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IZA DP No. 14108

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ISSN: 2365-9793

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ABSTRACT

The COVID-19 Pandemic's Evolving Impacts on the Labor Market: Who's Been Hurt and What We Should Do*

In this paper, we shed light on the impacts of the COVID-19 pandemic on the labor market, and how they have evolved over most of the year 2020. Relying primarily on microdata from the CPS and state-level data on virus caseloads, mortality, and policy restrictions, we consider a range of employment outcomes—including permanent layoffs, which generate large and lasting costs—and how these outcomes vary across demographic groups, occupations, and industries over time. We also examine how these employment patterns vary across different states, according to the timing and severity of virus caseloads, deaths, and closure measures. We find that the labor market recovery of the summer and early fall stagnated in late fall and early winter. As noted by others, we find low-wage and minority workers are hardest hit initially, but that recoveries have varied, and not always consistently, between Blacks and Hispanics. Statewide business closures and other restrictions on economic activity reduce employment rates concurrently, but do not seem to have lingering effects once relaxed. In contrast, virus deaths—but not caseloads—not only depress current employment, but produce accumulating harm. We conclude with policy options for states to repair their labor markets.

JEL Classification: J0, J1, J6

Keywords: COVID-19, pandemic, employment, low-wage workers, state closures

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* This paper has been prepared for the Conference on Uneven Outcomes in the Labor Market, organized by the Board of Governors of the Federal Reserve Bank, February 1, 2021. The authors thank Shane Reed and Steve Yesiltepe for capable research assistance; all errors are the authors' own.

I. Introduction

The broad outlines of the effects of the COVID-19 pandemic on the US labor market have been known for months, and are apparent from the Employment Situation Reports published each month by the Bureau of Labor Statistics (BLS).

For instance, we know that the labor market experienced a very steep decline, beginning in March and sharply accelerating in April, with over 20 million jobs lost. The recovery began in May and picked up steam in June; employment growth remained strong in the summer, but monthly increases began diminishing in magnitude by the fall and flatlined after October.

Unemployment increased broadly in March and April, but the jump was especially steep for African Americans, Hispanics, and workers in retailing, leisure, and hospitality. Labor force participation also dropped and involuntary part-time employment rose. All of these measures began to show improvement in May, but at increasingly modest rates over the summer; and as of late fall, long-term unemployment rates have risen, as has the share—and number—of layoffs that are permanent.

Though these broad patterns are well known, many questions remain. For instance, to what extent are the worse employment outcomes that workers of color have experienced caused by their lower average educational attainment, their concentration in low-wage service jobs, or something else (perhaps discrimination)? As many indicators improve, but permanent layoffs and long-term unemployment rise, who is still showing progress, and on which dimensions—and who is suffering longer-term dislocations?

Most importantly, we know that the path of the COVID-19 virus has been quite nonlinear and uneven across states and regions, as have its labor market impacts. On the one hand, the shutdown in economic activity in March and April was truly national (Forsythe et al. 2020a), even though some states were hit harder than others (especially on the coasts and those with very large metropolitan areas like Chicago and Detroit). But the virus surged in some states (especially in the South and Southwest) over the summer, and then in the Midwest and Plains in the fall, while mostly staying under control in the states hit hardest earlier. Beginning in late October, cases began to rise nearly everywhere, and by the end of the year remained at record-high levels.

It is likely that this uneven virus path has affected labor markets differently across states and regions, as well as across occupations, industries, and demographic groups. Yet the published national data tell us little to date about these patterns or how they have changed over the past several months. Of course, COVID-19 papers have become something of a cottage industry among economists; a search of the term "COVID-19" on the NBER working papers website yielded 487 papers released between March 1 and December 15, 2020, at least 60 of which relate to labor markets, with most of these coming before the fall and focusing on the initial period of job losses rather than more recent trends.[1]

In this paper, we seek to shed light on how the impacts of the COVID-19 pandemic on the labor market have evolved over time. We pay particular attention to patterns of decline and recovery, with rapid and then slowing improvements, in different states. We investigate differing impacts on multiple employment outcomes across demographic and education groups as well as occupations and industries, and how these have varied from the spring to the fall as COVID case and mortality rates—and state restrictions on economic activity—have changed.

[1] Two exceptions are Gallant et al. (2020) and Forsythe et al. (2020b), both of which stress the unusually high share of temporary layoffs in the current recession as complicating standard job search models, but differing in interpretation of existing labor market slack and the likely rate of recovery. Neither focuses on subgroups or regional variation.

We employ monthly microdata from the Current Population Survey (CPS) through December 2020, supplemented with other sources. After describing our data and our methods at greater length in the next section, we provide graphical (and tabular) time trends in key employment outcomes: in the aggregate, for different demographic and wage groups, and then separately by groups of states defined by the timing of peak virus caseloads. We then more systematically investigate the role of COVID-19 severity and economic restrictions on employment, allowing for contemporaneous and lagged effects. Finally, we summarize lessons learned and implications for employment policy in the months and years ahead.

II. Data and Methods

We begin our analysis by compiling summary monthly data from the CPS through December 2020. Although several papers (e.g., Bartik et al. 2020, Cajner et al. 2020) have used alternative private-sector employment data from sources such as Homebase and ADP, the advantages of these data in timeliness and geographic detail come at the expense of representativeness and demographic detail, for which the CPS is still the gold standard. We limit our analysis to individuals aged 18–64 and focus on select, summary measures of employment—including an adjusted employment rate described below, the share of individuals reporting permanent job loss, and total weekly hours worked—although we also briefly report more conventional measures, such as labor force participation and unemployment rates.[2]

Our adjusted employment rate measure modifies the more typical employment rate (or employment-population ratio) to exclude individuals away from work for "other" non-

[2] We have calculated numerous additional measures, available on request, but we believe the ones described in the paper adequately summarize employment trends and their evolution during the pandemic.

specified reasons (e.g., besides vacation, own illness, personal leave, etc.). The share of workers absent from work for "other" reasons skyrocketed in April and has only gradually come down, and the Bureau of Labor Statistics believes most of these individuals should have been classified as unemployed (U.S. Bureau of Labor Statistics 2020). We further modify the employment rate to exclude individuals who report working part-time involuntarily due to economic conditions, either on a "usual" basis or specifically during the reference week of the survey. The adjusted employment measure thus captures changes in work at both the extensive and intensive margins.

As a related summary measure in aggregate analyses, we also analyze the total weekly hours worked for a group, which can capture more subtle hours changes than the adjusted employment rate. Finally, we regard the share of people (and not just of the unemployed) with permanent job loss as particularly important, since it is the best measure we have to date of long-term employment disruption associated with the pandemic, and research has shown the enormous social costs it imposes on workers (Davis and Von Wachter 2011).

We prefer these measures also because they are invariant to endogenous changes in labor force status, such as the (U3) unemployment rate (which is conditioned on labor force participation) or the duration of unemployment (which is conditioned on unemployment). However, we present some of these latter measures for comparison and completeness.

For all the graphs we present below, we first collapse the data to a month-group level and seasonally adjust by residualizing each series separately on calendar month dummies over the period 2015 through 2019. We then present the seasonally adjusted series running from January through December 2020. In some cases, especially when making comparisons across groups, we present trends that have been normalized (at 0) to respective January baselines. We present trends over 2020 in the aggregate and then separately for select demographic groups (race/ethnicity and gender) and occupation-based wage quartiles.[3,4]

We then turn to the geographic breakdown of employment changes, as defined by the time patterns of the COVID-19 caseload through December 2020. We group states into 3 categories: 1) those whose virus caseload peaked in the spring; 2) those whose caseload peaked during the summer months of June-August; and 3) those where the peak occurred after August.

This breakdown correlates only loosely with region. Viruses peaked in the spring in many coastal states, but also some Midwestern states, such as Illinois, Michigan, and Minnesota, with very large metro areas and airline hubs through which many travelers pass. Caseloads surged in many Southern or Southwestern states in the summer, but also peaked in Idaho, Nevada, and Ohio. In the fall, cases rose sharply in the upper Plains states, but also in Alaska, Indiana, Vermont, and West Virginia.[5] We consider the first category of states the most informative for measuring long-term unemployment or permanent job loss.

After presenting results graphically, we turn to regressions across first individuals and then states to examine how employment measures have evolved over time and subject to different sets of covariates.

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[3] We merge occupational wage data from the Occupational Employment Statistics program (https://www.bls.gov/oes/home.htm) at the detailed occupation level and construct population-weighted quartiles.

[4] We have also examined trends in many additional demographic and job-characteristic groups, such as age, education, five categories of occupation, 12 categories of industry, and the Dingel and Neiman (2020) categorization of teleworkable jobs. Graphical trends for these groups are available upon request, but we omit them here for brevity.

[5] See Appendix Table 1 for the full list. States where cases peaked in the summer tended to be those that lifted restrictions in economic activity somewhat earlier than others, especially before the Memorial Day holiday weekend. Those peaking later also lifted restrictions earlier (or failed to ever implement them fully), and relaxed enforcement efforts in the late summer and around Labor Day weekend. For an analysis of employment trends by region see Crump et al. (2020).

More specifically, for individual-level regressions, we estimate coefficients on monthly time dummies, interacting these dummies with group identifiers in order to illustrate time trends separately by group. To understand the extent to which group-level differences in the education and occupational structure influence the patterns, we also estimate versions that control for education and occupational wage quartile categories, each interacted with the monthly dummies. In this latter case, the time interactions on the group indicators identify the differential time path of the group's outcome since January relative to the omitted group, net of the dynamics by education and occupation structure.

Formally, we run OLS regressions of the form:

$$y_{igt} = \boldsymbol{\alpha_t} + Black_{igt}\boldsymbol{\theta_t} + Hispanic_{igt}\boldsymbol{\delta_t} + \sum_{i=2}^{4} \beta_{it} \cdot wageq_{it} + \sum_{i=2}^{5} \gamma_{it} \cdot edu_{it} + \varepsilon_{igt} \quad (1),$$

where y_{igt} is the outcome—binary indicators for adjusted employment or permanent job loss, as well as weekly hours worked last week—for individual *i*, of group *j*, in month *t*, and the sample consists of the population age 18–64 from January through December 2020.[6] The vector $\boldsymbol{\alpha_t}$ is a sequence of monthly time dummies, ranging from February through December, with the omitted January serving as baseline. $Black_{igt}$ and $Hispanic_{igt}$ are indicator variables for membership in the respective groups, and $\boldsymbol{\theta_t}$ and $\boldsymbol{\delta_t}$ are the coefficients of interest, vectors of time dummies that capture the *differential* from $\boldsymbol{\alpha_t}$ (which represent the time path, relative to January, for non-Black, non-Hispanic individuals). In some specifications, we include the terms $\sum_{i=2}^{4} \beta_{it} \cdot wageq_{it}$ and $\sum_{i=2}^{5} \gamma_{it} \cdot edu_{it}$, which respectively capture the time dynamics (notice the t subscripts on β and γ) for occupational

[6] More accurately, y_{igt} is a seasonally adjusted measure of the outcome, in which we first run an ancillary regression of the outcome on only calendar month dummies (11, omitting April) in a sample that ranges from January 2015 through December 2020 but otherwise with the same sample restrictions as mentioned previously. We use residuals from these regressions as y_{igt}.

wage quartile and education categories.[7] In these cases, we are interested in how estimates for $\boldsymbol{\theta_t}$ and $\boldsymbol{\delta_t}$ change with the additional controls, which helps address the question of whether differences in employment trends for Blacks and Hispanics can be accounted for by salient human capital characteristics. The term ε_{igt} is an idiosyncratic error, which we allow to be heteroskedastic.

