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Geographic impact of COVID-19 in BLS surveys by industry

Using microdata from the Current Employment Statistics survey and the Current Population Survey, I illustrate how the local spread of coronavirus disease 2019 (COVID-19) has differentially affected industry employment. Industries that are not very telework friendly are more likely to have job loss related to its spread. In addition, COVID-19's spread appears to be most correlated with temporary job loss, which could partially explain employment numbers improving slightly in May and June 2020.

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The novel coronavirus disease 2019 (COVID-19) pandemic has brought historically high numbers of job loss and unemployment claims in a very short time. Every locality and every sector have been affected, although the impacts have been varied. There are many possible explanations for the variation:

- Consumers staying home to avoid infection
- Employers closing down for safety reasons
- Government-mandated business closures
- Government-mandated orders to stay home
- Loss of demand because of income uncertainty
- Local occupational composition
- Supply-chain issues

The local spread of the virus affects both the decision of individuals to avoid public spaces and the government's mandates to limit visits to businesses. This fact is important because it emphasizes the economic value to the local labor market in controlling the spread of the virus.

This article uses microdata from the most recent Current Employment Statistics (CES) survey and Current Population Survey (CPS) to provide descriptive evidence on how the local incidence of the virus has affected employment across localities and industries. In a companion working paper, the impacts of the local incidence of the virus on employment are directly estimated, separate from impacts from government mandates and the broad national effect.[1] The working paper shows that a larger portion of the employment decline in leisure and hospitality and other services is unrelated to the spread of the virus. Construction employment, on the other hand,

is more tied to the local spread of the virus. Using current data, the present article expands results by identifying trends in the economy that are relevant for future business and policy decisions.

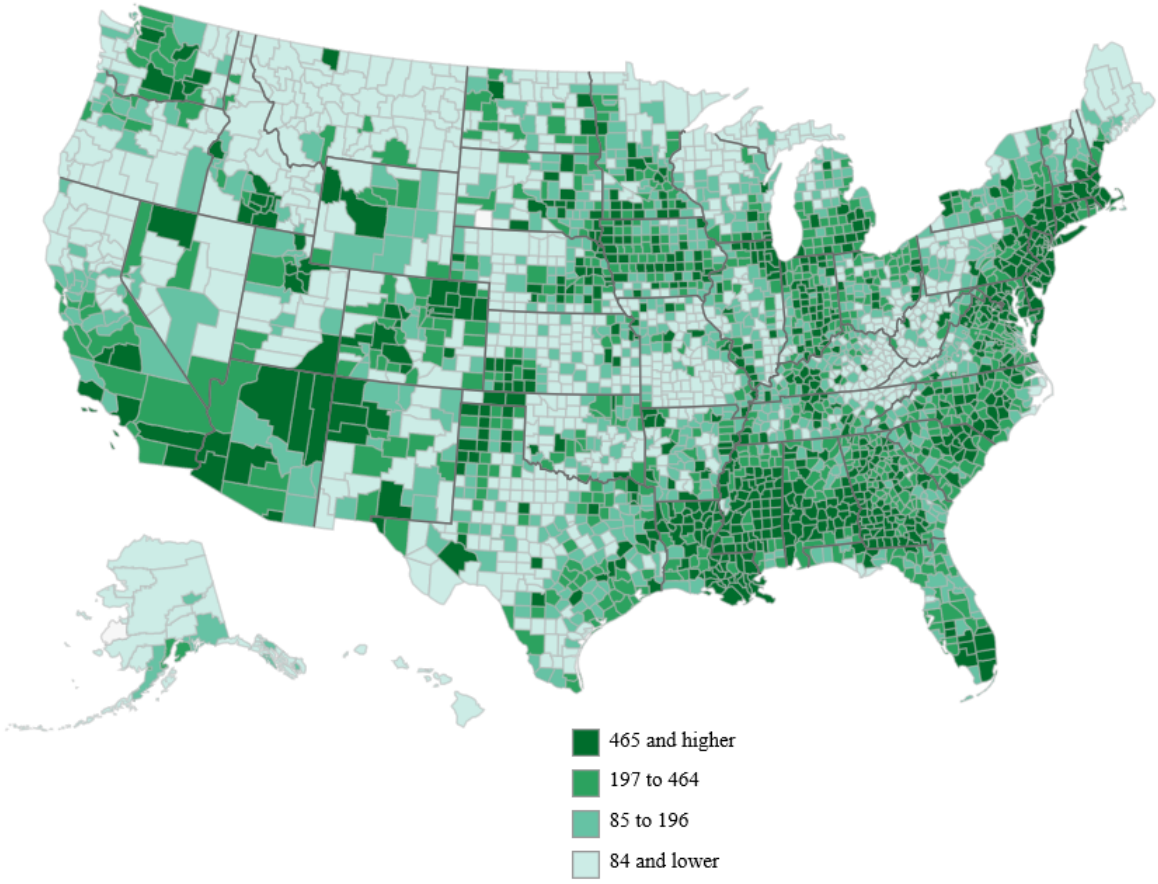
Data

Establishment-level results are from the CES survey, focusing on responding establishments in April, May, and June from 2019 and 2020. The CES survey collects data from 145,000 businesses and government agencies representing 697,000 worksites. The survey asks about employment, hours, and payroll in the pay period encompassing the 12th of the month. I use the longitudinal aspect of the survey to estimate employment changes within establishments since February. In addition, to identify the county that each establishment is in, I use confidential information about the address of the establishment to match county-level information about incidence of COVID-19.

