2	0.693	0.693	0.714	0.731

Table 6
Infections and deaths: placebo

Regressions are weighted by county total population as of 2019. Variables are windsorized at the first and ninety-ninth percentiles. Standard errors presented in parentheses are clustered at State Level. *, **, and *** denote significance at the 10%, 5%, and 1%, respectively.

	Placebo - 2019 Deaths/Pop (%)			
Restricted Labor (cz level)	0.165	0.156	-0.088	-0.088
	(0.372)	(0.373)	(0.215)	(0.201)
Work-at-home share	-1.296***	-1.295***	0.264**	0.250*
	(0.221)	(0.220)	(0.120)	(0.127)
Pop Density	0.026*	0.026	-0.009	-0.012
	(0.016)	(0.016)	(0.010)	(0.011)
Ln(Pop)	-0.063***	-0.063***	-0.027**	-0.022*
	(0.008)	(0.008)	(0.011)	(0.013)
Stay At Home Dummy		0.134***	0.081***	-0.049**
		(0.014)	(0.011)	(0.021)
State FE	Y	Y	Y	Y
Demographics controls			Y	Y
Hospital controls			Y	Y
Days from first Covid-19 case FE				Y
Observations	2877	2877	2877	2877
R^2	0.557	0.558	0.858	0.860