Turning to state-level regressions, we are interested in how outcomes at the state-month level evolve as a function of caseloads, death rates, and economic restrictions. We pay special attention to the possibility that these covariates can have enduring effects by allowing for their lags to enter the model.[8] Using aggregate rates of the same dependent variables as before, our regression focuses is of the form[9]:

$$y_{st} = \boldsymbol{\eta_t} + \tau \cdot caserate_{st} + \pi \cdot deathrate_{st} + \phi \cdot restriction_{st} + \epsilon_{st} \qquad (2),$$

where $\boldsymbol{\eta_t}$ is a vector monthly indicator variables (omitting January 2020) to capture national time trends in 2020, $caserate_{st}$ is the 14-day moving average of the number of newly diagnosed COVID-19 cases per 100,000 population in state s for month t, $deathrate_{st}$ is the 14-day moving average of the number of COVID-19 fatalities per 100,000 population, and $restriction_{st}$ is an index of state economic restrictions in effect in month t. Rather than include state fixed effects, we normalize y_{st} to be the difference from each state's January 2020 value. We take case rate and mortality data from the Economic Tracker of Opportunity Insights (Chetty et al. 2020; https://github.com/OpportunityInsights/EconomicTracker),

[7] The education categories are less than high school, high school graduate/some college, associate degree, bachelor's degree, advanced degree. In practice, we omit wage quartile 2 and high school graduate/some college; this choice does not affect $\boldsymbol{\theta_t}$ and $\boldsymbol{\delta_t}$, but does affect $\boldsymbol{\alpha_t}$.

[8] We have also estimated specifications with leads to allow for anticipation effects. These specifications yield qualitatively similar patterns and are available on request.

[9] We emphasize we use the population as the denominator for adjusted employment rates and permanent unemployment shares, and the natural log of the total weekly hours worked across individuals, not just across the employed.

which in turn takes in data from *The New York Times* and the COVID Tracking Project. We further smooth the 7-day moving averages reported there by additionally averaging over the 7 days of the week preceding the reference week of the CPS survey (the week containing the 12th of the month); this effectively creates a 14-day moving average.

Our policy restrictions come from Fullman et al. 2020 (available at (https://github.com/COVID19StatePolicy/SocialDistancing/tree/master/data). They provide the dates in which numerous state-level restrictions on economic and social activity are in effect. We focus on eight restrictions likely to affect economic activity—bar limitations, gathering restrictions, non-essential business closures, other business closures, mandatory quarantines, restaurant limitations, school closures, and stay-at-home orders—and code each as 0 or 1 based on whether the restriction is in effect as of the end of the reference week for each month's CPS survey. (If a restriction was eased but not removed, we code it as 0.5 for the month.) For simplicity, we then create an index by summing the restrictions in effect in each state for a given month, and then rescaling so that the index ranges from 0 to 1 across state-months.[10] Thus ϕ captures the effect of moving from no restrictions to the most restrictive state-month.

In related specifications, we modify (2) to also include both one-month and two-month lags of each covariate, as well as cumulative measures of each covariate. These specifications allow the influence of COVID conditions and policies to accumulate over time. All these state-level regressions rely on cross-sectional state variation in these covariates to capture evolution in different labor market measures. Because we use state-month averages, we weight each cell by the number of observations contributing to it (down-

[10] We have also created an index using a polychoric factor matrix, essentially a generalization of principal components to include categorical as well as Gaussian latent variables. This approach effectively adds the orthogonal components of each of the eight restrictions. Our results are similar using this measure.

weighting small cells with imprecise averages), and we cluster ϵ_{st} at the state level to allow for arbitrary autocorrelation. We run these regressions on March through December 2020 to ensure variation in the covariates, as well as allow lags to reach to earlier months.

III. Employment Trends in 2020

A. Aggregate and by Demographic or Job Categories

Figure 1 presents aggregate employment trends through December 2020, with employment measured in a variety of ways. In part A, we present traditional measures such as labor force participation, the employment-to-population ratio, and the unemployment “share” (measured relative to the overall population rather than the labor force). In part B, we refine our measures of employment to exclude those missing from work (for “other” reasons) or those working part-time involuntarily, and also present total hours worked. In part C, we present the trend in permanent job loss, either relative to the unemployed or to the total population; while in part D we present the median duration of unemployment among those who report being unemployed.

The results in part A for the three most traditional employment measures illustrate an aggregate pattern that is, by now, well known: the rise in unemployment (and declines in employment and labor force participation) reached their extremes in April, recovered fairly rapidly in May and June, improved more slowly from July through October, and were essentially stagnant by the end of the year. For instance, the employment-population ratio declined from 76 percent in February to 64 percent in April, before recovering to about 68 percent in June and to 72 percent by October through December.

Part B illustrates that the temporal patterns of employment decline and recovery are similar when we exclude those missing from work for “other” reasons (solid blue line) and involuntary part-time workers (dashed red line), though the magnitude of observed employment loss rises (and that of the recovery shrinks) when we implement these exclusions. For instance, excluding the “other” absent and involuntary part-time workers reduces the employment-population ratio from 64 to 56 percent in April and from 72 to 68 percent in October through December. (The latter gap is more than twice as large as in February.) The pattern we observe in total hours worked, our single most comprehensive measure of employment, is also similar as well, and this measure as of October remains roughly 7 percent below its February level.[11]

Part C of Figure 1 illustrates the temporal pattern of permanent job loss during 2020. We present two measures: one where workers with permanent job loss are measured as a fraction of the unemployed (as often done in the BLS Employment Situation Reports), and another where they are measured relative to the population. Both show large increases in such employment loss since April, though the patterns differ in the early months of the year: as a share of the unemployed, the rate *falls* between February and April, since so many temporary layoffs occurred then, and then rises afterwards.[12] As a share of the population, however, they grow nearly monotonically over time. Permanent job loss increased to over 1.5 percent of the population (and nearly one-third of the unemployed) by October and November, before dipping slightly in December.[13] These patterns illustrate the large and lasting economic and social costs that the pandemic has already and likely will continue to impose on U.S workers.

[11] We see a modest and temporary dip in hours during the month of September, perhaps associated with the school year beginning with unanticipated ongoing closures. This dip also appears in Donovan and Labonte (2020).
[12] Forsythe at el. (2020b) and Gallant et al. (2020) find little evidence that individuals with temporary layoff transition to permanent unemployment. Rather, the increase seems to come directly from the employed.
[13] The permanent job loser share was last at this level in early 2014 but peaked at almost twice this level in early 2010, the trough of the Great Recession.

Part D of Figure 1 then confirms this pattern by presenting the median duration of unemployment in weeks (measured only for those unemployed). The pattern is similar to the one we observe for permanent job loss among the unemployed: median weeks initially fell in April, as many workers lost their jobs, but then rose consistently over subsequent months until declining slightly near the end of the year.[14]

In Figure 2 we present trends in employment over 2020, broken down by key worker wage or demographic categories: occupational wage quartile (part A), race/ethnicity (part B), or gender (part C). We use our most restrictive dichotomous measure of the employment rate (or most inclusive measure of nonemployment), that which excludes those not at work for "other" reasons and those working part-time involuntarily.[15]

Part A of Figure 2 shows dramatic and consistent differences in employment patterns by wage quartile, with both the greatest employment losses and the slowest recoveries occurring among the lowest-wage workers. Specifically, we find relatively modest employment losses in the highest wage quartile by April (96 to 86 percent), with most of the lost employment recovered by December (back to 94 percent). In contrast, we observe dramatically larger employment loss by April for the lowest quartile, which declines from 85 percent in February to 51 percent two months later, before recovering to 75 percent in October and November, and then dipping slightly for the first time in December—marking an 11-percentage point gap from pre-pandemic levels. Such differences in both initial and

[14] The effective exhaustion of additional unemployment benefits in the later months of the year—both the automatic Extended Benefits programs and the Pandemic Emergency Unemployment Assistance program authorized by the CARES Act, which provided an additional 13 weeks of benefits—complicate the interpretation of this decline, as people may have shifted from reporting unemployment to reporting not being in the labor force.

[15] We present analogous graphs of total hours worked in Appendix Figure 1.

lasting employment loss between the highest- and lowest-wage workers are almost certainly unprecedented among U.S. recessions over the past 100+ years.

Part B of Figure 2 also illustrates dramatic differences in employment patterns by race and ethnicity, with workers of color showing both the largest initial and lasting employment losses. Among white workers, the adjusted employment rate drops from about 76 to 59 percent by April, and then recovers by October to 71 percent, where it stayed for the next two months. In contrast, employment rates among Blacks and Hispanics drop from about 70 and 73 percent to 52 and 50 percent respectively by April, and recover to only 63 and 65 percent by October, with the rates for Blacks staying stagnant over the last two months of 2020, and the rate for Hispanics slipping a percentage point in December. The relatively larger employment losses among both minority groups in part results from their greater concentration in the lower-wage service jobs that have been hit so hard by the pandemic-induced recession. The job loss among Hispanics remains large, even though their employment rate has almost reverted to its usual higher *level* relative to Blacks.

Finally, part C of Figure 2 presents employment patterns by gender. Though employment is consistently lower among females than males, the magnitudes of loss and recovery are quite similar between the two. This is consistent with what we have learned from published BLS numbers over time—the rise in unemployment has been slightly smaller among women, while their drops in labor force participation have been slightly larger. Although women are more concentrated in lower-wage quartiles than men (a consequence of occupational and industry gender segregation), their employment losses within these groups are slightly smaller.

In Figure 3, we present the share of the population reporting permanent job loss by wage quartile (part A), race/ethnicity (part B), and gender (part C).[16] As expected, permanent job loss is substantially higher in the lowest compared to the highest wage quartile; indeed, at the October peak, such losses as shares of the population reached nearly three times as high among the bottom quartile as among the top quartile (0.032 vs. 0.012). This measure has come down slightly, especially in December, for all groups—likely a result of exhaustion of unemployment benefits and respondents changing their reporting from unemployed to out of the labor force, especially since part A of Figure 2 did not show appreciable gains in the employment rate. Nonetheless, the relative magnitudes of permanent job loss have changed little across the wage quartiles.