Household-level results are from the CPS, focusing on responding households in April and May from years 2019 and 2020.[2] The CPS is a monthly survey of about 60,000 households that collects employment status during the week of the 12th of the month, among many other labor force and demographic pieces of information. This survey also has a longitudinal aspect that allows me to estimate the percentage of transitions out of employment since February. I primarily focus on transitions into being “on temporary layoff.” Lastly, I rely on the confidential information to identify the county of residence for each respondent.

For COVID-19 data, I use the published *New York Times* data,[3] which tracks the number of cases by day and county. Figure 1 shows the number of cases per 100,000 residents in each county as of Saturday, June 13, 2020, which was the last day of the week that included the 12th of the month. The map shows counties that were particularly hard hit in the northeast, southeast, southwest, and around the Great Lakes. The heterogeneity in spread across climates and population densities show this virus is not geographically isolated.

Figure 1. Number of coronavirus disease 2019 cases as of June 13, 2020, by county and state, per 100,000 population



Hover over a county to see data.
Hover over legend items to see counties in a category.
Source: *New York Times*.

Results

In this section, I present results on employment patterns for the CES survey and CPS separately.

Analysis of Current Employment Statistics microdata

The key measure that I focus on in this article is the change in establishment employment from February to the month of the survey. I choose February because the vast majority of economic impacts did not occur until after February 12 (the reference period for that month's survey). I calculate the percentage change in employment as

$$\Delta \text{emp}_{it} = \frac{\text{emp}_{it} - \text{emp}_{i,\text{Feb}}}{\overline{\text{emp}_{it}}}, \quad (1)$$

where

$$\overline{\text{emp}_{it}} = \frac{\text{emp}_{it} + \text{emp}_{i,\text{Feb}}}{2}.$$

Equation (1) shows that the change in employment, Δemp_{it}, for establishment *i* in month *t* is the difference in employment relative to February, divided by $\overline{emp_{it}}$, the average employment for the 2 months. Dividing by the average employment bounds the percentage change to between −2 and 2, which will reduce the effect of potential outliers in the data, and it allows for any establishments with zero employment in February to be included. When averaging across establishments in a group, I weight each observation *i* by the sample weight.

For figure 2, I alter equation (1) slightly, by summing across establishments in both the same metropolitan statistical area (MSA) and industry with a reported employment in both February and June 2020.[4] Therefore, for each MSA, I use equation (2):

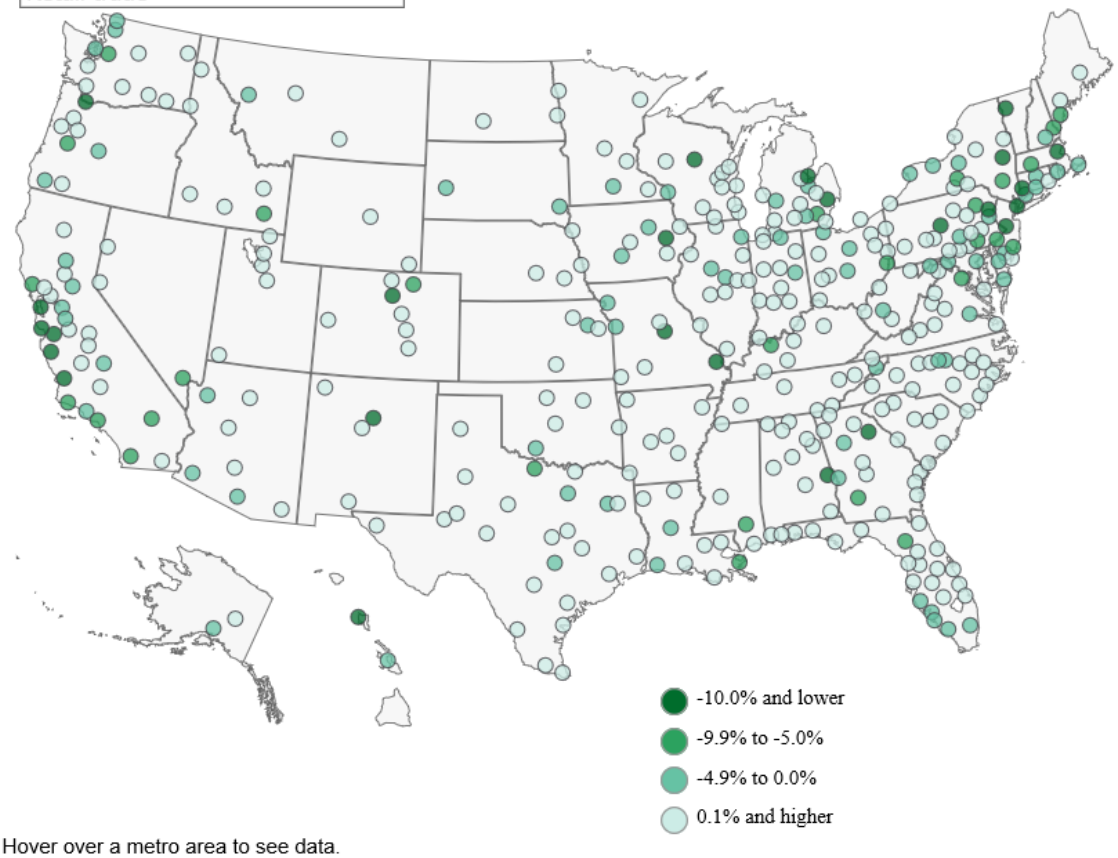
$$\Delta emp_{mj} = \frac{\sum_{i \in m} 1(i \in j) \times \left(emp_{i,\text{June}} - emp_{i,\text{Feb}}\right) \times \omega_i}{emp_{mj}}, \quad (2)$$

where

$$\overline{emp_{mj}} = \frac{\sum_{i \in m} 1(i \in j) \times \left(emp_{i,\text{June}} - emp_{i,\text{Feb}}\right) \times \omega_i}{2}.$$

Δemp_{mj} is the change in employment for MSA *m* in industry *j* from February 2020 to June 2020. This formula is calculated as the difference in summed employment for all establishments, with reported employment for both February 2020 and June 2020 in that MSA $(i \in m)$ and in that industry $(i \in j)$, and is weighted by the sample weight in June, ω_i.

Figure 2. Industry percent change in employment, by metropolitan statistical area, during coronavirus disease 2019, from February to June 2020



Calculated with equation (2), major industry employment estimates by MSAs are shown in figure 2.[5] Figure 2 reveals that the employment effects of the pandemic are varied by both geography and industry.

Across all industries, the northeast (New York, in particular) has had large declines in employment. In many industries, the southwest also has had large declines in employment. In addition, several industries, including manufacturing, have seen employment decline notably in locations around the Great Lakes. These geographic areas are worth pointing out because they also had some of the highest incidences of COVID-19 in the country.

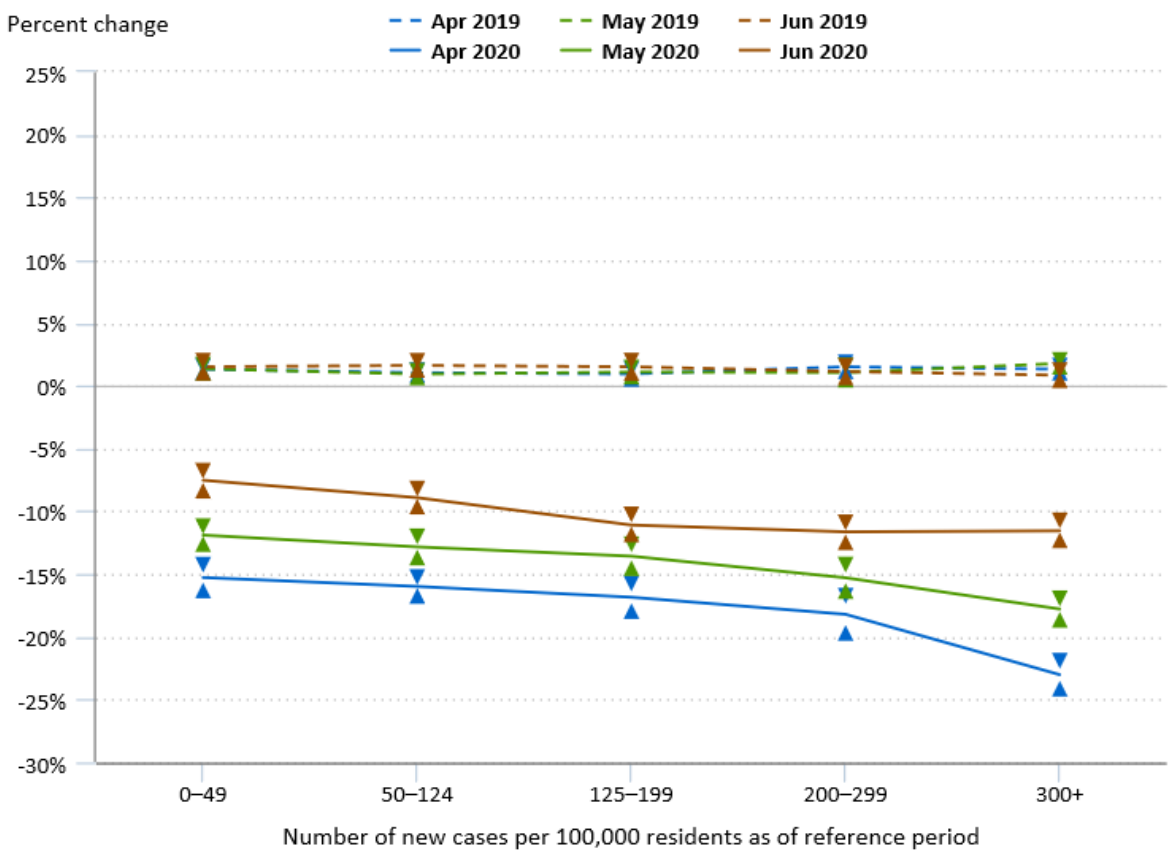
Industries with a sufficient sample size consistently reveal large drops in employment across all MSAs. Retail trade is notable because the declines were minimal, with the main exception of the northeast.[6] Leisure and hospitality, construction, and health care appear to have the most similar geographic distributions of high job loss in figure 2 and high incidence in figure 1.