Permanent job loss as of December is also substantially higher among Black workers (0.022) than white workers (0.012), although the gap is smaller for Hispanic workers (0.017) and has exhibited less increase since the summer. In accordance with the labor force participation gender differential discussed above, the permanent job loser share is also larger for men (0.016) than women (0.013), and this gap had been steadily widening until December.

Finally, Table 1 presents a more complete breakdown of employment losses and recovery across a more complete range of demographic and job categories. We show the adjusted employment rate in February, April, June, October, and December for demographic groups (Part A) and job categories (Part B).[17]

[16] From here onward, we do not present the graphs of unemployment duration across groups, since these follow relatively similar patterns to what we observed in Figure 1d, and they are harder to interpret as the share of the unemployed changes.
[17] Appendix Tables 2A and 2B present analogous estimates for the share of the population with permanent job loss.

Beyond the differentials across wage quartiles, race and ethnicity, and gender illustrated in the figures, the results in part A of Table 1 show relatively larger losses among younger workers and less educated workers (but also somewhat faster recovery). Indeed, for 18–24-year-olds, the employment rate in April had fallen to just about three-fifths of its level in February, and even by December remained 10 percent (6 percentage points) below its February level; employment among older workers fell by less than one-quarter at trough and was down 7–8 percent down by December. Similarly, employment rates among those with high school education or less fell by more than 30 percent by April and remain depressed by 10 percent in December, while the relative losses of those with at least a bachelor's degree are much smaller. Somewhat ominously, and congruent with the K-shaped recovery noted by many others, the employment rates continued to improve slightly between October and December for those with at least a bachelor's degree, while falling slightly for those with less education.

The results in part B of the table clearly show which job categories have borne the greatest brunt of job loss. By occupation, the losses (both by April and later) are greatest in the low-wage services and least among professional and managerial workers. By industry, losses are greatest in the "arts, accommodation, and food services" and "other services" categories (which mostly includes lower-wage personal services jobs rather than professional, business, health, or education services). However, they are also high, especially initially, in trade and construction, likely reflecting differing degrees of customer or coworker contacts. While these latter sectors have recovered about in line with average, the former two remain substantially depressed in December, with employment rates roughly 20 percent below February levels. Furthermore, these two industries also showed among the largest drops in employment rates between October and December.

Finally, changes in employment rates are dramatically different by the extent to which work can be done remotely: those who cannot easily do so lose about one-third of employment in April and are still down by one-tenth by December, whereas among remote workers the losses are closer to one-sixth and one-twentieth, respectively.

The patterns of greatest long-term employment loss among the most vulnerable workers—those with the least education, disproportionately people of color, and in the lowest-wage job categories—remain clear no matter how we slice the data.

B. Employment Patterns by States: Categorized by COVID-19 Caseload Patterns

Since the timing of COVID-19 caseloads varies greatly across states, it stands to reason that employment patterns could also vary across states. We therefore consider employment rates and permanent job loss shares (out of the population) across our three (population-weighted) categories of states: 1) those where caseloads peaked in the spring, mostly in April and May; 2) those where cases peaked in the summer months, between June and August; and 3) those peaking (or still climbing) in the fall.

Figure 4 shows the trend throughout 2020 in our broadest employment variable (the employment rate excluding workers absent for other reasons and those involuntarily employed part-time) for each of the three state groups. To facilitate comparison, we have normalized each state group to its own January 2020 level.

All groups share a basic pattern of dramatic declines in employment in March and especially April, followed by rapid recoveries in May and June that flattened somewhat in subsequent months. However, while employment rates dropped dramatically everywhere, they did so somewhat more in states with spring and summer peaks than those with fall peaks. Additionally, while employment rates rebounded quite sharply everywhere beginning in May, the recovery was slightly slower over the summer in states with spring caseload peaks. We find some convergence of employment rates across groups in late summer and fall, as employment growth flattened during the latter seasons more in states with later caseload peaks. Nonetheless, the states with the latest case peaks have on average the smallest reduction in employment rates by December (although this could still change over the winter).

Of course, it is not possible to determine exactly what caused the greater decline in employment in the states with earlier peaks or the convergence later, though in both cases it is likely linked to trends in COVID-19 cases. For instance, to what extent was the steeper decline in employment for the first two categories of states driven by the worse caseloads *per se* during those times, by stricter shutdowns (and later relaxations), or by customers themselves choosing to venture less frequently to shops or leisure and hospitality venues? Goolsbee and Syverson (2020), using cell phone mobility data, find evidence suggesting the latter channel was more important during the pandemic's initial months, but it is still an open question to what extent public messaging and actual shutdowns were more serious and longer-lasting in states with spring peaks (which tend to be Democratic leaning) than those with summer or fall peaks (which tend to lean Republican).

Since employment rebounded fairly rapidly in all three areas beginning in May, but from different troughs and with some convergence over time, we need to consider the variance in long-term employment damage, as represented by permanent job loss, across the three state categories. Figure 5 presents the trends over time in permanent job loss as a share of the total population, in each of the three categories of states and normalized (at 0) to each state group's January level.

The results show substantially more reported permanent job loss in states with spring caseload peaks than in those with summer or fall peaks. Interestingly, although these shares fell slightly at the end of the year for the summer and fall peak states, that for spring peak states has barely budged. Nonetheless, the rapid rise all three state groups experienced in late summer have largely persisted.

Finally, we measure trends in permanent job loss across a few key occupational and demographic breakdowns for the states with the earliest caseload peaks. In part A of Figure 6 we present these trends for the highest and lowest wage quartiles, while in part B we do so by race and ethnicity. In both cases, but especially for the lowest wage quartile and for Hispanics, permanent job loss rises substantially in the states where caseloads peaked earliest. And disparities in such job loss across wage quartiles and racial groups remain dramatic, even within the group of states with the earliest peaks.

C. Regression Analysis

In the second part of the paper, we adopt a more systematic approach and investigate labor market trends for different groups as a function of secular time trends, state policies to restrict (or relax) economic activity, and cumulative measures of COVID diagnoses and mortality.

We begin with estimation of equation (1), designed to measure what accounts for differences across racial groups in their employment responsiveness to the pandemic, before moving to a fuller consideration of how COVID-19 caseloads and state actions affect employment trajectories (equation 2).

In Table 2, we present results from linear probability model estimation of equation (1) on individuals. We present coefficients on monthly dummies from March through

December 2020, with January as the reference group. In these regressions, we include interactions of month dummies with indicators for being Black or Hispanic. We first run the equations without and then with interactions between time dummies and indicators for education and wage quartiles (with high school/some college degree and the second quartile as reference groups, respectively). Comparisons between the first and second specifications then indicate the extent to which education and wage quartile account for the relatively more negative employment trends we observe for Blacks and Hispanics in 2020.

The first six columns of Table 2 present estimates for the adjusted employment rate (excluding those absent from work for other reasons and those working part-time involuntarily, in consecutive pairs for the overall time trends, Blacks, and Hispanics. The overall time trends reflect the progression for non-Blacks and non-Hispanics, while the columns for Blacks and Hispanics represent the deviation from the overall trend. The first column of each pair omits the education and wage quartile time interaction controls, while the second column includes them. The next six columns are similar but have as the dependent variable an indicator for permanent job loss. (Appendix Table 3 presents results for total hours worked, including 0s.)

The results of Table 2 mostly recreate what we observed in the figures above, except that we can now see the extent to which education and occupational wage quartile account for the differential time patterns by race. The overall coefficient estimates, both without and with controls (columns 1 and 2), show dramatic employment declines in April and then initially strong but slowing recovery afterwards. The estimates in columns 3 and 5 show that Blacks and especially Hispanics suffered relatively greater employment declines in April and May. Although Hispanics were recovering more quickly than Blacks over the summer and into the fall, this pattern appears to have reversed by the end of the year. By December, Blacks were not statistically behind in employment rates—relative to their own January baseline—than the overall trend, but Hispanics had slipped further behind. Controlling for education and wage quartile dynamics (columns 4 and 6) reduces by roughly half the initially larger employment declines for Blacks and Hispanics, but these controls play a smaller role in later months. These patterns are remarkably similar (albeit reversed in sign) for the permanent job loss share in columns 7 through 12, down to the differentials in recovery between Blacks and Hispanics.

To summarize, most racial groups demonstrate at least partial recovery from initially large declines in employment, but as of December, while Blacks have converged with the overall population, Hispanics have not. The ongoing disadvantage for Hispanics (and the earlier disadvantages for both Blacks and Hispanics) is *not* mostly driven by differences in education or concentration in low-wage jobs. Commensurately, permanent job loss rises for all groups, but especially for Hispanics and Blacks.

Shifting to state-level regressions and the role of COVID cases, mortality, and state policies, we present summary statistics of these covariates (as well as for the dependent variables of the adjusted employment rate and permanent job loss share) in Table 3. There is substantial cross-state and within-state variation in these covariates—indeed, although it is not shown in the table, many states have non-monotonic trends in both case and mortality rates, as well as state restrictions (and in outcomes, as we have already seen).

In Table 4, we present estimates of equation (2), where the data are a panel of states over the months in 2020; we are interested how case rates, mortality rates, and an index of state restrictions affect the adjusted employment rate (columns 1 through 4) and the share of the population reporting permanent job loss (columns 5 through 8). For each of these outcomes, we present estimates for four versions of equation (2). In the first, we use the contemporaneous rates of new caseloads, deaths, and the restrictions index; in the second, we add one-month lags of all three covariates; in the third, we use both one-month and two-month lags to capture additional accumulation; and in the fourth, we replace the lags with total cumulative versions of the same variables.

The first column of Table 4 shows that the current mortality rate and economic restrictions index are negatively associated with the adjusted employment rate, although the current case rate has a *positive* association. The latter relationship may stem from the high correlation of case rates and mortality rates (r = 0.63) as well as short- term tradeoffs: heightened economic activity correlated with greater employment but also greater virus transmission.[18] To interpret magnitudes, we can consider changes of one standard deviation in each covariate (Table 3). For the new case rate, such an increase implies a rise in the adjusted employment rate of about 1.8 percentage points; for the mortality rate, it implies a decrease of about 1.1 percentage points; and for the restrictions index, it implies a decrease of approximately 1.6 percentage points. If all three were to increase by one standard deviation, the adjusted employment rate would be expected to drop by about 0.9 percentage points, or about 16 percent of the gap between February and October (Table 1A).

Column 2 adds one-month lags of each covariate. While the overall picture changes little, the combined coefficients on the mortality rate and its lag are larger than the contemporaneous coefficient in column 1, suggesting that mortality rates have an accumulating effect in depressing employment rates. In contrast, the lagged economic restrictions index is much smaller in magnitude than its contemporaneous coefficient and

[18] The estimate on contemporaneous case rates is weaker when entered as a single regressor, and, unlike contemporaneous mortality rates and restriction indices, statistically insignificant if the surge periods in November and December are excluded.

not statistically significant, suggesting that the impact of past restrictions is relatively short-lived. The specification in column 3 adds an additional lag for each covariate. These two-month lags are statistically significant (marginally for the restrictions) and of larger magnitude than the one-month lags, with the same sign as the contemporaneous effects. These patterns could imply longer-term accumulation of the impact of the public health indicators on employment rates, but they could also capture possible nonlinearities.[19]

Thus, we turn to the estimates in column 4, which replace the lags with cumulative measures. We find that cumulative mortality rates reduce employment rates independent of current mortality rates (and in magnitudes, by a similar margin), while cumulative case rates and economic restrictions have little effect. This suggests that mortality rates inhibit employment well into the future but that case rates and economic restrictions, while possibly having nonlinear contemporaneous impacts (especially with the surge near the end of 2020), are less likely to cause labor market hysteresis.

The second four columns of Table 4 repeat the analysis but with the permanent job loss share as the outcome. Because this measure has been slowly but steadily increasing over time, it is perhaps not surprising that contemporaneous measures of case rates, mortality rates, and economic restrictions—which both rise and fall over the sample period—are only weakly associated with it. However, the one- and two-month lagged mortality rates (columns 6 and 7), as well as the cumulative mortality rate (column 8) both strongly predict increases in the share of the population with permanent job loss, as they did with employment rates.

[19] For example, the acceleration of mortality (a quadratic term) could influence mortality rates in the next period but also plausibly affects business and worker decisions contemporaneously. Unfortunately, with such a short panel, we lack the statistical power to test these hypotheses.

Magnitudes are relatively large, as well. A one-standard deviation increase in the (lagged) mortality rate induces a decline in employment rates of between 1.6 and 2.2 percentage points. The same shock leads to an increase of between 0.09 and 0.14 percentage points in the permanent job loss share—up 13–21 percent from the mean of 0.67 percent. A one-standard deviation increase in the cumulative mortality rate as of December (which is right-skewed) implies a decrease of about 1.2 percentage points in the adjusted employment rate and an increase of about 0.18 percentage points in the permanent job loss share, or more than 25 percent of the mean. Evidently, the static tradeoffs between lives and jobs postulated by some early commentators (The Economist, 2020) have considerably more complicated dynamics.

IV. Conclusion and Policy Implications

In this paper, we have used CPS microdata, supplemented with COVID case and mortality data and state economic restrictions data, to analyze how employment trends through October 2020 reflect the recession induced by the COVID-19 pandemic. We have presented these trends in graphical and tabular forms, using several (somewhat novel) measures of employment outcomes. We have analyzed these trends in the aggregate and separately by demographic as well as occupation groups. We have also estimated distributed lag regressions to shed greater light on these processes and what drives them. Our major findings can be summarized as follows:

- While employment fell dramatically in the spring of 2020 and recovered substantially thereafter, this recovery stalled after October and even deteriorated a bit (especially for Hispanics and in arts/accommodations/food and other services);

- We observe rising unemployment durations and increasing shares of permanent job loss through the fall, indicating the pandemic's longer-term damage to workers;
- Workers in the lowest wage quartiles or education groups, those of color, and those working in lower-paying service occupations and industries have suffered the greatest longer-term losses in all measures of employment and, especially for Blacks, education and occupational differences mostly do not explain their relatively worse outcomes;
- While all states have endured substantial employment disruptions, states with earlier peak virus caseloads and deaths have had worse employment disruptions that have persisted; and
- While caseloads *per se* do not seem to have much impact on employment measures, contemporaneous economic restrictions and mortality rates do, and although the effects of the former fade once restrictions are eased, the effects of past mortality rates accumulate.

Of course, the reemergence of the virus in the fall and especially the winter will no doubt have lasting labor market implications as well. Employment levels will likely stagnate or deteriorate (as they did in November and December), and may decline further this winter; low-wage workers and those of color will likely bear the greatest brunt of any such developments, and permanent job loss (especially accounting for those who have left the labor force) will likely continue to grow. In addition, new patterns of employment gains and losses across states may emerge, depending on when and where mortality rates rise the most and the degree of new (or renewed) economic restrictions. On the other hand, the development and distribution of effective COVID-19 vaccines should lay the groundwork for more solid labor market recovery to begin in 2021, although if past experience from recessions is any guide, it may be a long haul.

In the meantime, we consider the implications of our findings for policy, which has the potential to shorten that long haul. We believe labor market recovery efforts should include the following:

- Ongoing relief and stimulus efforts while unemployment remains high, including fiscal relief to state and local governments;
- Efforts to spur more rapid employment growth through public spending on infrastructure, subsidized jobs, and perhaps marginal employment tax credits;
- Upgrading workforce development services at community colleges and American Job Centers to help the long-term unemployed and permanent job losers (as well as essential low-wage workers who are employed) retrain and find well-paying jobs;
- Wage supplements or wage insurance for those who either remain in low-wage essential jobs or now have to take them after permanently losing better-paying jobs; and
- Targeting all such efforts on the demographic groups and states hardest hit by the pandemic.

Our nation's infrastructure needs are great, and investing in repairing our infrastructure enjoys bipartisan support (though large disagreements remain about exactly how to finance it, even with negative real interest rates that should encourage borrowing). The workers hardest hit by the pandemic should be given special access to any jobs created, and training them for the appropriate construction skills should be a high priority. Construction apprenticeships might be a particularly useful vehicle for skill training while workers are employed (National Skills Coalition 2017), so as not to slow the recovery process.

Tax credits for marginal employment growth—in other words, growth above some expected baseline level—have sometimes been used in previous recessions, and with some effectiveness (Neumark and Grijalvo 2016). Targeting such tax credits to the states hardest hit also makes sense economically (T. Bartik et al., 2020), though the politics of such targeting can be challenging. Subsidized public or private sector jobs for disadvantaged workers with permanent job loss should be part of the policy mix, as well (Roder and Elliott, 2013).

Our nation's workforce development efforts must also be strengthened to help workers retrain for new work and/or find new jobs. Support for workforce training and services can take a number of forms. For instance, a major one-time injection of dollars into programs funded by the Workforce Innovation and Opportunity Act (WIOA) is certainly warranted and has been proposed.[20] New funding for individual training accounts for low-wage and/or unemployed workers has also been proposed, as has block grant funding for community colleges and other providers of workforce training.[21]

More ambitious ideas, like a "GI Bill" for essential low-wage workers, have been discussed as well, and even implemented to some extent in Michigan (Jesse 2020). And there have been proposals for wage supplements for low-wage "essential workers" (Nunn et al. 2020) as well as more traditional calls for wage insurance for those displaced from better-paying jobs than the new ones with which they are replaced (Wandner 2016).

Whichever path is chosen, it is important that those hardest hit by the pandemic and recession—including those displaced from low-wage jobs—get both training and workforce services to help them regain employment, ideally at higher wages than before. Unlike previous recessions or other periods of structural change, when somewhat more skilled or

[20] For instance, Rep. Bobby Scott (D-VA), chair of the House Committee on Education and Labor, has proposed an injection of $15B into the WIOA system through the Relaunching America's Workforce Act (RAWA).
[21] See the Markle Foundation's proposal (2020) for Opportunity Grants for disadvantaged and unemployed workers, as well as the Aspen Institute's Economic Strategy Group report (2020) calling for block grant funding to public higher education institutions, including community colleges.

higher-wage workers (in manufacturing and other industries) have been displaced, this time these workers are especially disadvantaged to begin with. Making the best training programs, as identified in rigorous evaluations, available to these groups at scale should be high on policymakers' agenda.[22]

[22] The strongest impacts on earnings to date for low-wage workers have been observed in "sector-based" training programs, like Per Scholas and Project Quest. See Roder and Elliott (2019) and Schaberg (2017). For a discussion of how to scale up such programs see Holzer (2021).

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Figure 1A: Aggregate Employment Trends in 2020: LFP, Epop, and Unemployment Share

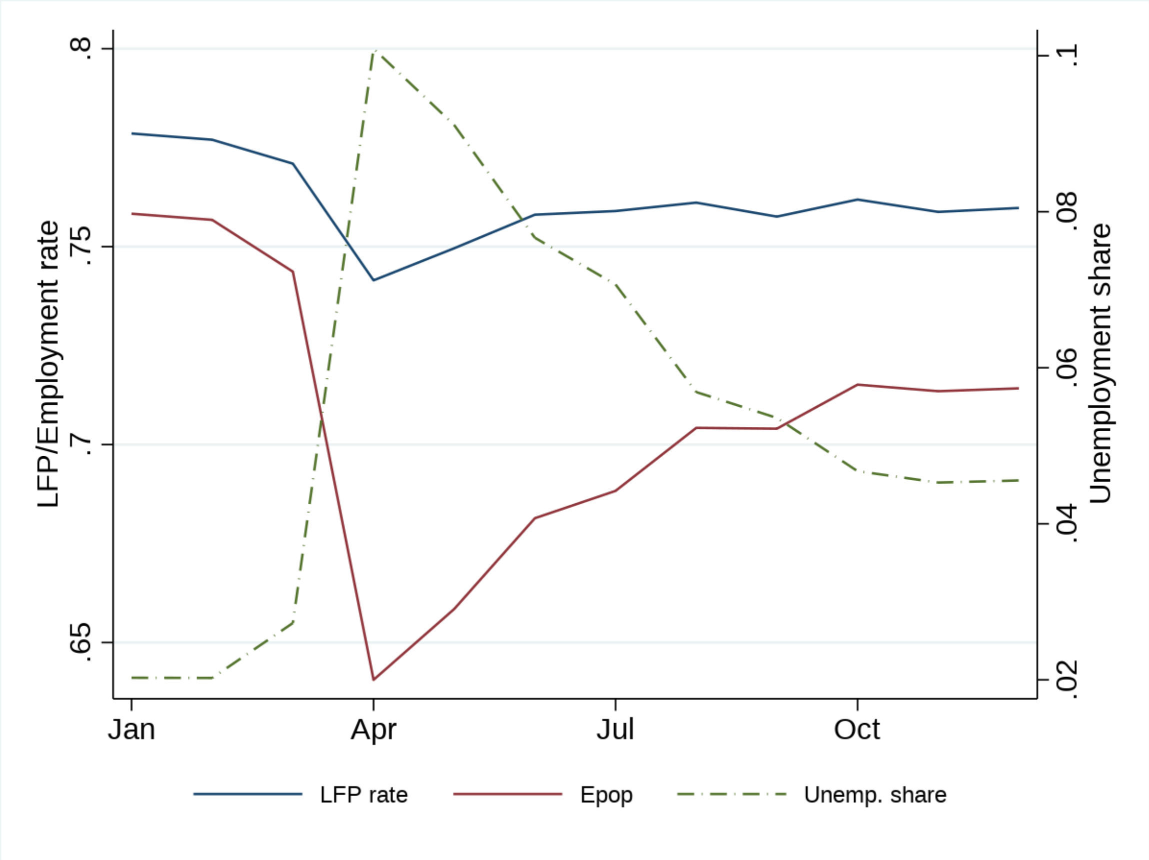


Figure 1B: Aggregate Employment Trends in 2020: Adjusted Epops and Total Weekly Hours