To more clearly illustrate the relationship between incidence of COVID-19 and employment, figure 3 plots average employment change relative to local incidence of COVID-19. To calculate the employment change for each establishment, I use equation (1). I then calculate the average employment change across establishments for each grouping of county virus incidence. The *x*-axis plots groups of establishments on the basis of the number of new

cases of COVID-19 per 100,000 residents in the county in the 4 weeks before and including the reference period of the survey, as shown in the following:

- For June data, the number of new cases in the 4 weeks leading up to June 13
- For May data, the number of new cases in the 4 weeks leading up to May 16
- For April data, the number of new cases in the 4 weeks leading up to April 18

Figure 3. Average percent change in employment, by number of confirmed coronavirus disease 2019 cases, from February to reference period



Click legend items to change data display. Hover over chart to view data.
Note: CI = confidence interval. Triangles show 95% CI.
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics, and *New York Times*.

April, May, and June 2019 are also included in figure 3 as dashed lines, mapped to the same county incidence rates as their corresponding month in 2020. Each establishment is weighted with the use of the accompanying sample weights from the CES, and 95-percent confidence intervals are shown for each plot with the triangles.

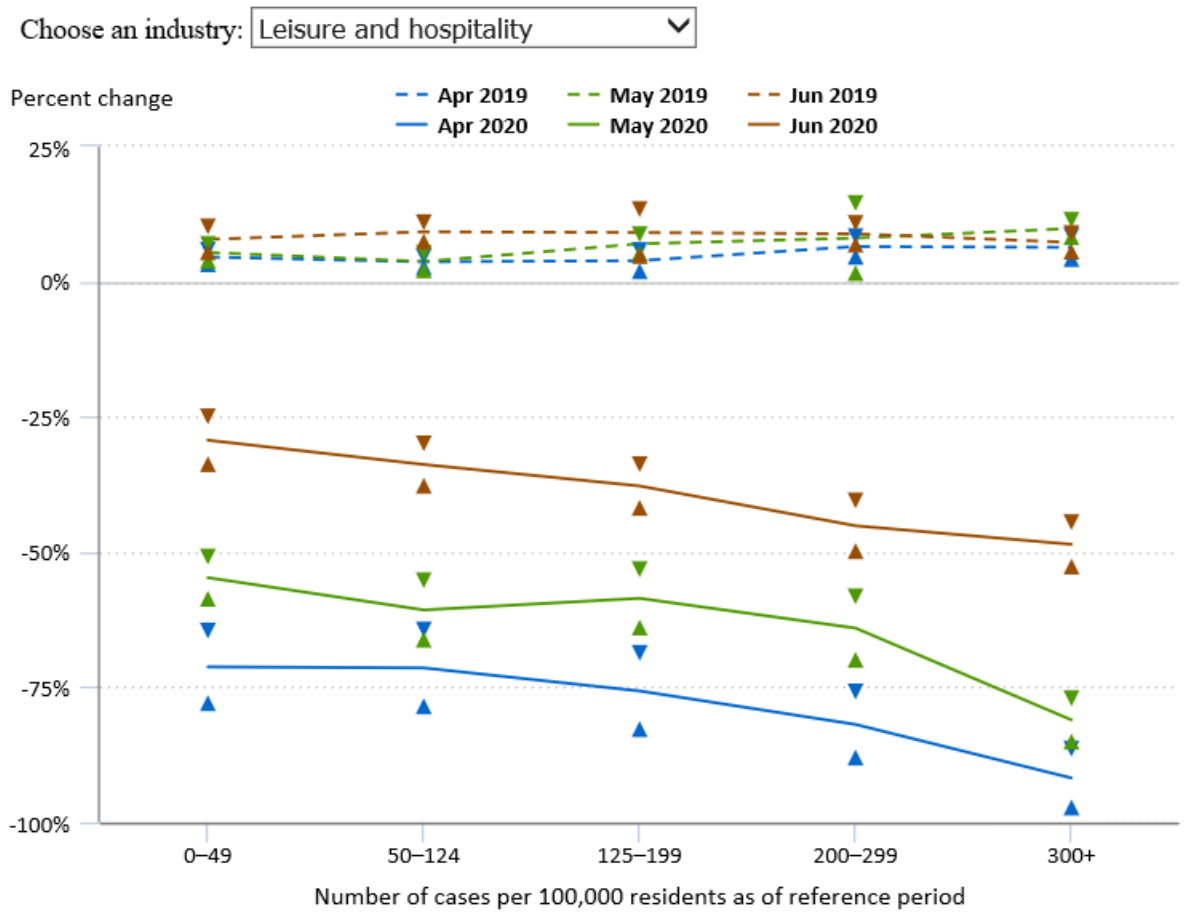
COVID-19 incidence is likely correlated with certain geographic characteristics (population density, climate). The 2019 data are included to illustrate that neither seasonal nor geographic trends explain the observed correlations between incidence of the virus and employment decline. Direct comparison with the same month in the previous year prior to the pandemic illustrates how much seasonal patterns may explain employment patterns. In addition,