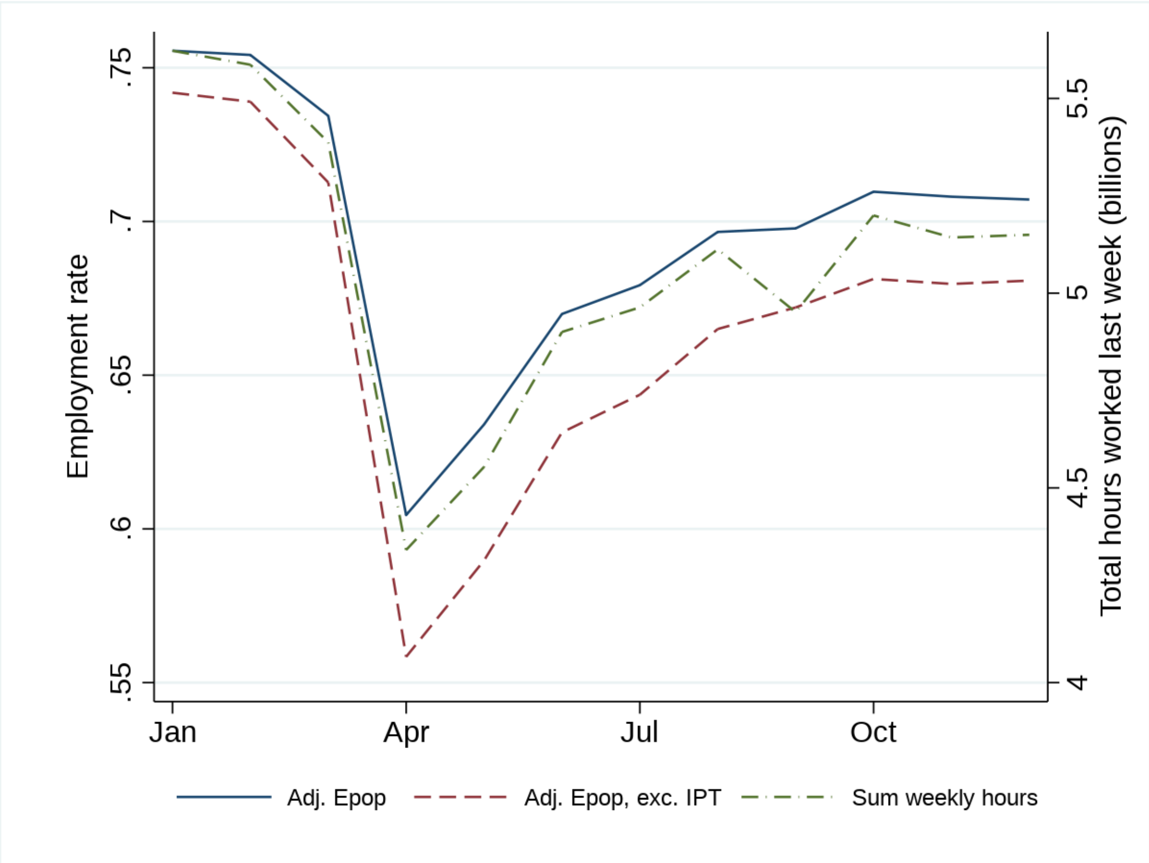


Figure 1C: Aggregate Employment Trends in 2020: Permanent job loser share/rate

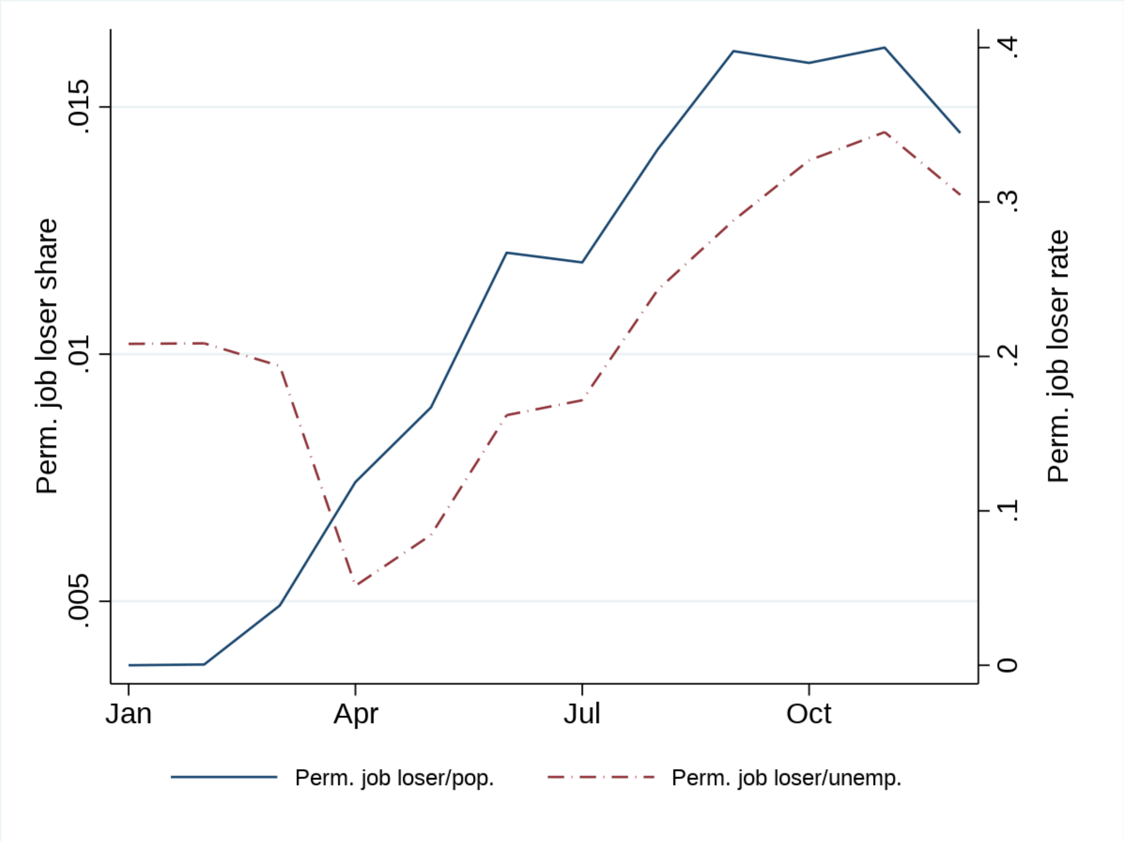
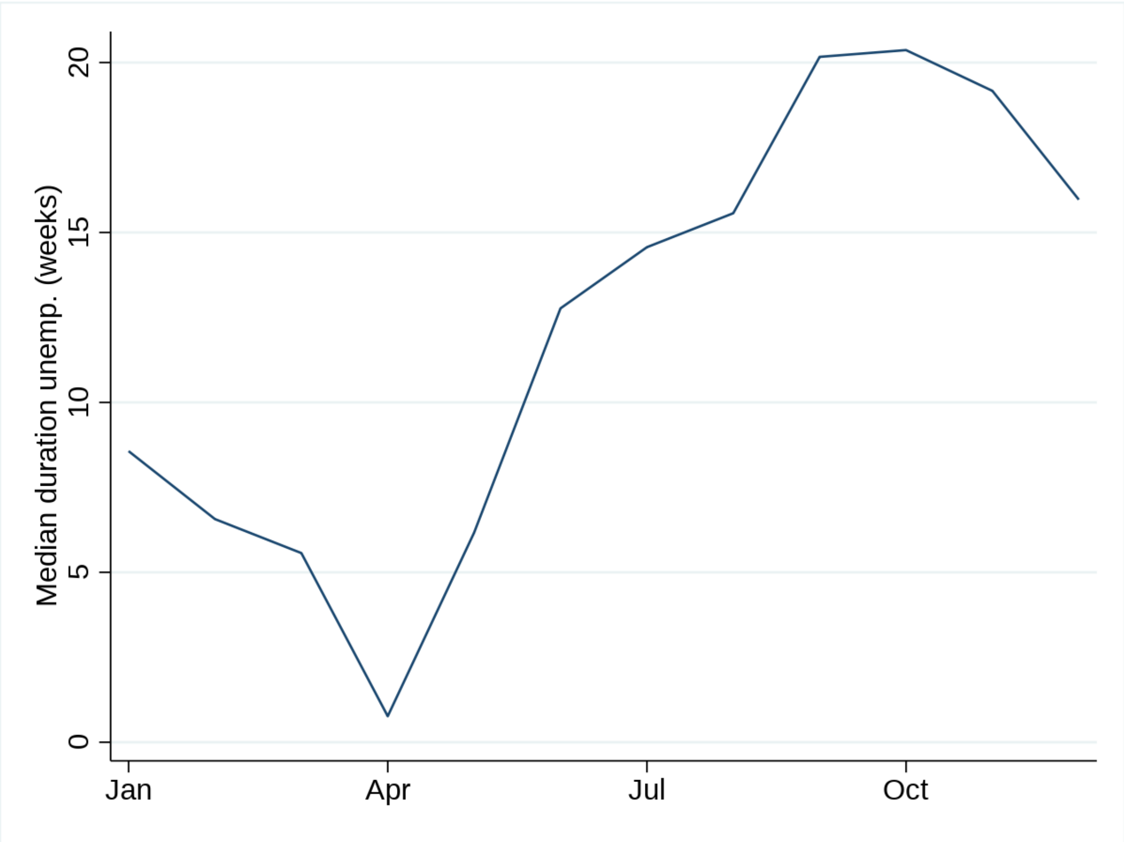


Figure 1D: Aggregate Employment Trends in 2020: Unemployment Duration



Note: See text for definitions. All series have been seasonally adjusted as described in the text.