comparing the same grouped geographies with trends prior to the pandemic also rules out that the observed employment trends during the pandemic can be explained by common geographic characteristics.

Employment growth was minimal for the months for 2019, consistent across all COVID-19 incidence groups, as illustrated by the flat lines depicted in figure 3. However, April, May, and June 2020 depict a clear pattern that the higher the local incidence of COVID-19, the bigger the decline in employment beginning in February for the establishment. Employment in May and June 2020 improved slightly compared with employment in April 2020, although the decline in employment from February is still very large.

Figure 4 is similar to figure 3 but is broken down by industry. Both leisure and hospitality and other services show the largest shifts downward in their curves, meaning the biggest declines in employment in all months in 2020. From the 2019 data, finance and insurance is the only industry with no apparent change in employment.

Figure 4. Average percent change in employment and number of confirmed coronavirus disease 2019 cases, by industry, from February to reference period



Click legend items to change data display. Hover over chart to view data.
Note: CI = confidence interval. Triangles show 95% CI.
Source: U.S. Bureau of Labor Statistics, Current Employment Statistics, and *New York Times*.

Leisure and hospitality, retail trade, construction, transportation and warehousing, management services, other services, and wholesale trade industries have the most apparent downward trend for all months in 2020. Manufacturing has a slight downward trend for April 2020 but not for May or June 2020.

In a working paper published in 2020, Jonathan I. Dingel and Brent Neiman identify industries in order of telework friendliness.[7] The order of friendliness from least to greatest is as follows:

- Leisure and hospitality
- Retail trade
- Construction
- Transportation and warehousing
- Manufacturing
- Health care
- Management services
- Other services
- Public administration
- Real estate
- Wholesale trade
- Information
- Finance and insurance
- Professional services
- Educational services

Combined with the results about telework in Dingel and Neiman, figure 4 data illustrate that the least telework-friendly industries have the steepest decline in employment. A job that must be done in a certain location and away from home often means that workers must interact directly with customers or interact with other employees. Higher incidence of the virus in a county can influence customers' decisions (choosing not to leave home or go to an establishment), and it can influence government decisions about what businesses can remain open. Being able to work from home allows one to maintain his or her job even when the government orders the establishment closed. Working from home also means that workers can continue to meet demand while minimizing in-person interactions with customers and other coworkers. Employees in industries with limited telework capabilities will face reduced demand and increased restrictions from government mandates as the local incidence of the virus grows. With such limitations, employees in these industries are at elevated risk for job loss and income uncertainty in the short and medium terms.

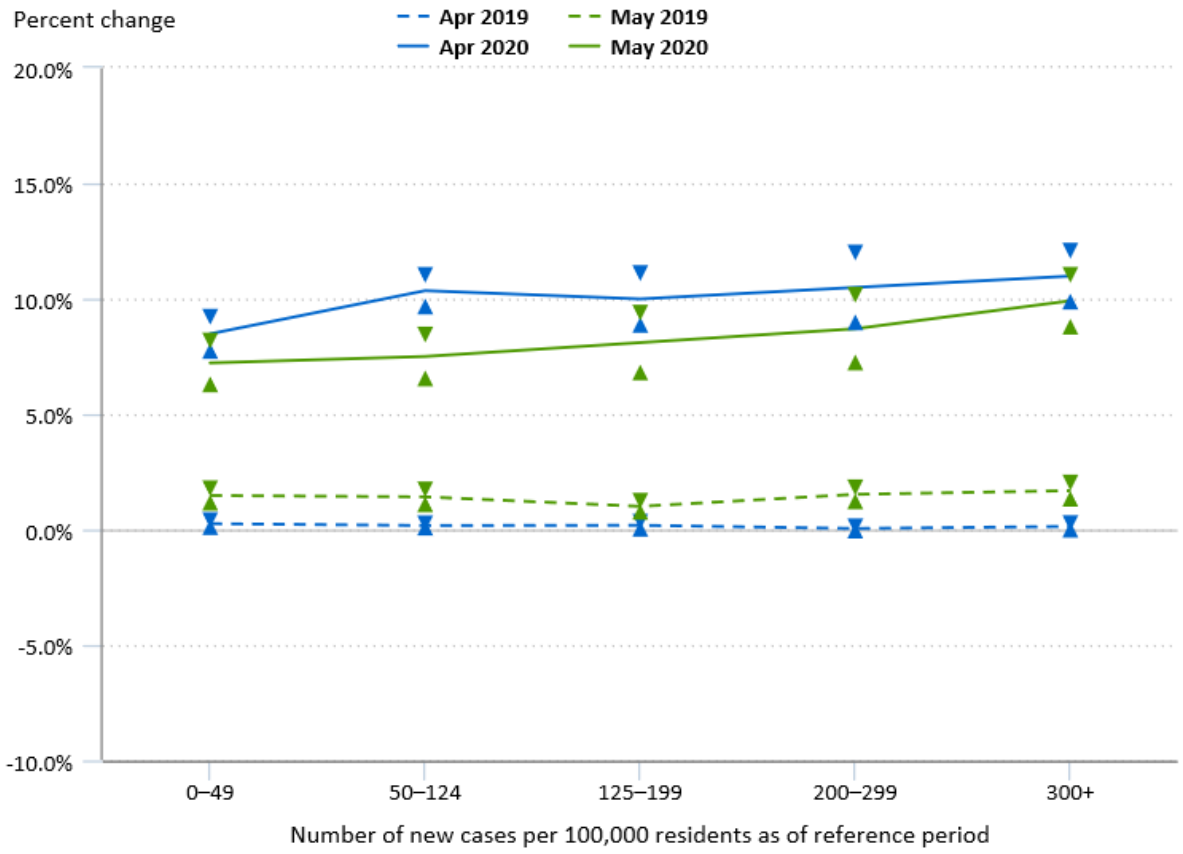
Analysis of Current Population Survey microdata

I now move the analysis to the household survey microdata. For the CPS, the sample will be conditional on respondents who were employed in February. I then estimate the proportion of that sample that is on temporary layoff in April and May for both 2019 and 2020.[8] I weight all results by using the standard-person weights in the CPS.

Figure 5 shows similar patterns to figure 3. The proportion of the population that moved from employed to temporary layoff in 2019 was relatively flat. However, in 2020, this proportion rises, corresponding to the rise in the number of COVID-19 cases. Both April and May 2020 show a large upward shift, matching the national trend in

large employment losses. The key result is that transitions from employment to temporary layoff increase as the number of COVID-19 cases increases for both April and May, matching patterns observed in the CES.

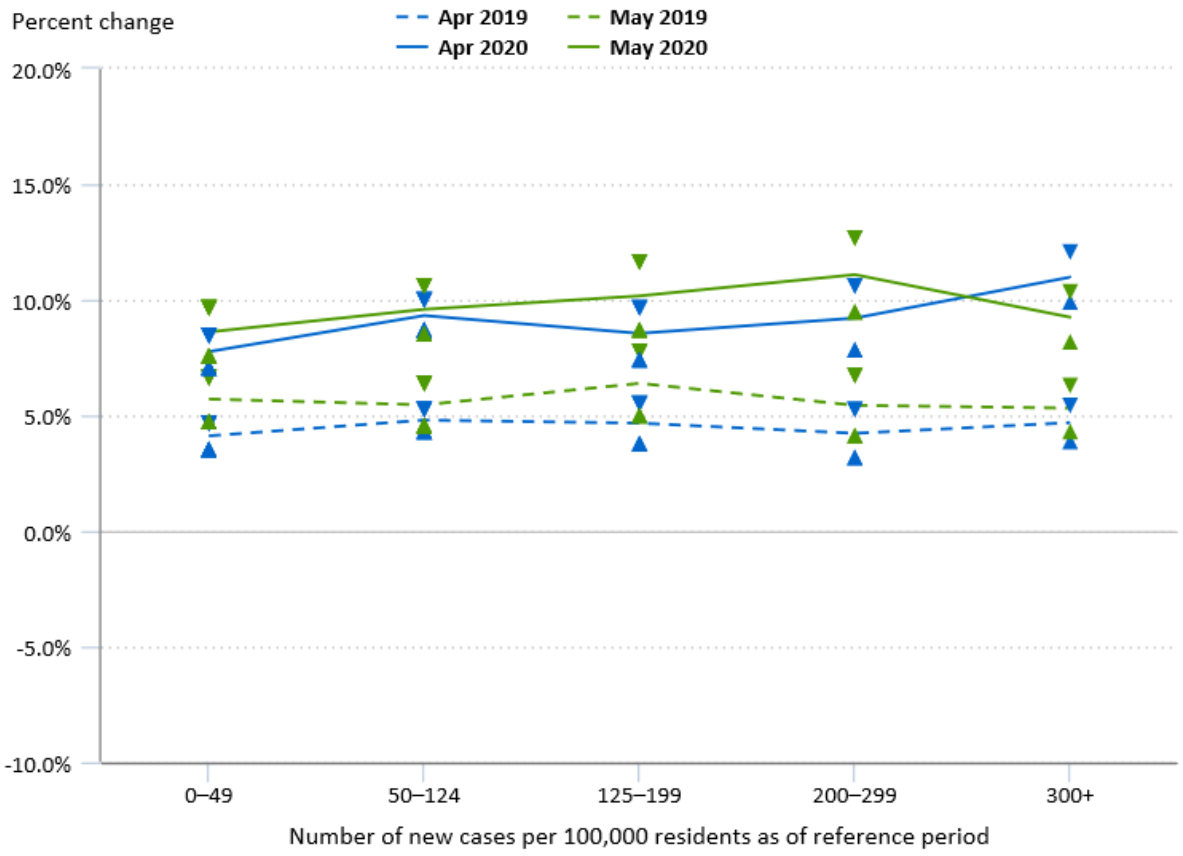
Figure 5. Percentage transitioned from employment to temporary layoff, by number of confirmed coronavirus disease 2019 cases in county, from February to reference period



Click legend items to change data display. Hover over chart to view data.
Note: CI = confidence interval. Triangles show 95% CI.
Source: U.S. Bureau of Labor Statistics, Current Population Survey, and *New York Times*.