Figure 2A: Adjusted Employment Rates by Occupational Wage Quartile

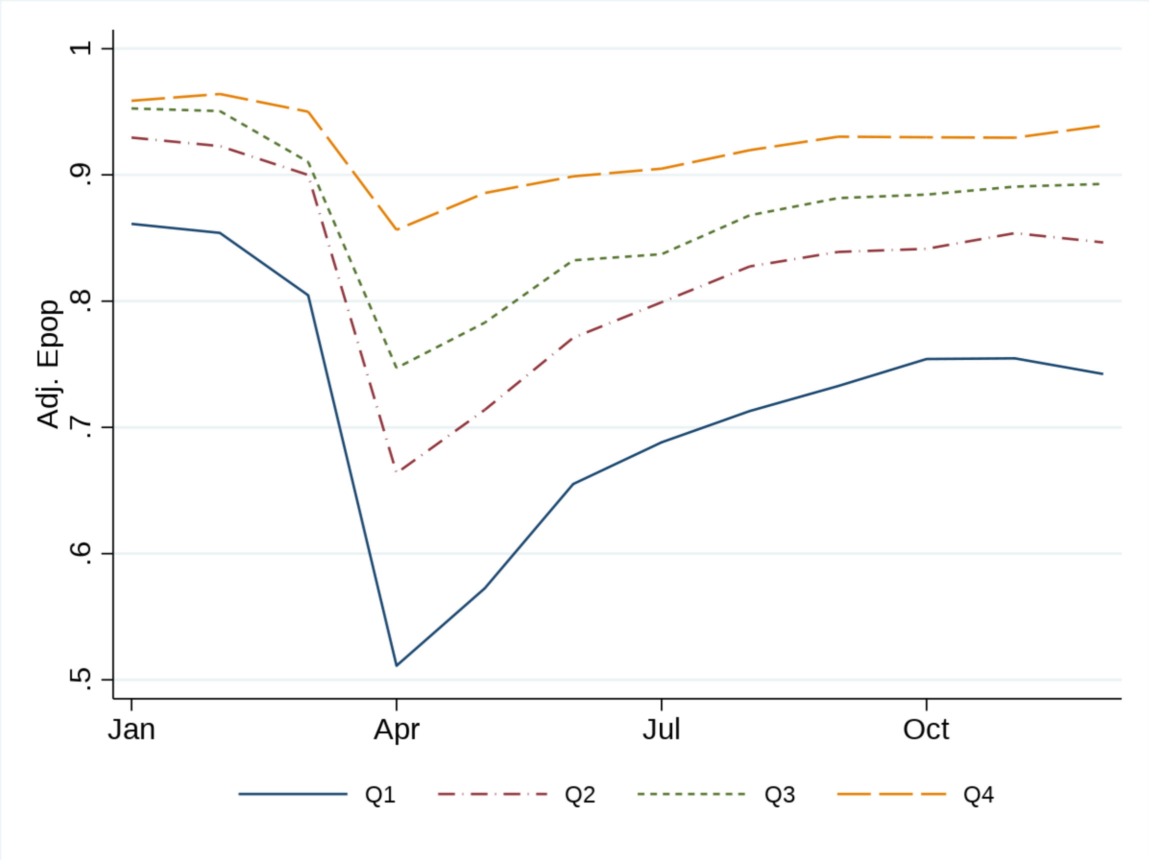


Figure 2B: Adjusted Employment Rates by Race/Ethnicity

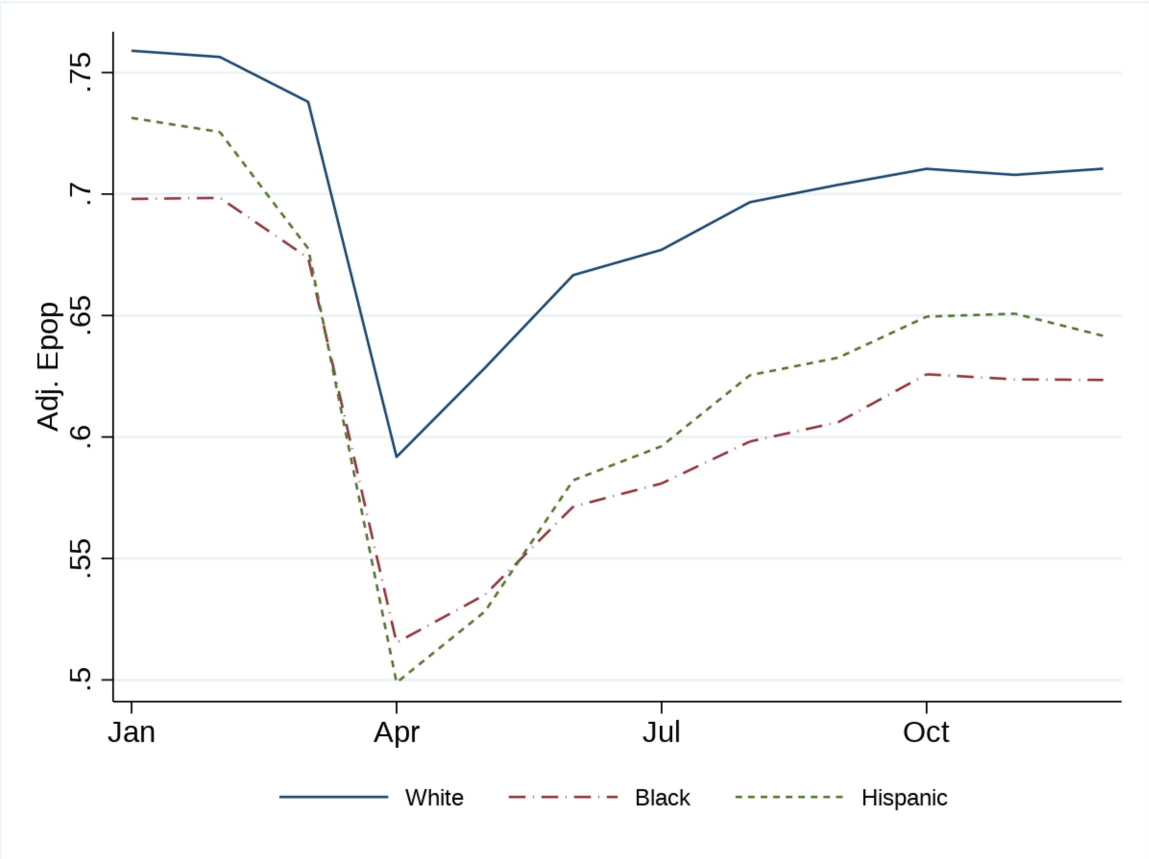


Figure 2C: Adjusted Employment Rates by Gender

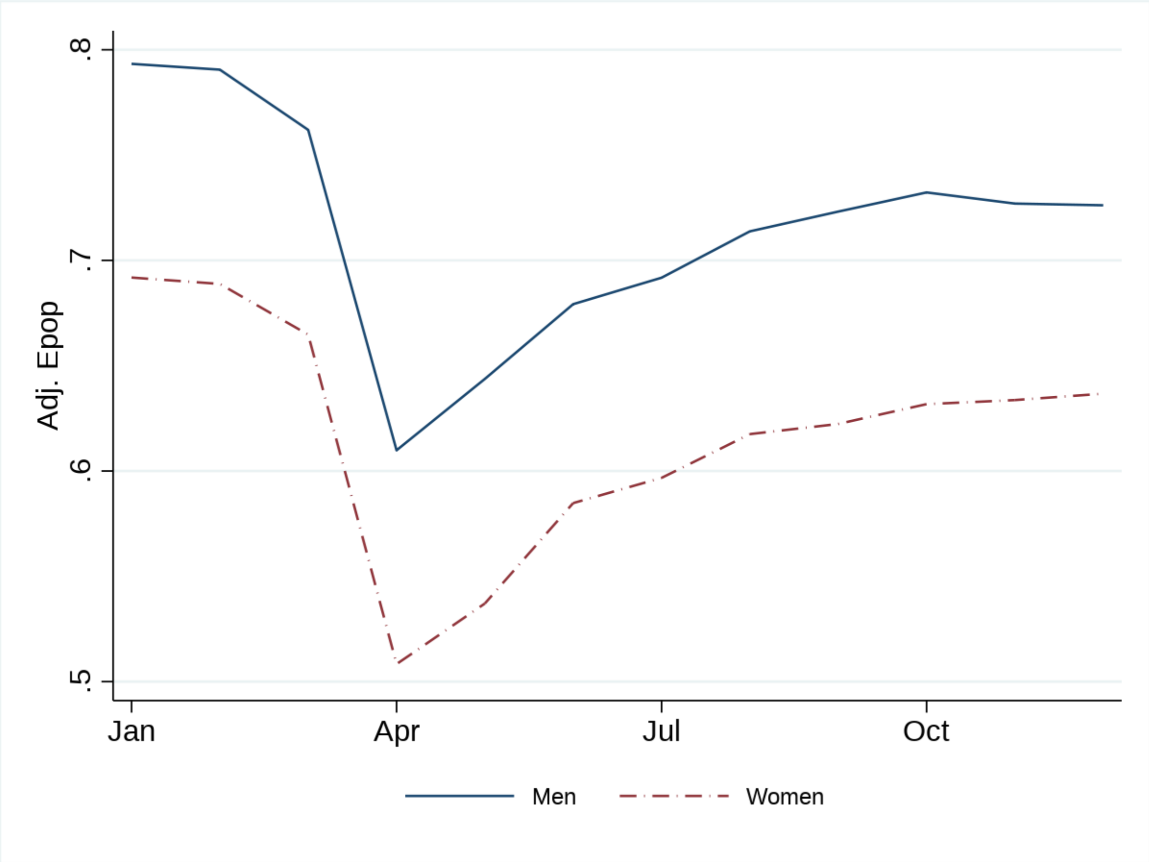


Figure 3A: Permanent Job Loser Share (of Population) by Occupational Wage Quartile