As a comparison with figure 5, figure 6 plots the percentage of transitions to not working for all respondents, excluding those on temporary layoff. This definition accounts for all unemployed and not in the labor force designations not covered by figure 5. In figure 6, plots of percentage of employment transitions for May 2020 are flatter compared with percentage plots of employment transitions in figure 5, although the trend shown for April 2020 in both figures is similar. This finding helps illustrate a key point of this analysis: job loss (in particular, temporary layoffs) is likely tied to the local spread of the virus. These results do not preclude many of these temporary layoffs eventually becoming permanent layoffs or preclude structural economic changes in response to a particularly intense local spread of the virus. However, these results do show that job losers whose unemployment is tied to the incidence of the virus may return to work because they have an anticipated date to return to their job. Reducing the spread of the virus not only keeps these layoffs from happening but may also hasten the return of laid-off individuals who have a recall date.

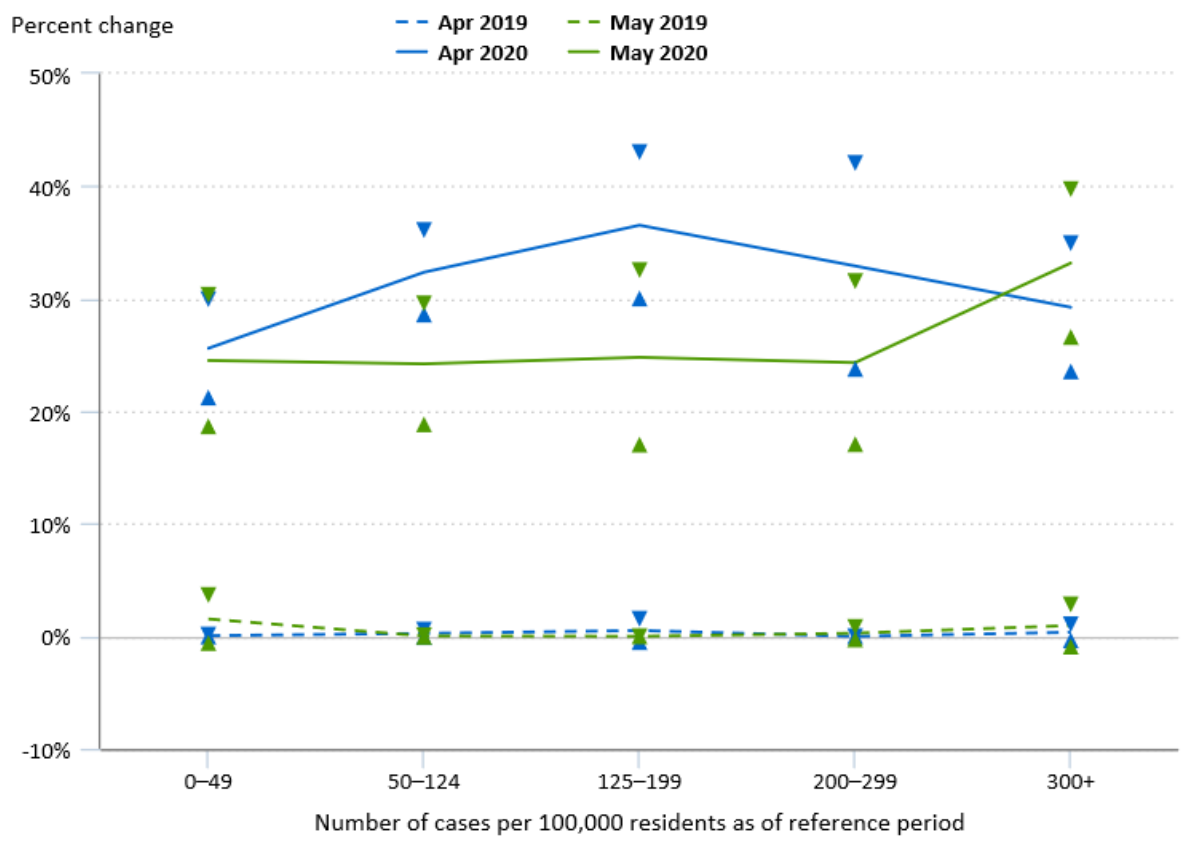
Figure 6. Percentage transitioned from employment to not working but not temporarily laid off, by number of confirmed coronavirus disease 2019 cases in county, from February to reference period



Click legend items to change data display. Hover over chart to view data.
Note: CI = confidence interval. Triangles show 95% CI.
Source: U.S. Bureau of Labor Statistics, Current Population Survey, and *New York Times*.

Figure 7 shows the same analysis as figure 5 but is broken down by industry. In the CPS, the industries that have more transitions to temporary layoff as the number of COVID-19 cases grows are construction, transportation and warehousing, and management services for April and May 2020. Leisure and hospitality and other services show an upward trend only for May 2020, and retail trade, real estate, and health care show an upward trend only for April 2020. The results are similar to the results shown in figure 4 in that figure 7 depicts that less telework-friendly industries, as defined in Dingel and Neiman,[9] trend toward more job loss when the local incidence of the virus is higher.

Figure 7. Percentage transitioned from employment to temporary layoff, by number of confirmed coronavirus disease 2019 cases, by industry, from February to reference period



Click legend items to change data display. Hover over chart to view data.
Note: CI = confidence interval. Triangles show 95% CI.
Source: U.S. Bureau of Labor Statistics, Current Population Survey, and *New York Times*.

Conclusion

Using the most recent BLS data, this article provides graphical evidence for limiting the spread of the virus in order to improve local labor markets. Layoffs have increased in response to higher incidence of the virus and have disproportionately affected employment in industries that are less telework friendly, such as construction and transportation and warehousing.

Although employment improved slightly in May and June 2020, job loss continues to be historically high. For industries such as construction and transportation and warehousing, the concern is that as the virus continues to spread, employees in these industries may face the prospect of additional layoffs. The first-order effect of the pandemic on workers' employment status is clear, but the potential second-order effect of income uncertainty leading to even more reduced demand will also affect the local economy. Evidence shows that during the Great Recession, increased uncertainty likely led to a worsening of the Great Recession, partially because of reduced demand.[10] In addition, researchers have found that increased job uncertainty leads to reduced demand.[11] As shown in a recent press release from the U.S. Bureau of Economic Analysis, savings dramatically increased in

April 2020. One potential explanation is that individuals are choosing to save in response to future economic uncertainty.[12] These considerations should be kept in mind as decisions surrounding opening up businesses are made.

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SUGGESTED CITATION

Michael Dalton, "Geographic impact of COVID-19 in BLS surveys by industry," *Monthly Labor Review,* U.S. Bureau of Labor Statistics, August 2020, https://doi.org/10.21916/mlr.2020.17

NOTES

1 Michael Dalton, “Labor market effects of local spread of COVID-19,” Working Paper 524 (U.S. Bureau of Labor Statistics, June 2020), https://www.bls.gov/osmr/research-papers/2020/pdf/ec200060.pdf.

2 Because of the sample design of the Current Population Survey (CPS), in which households are interviewed for 4 consecutive months, no respondents in June are also interviewed in February. For this reason, the most recent survey responses used are for May.

3 “Coronavirus in the U.S.: latest map and case count,” *New York Times*, updated July 27, 2020, https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html.

4 Counties are grouped by metropolitan statistical area (MSA) and non-MSA designation. Additional information can be found at “Occupational Employment Statistics: May 2019 metropolitan and nonmetropolitan area definitions” (U.S. Bureau of Labor Statistics, May 2019), https://www.bls.gov/oes/current/msa_def.htm.

5 An MSA is shown in figure 2 only if it has at least five establishments in that industry responding to the survey.

6 This finding differs slightly from published estimates from the Current Employment Statistics (CES). This difference is because many retail establishments were rotated out of the sample in April and a new rotation of establishments entered the sample. The published estimates from the CES are based on the new sample that only began being interviewed in April, whereas the estimates presented here are on a subset of the sample that was interviewed in both June and February.

7 Jonathan I. Dingel and Brent Neiman, “How many jobs can be done at home?” Working Paper 26948 (National Bureau of Economic Research, April 2020, revised June 2020), https://www.nber.org/papers/w26948.

8 Households in the CPS are only interviewed for 4 consecutive months. As a result, the final consecutive interview will be in May for a household interviewed in February. In order to ensure a comparison with a month prior to most of the impacts of the pandemic in the United States, the analytical sample is restricted to having an interview in February. As a result, the most recent household interviews that can be included are in May.

9 Dingel and Neiman, “How many jobs can be done at home?”

10 Susanto Basu and Brent Bundick, “Uncertainty shocks in a model of effective demand,” *Econometrica*, vol. 85, no. 3, May 2017, pp. 937–958, https://www.econometricsociety.org/publications/econometrica/2017/05/01/uncertainty-shocks-model-effective-demand.

11 Morten O. Ravn and Vincent Sterk, “Job uncertainty and deep recessions,” *Journal of Monetary Economics,* vol. 90, October 2017, pp. 125–141, https://www.sciencedirect.com/science/article/pii/S0304393217300806.

12 See *Personal Income and Outlays: April 2020* (U.S. Bureau of Economic Analysis, May 29, 2020), https://www.bea.gov/news/blog/2020-05-29/personal-income-and-outlays-april-2020.

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