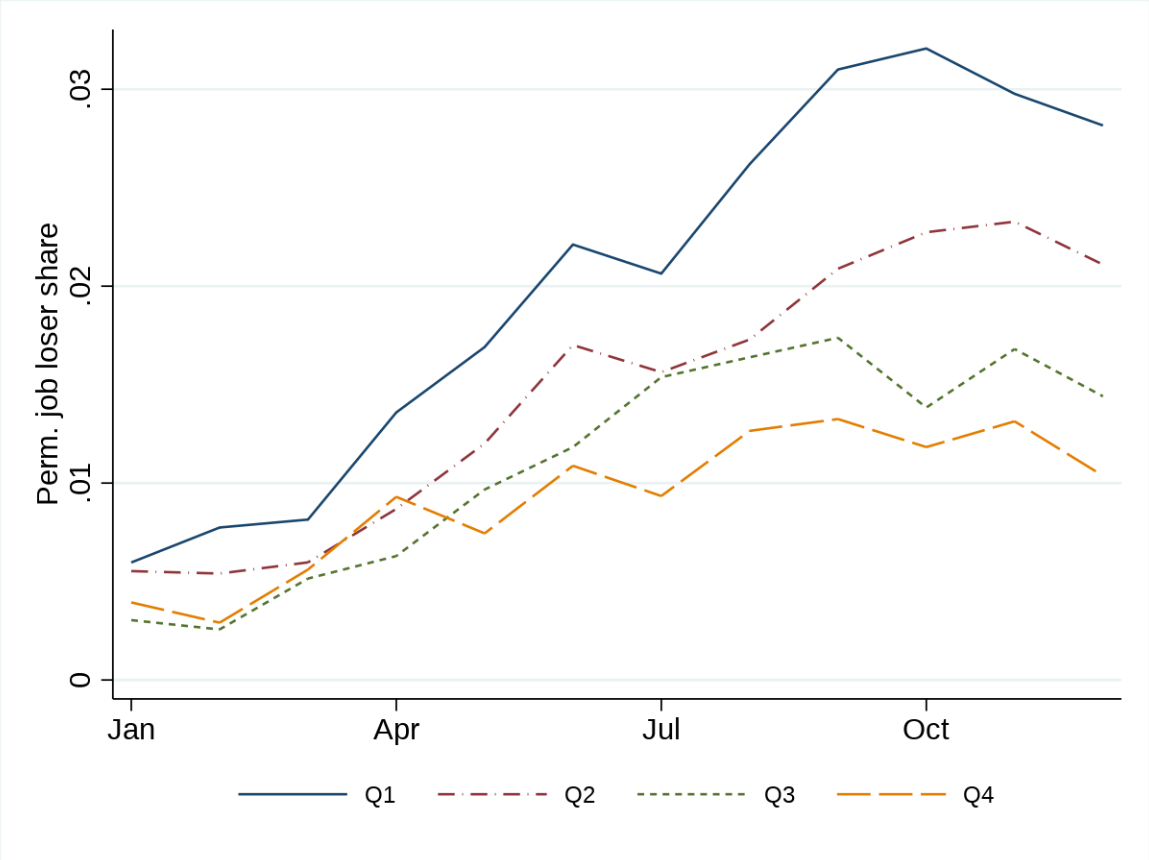


Figure 3B: Permanent Job Loser Share (of Population) by Race/Ethnicity

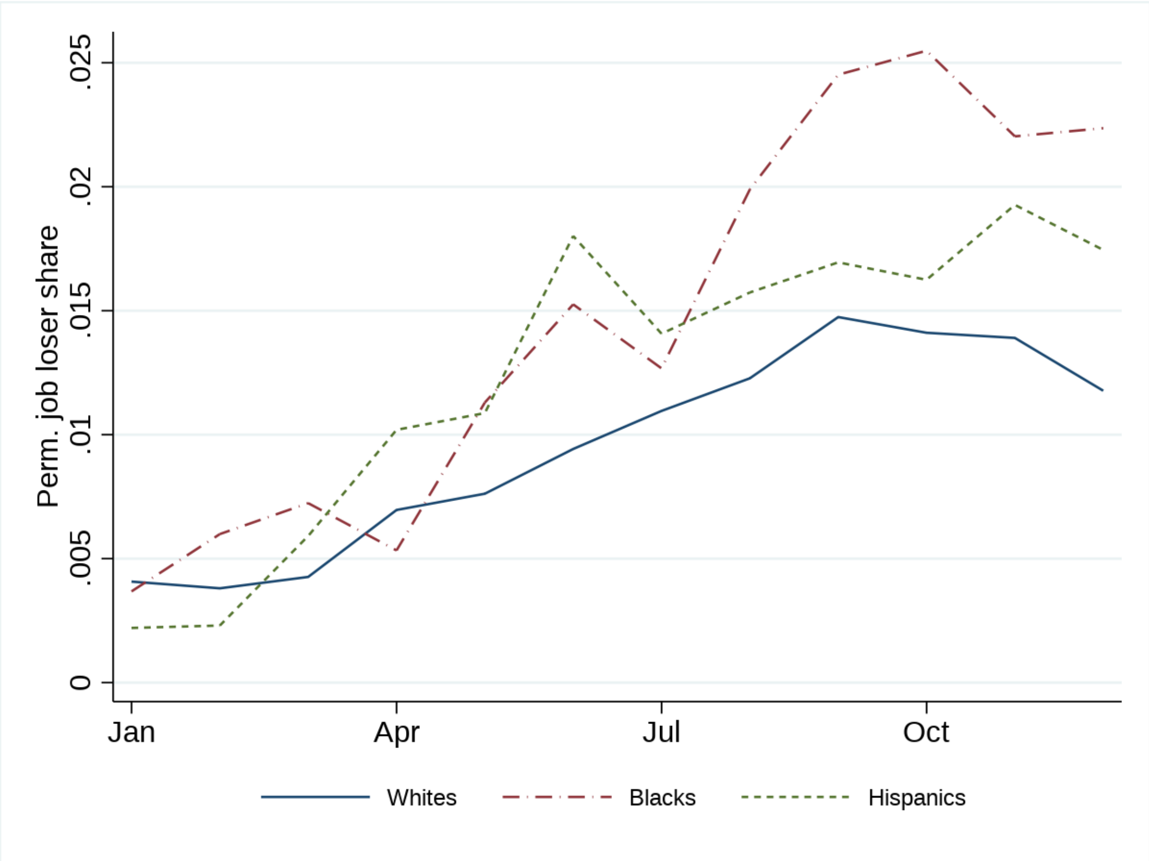


Figure 3C: Permanent Job Loser Share (of Population) by Gender

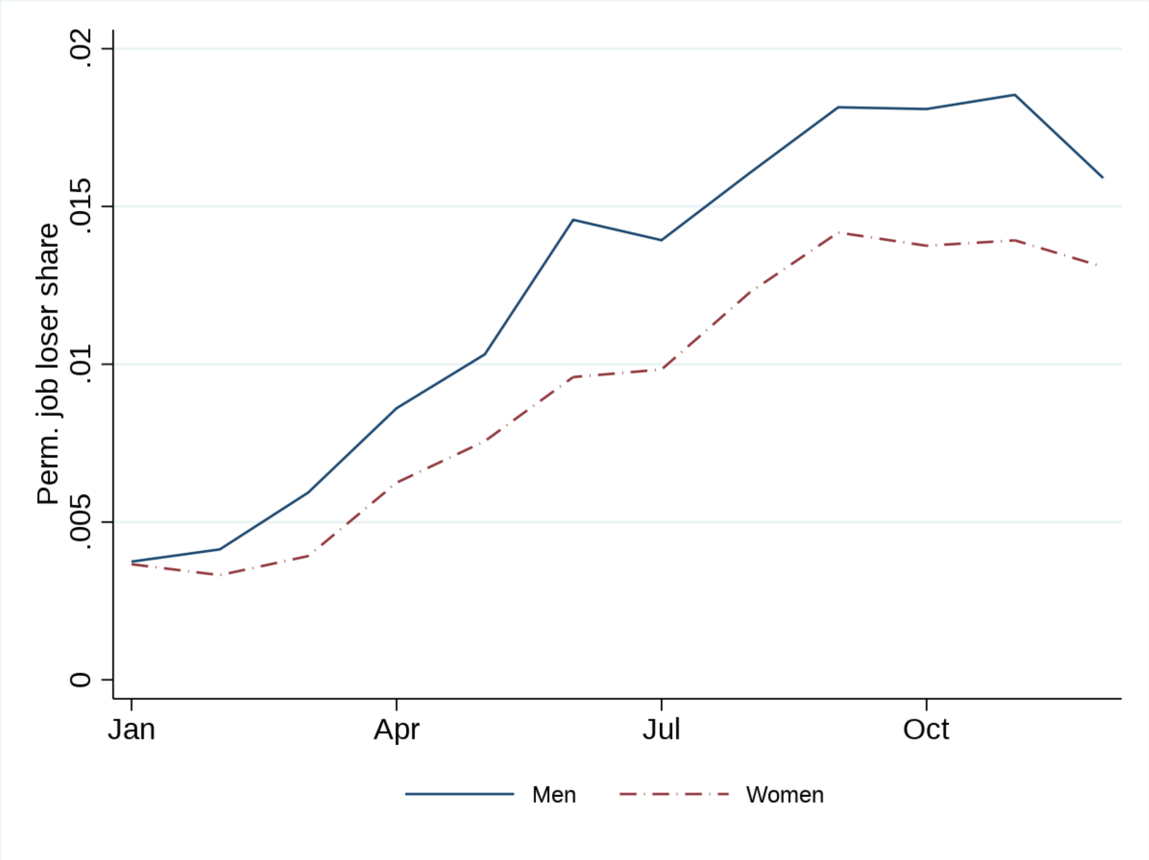


Figure 4: Adjusted Employment Rate, by State COVID Group (Normalized to Jan. 2020)

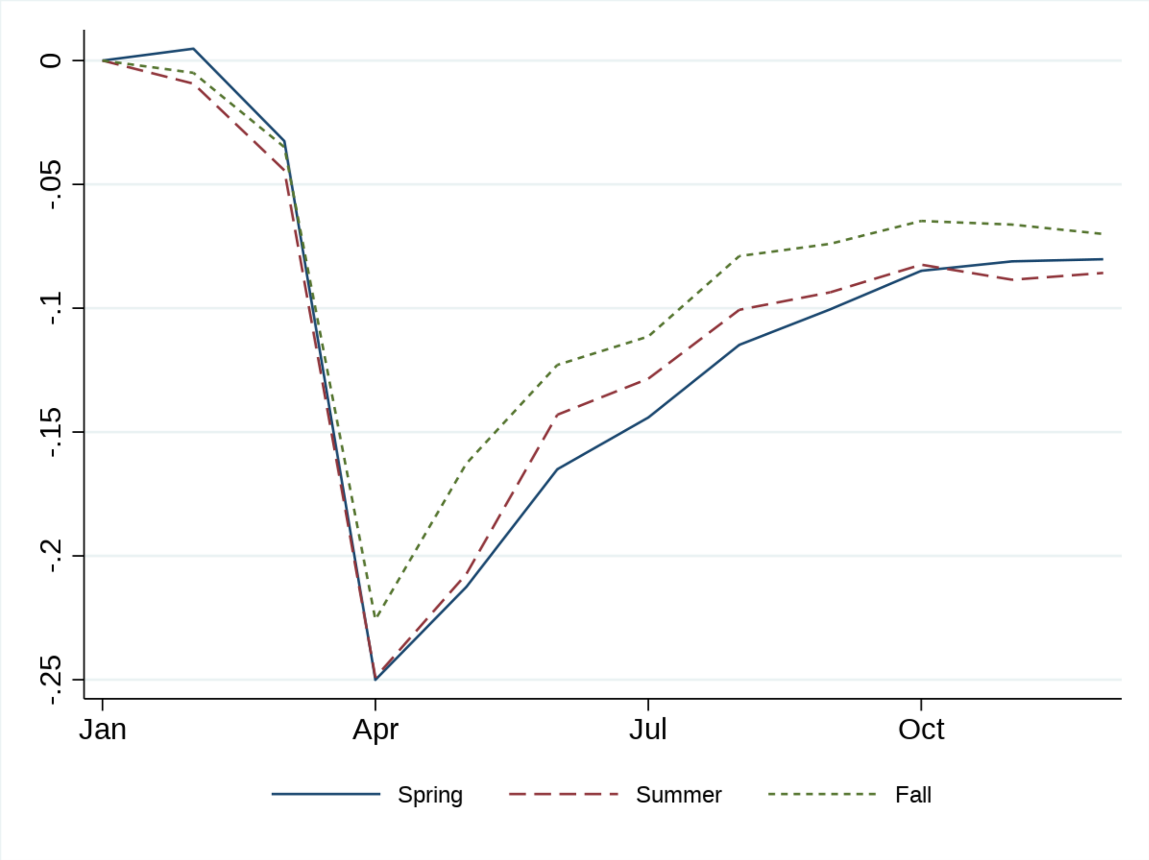


Figure 5: Permanent Job Loser Share (of Pop.), by State COVID Group (Normalized to Jan. 2020)

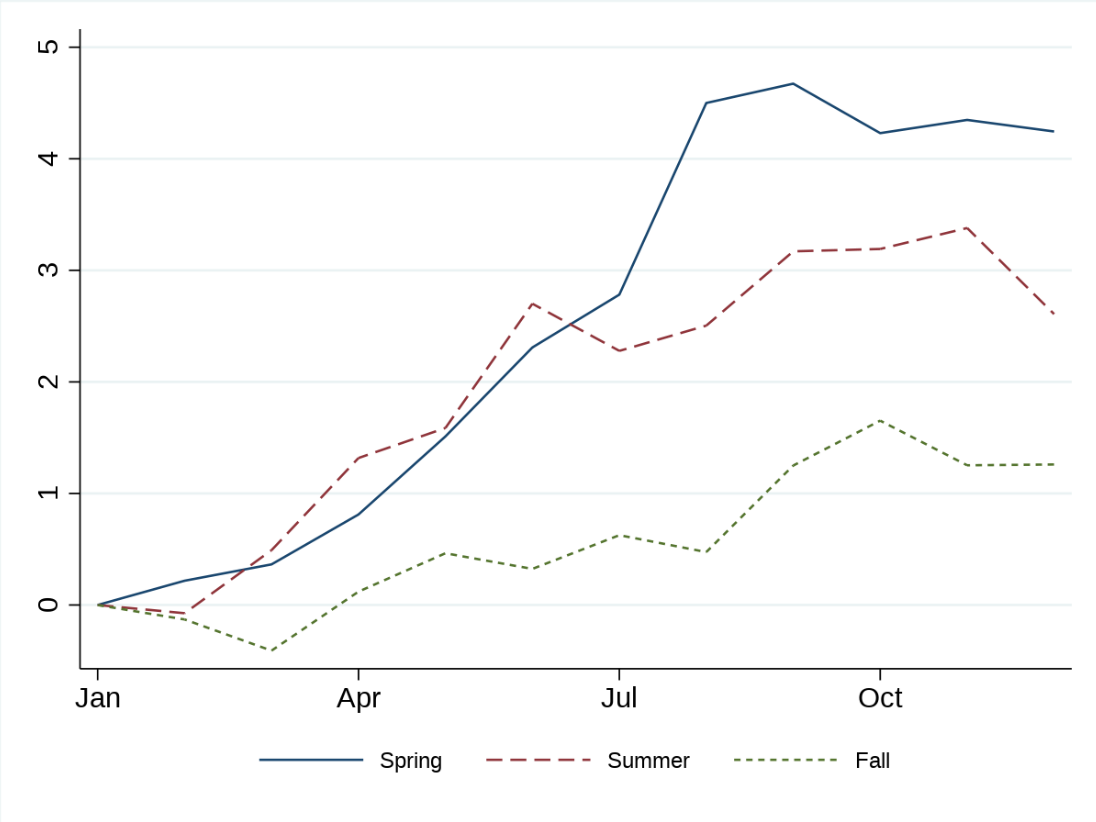


Figure 6A: Permanent Job Loser Share (of Pop.), by Occupational Wage Quartile, Spring Peak State (Normalized to Jan. 2020)

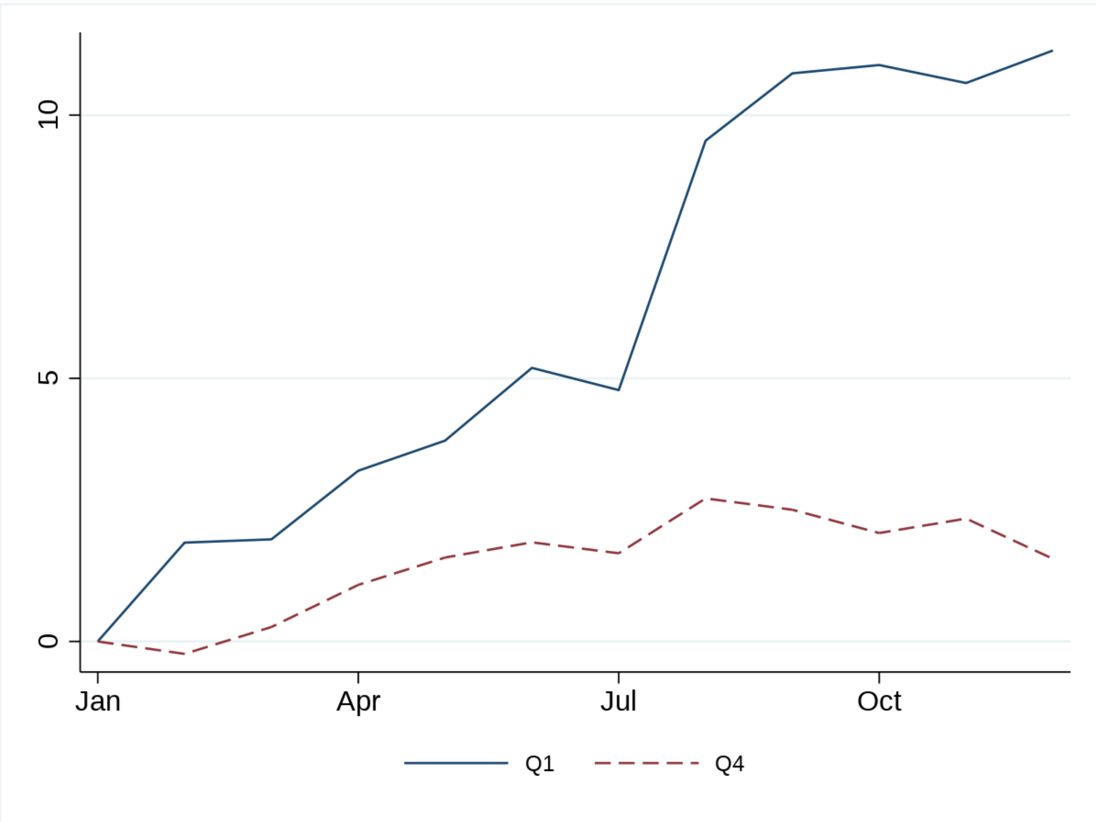


Figure 6B: Permanent Job Loser Share (of Pop.), by Race/Ethnicity, Spring Peak State (Normalized to Jan. 2020)

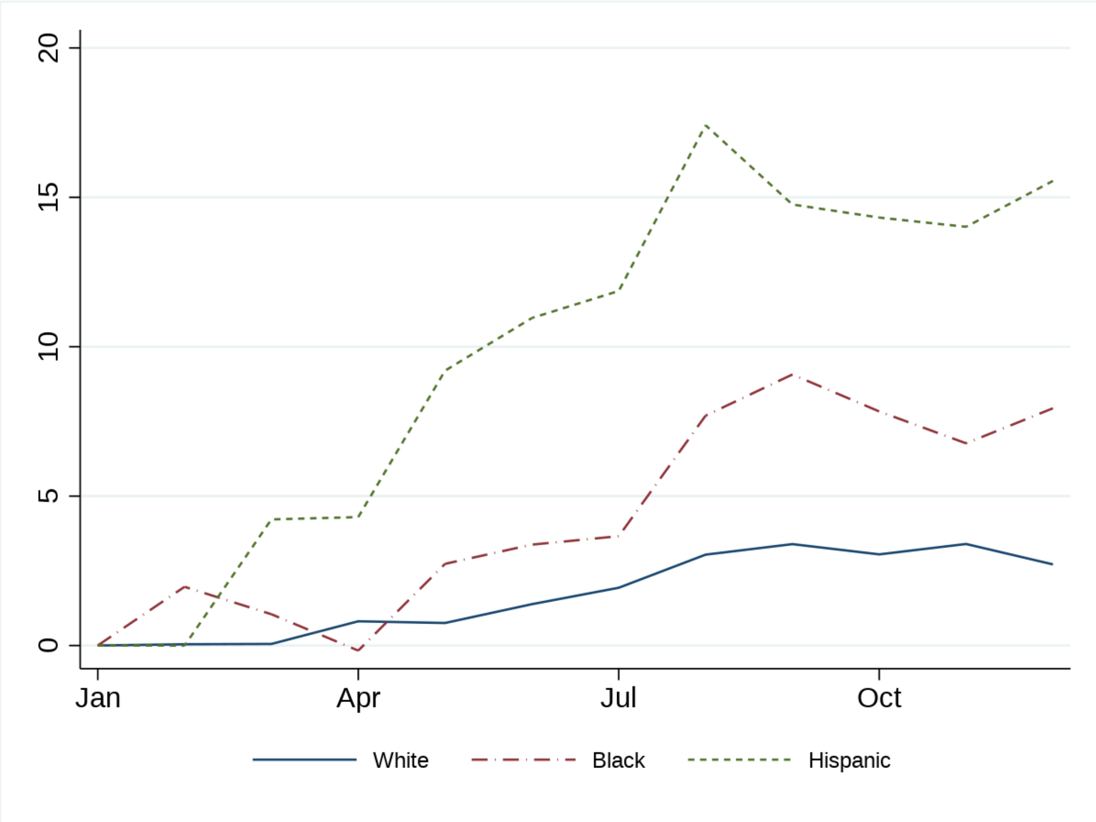


Table 1A: Adjusted employment rates by Select Months: Demographic groups

	Feb	April	June	Oct	Dec
All	73.9%	55.8%	63.1%	68.1%	68.1%
Whites	75.6%	59.2%	66.7%	71.0%	71.0%
Blacks	69.8%	51.5%	57.1%	62.6%	62.3%
Hispanics	72.6%	49.9%	58.2%	65.0%	64.2%
Men	79.1%	61.0%	67.9%	73.2%	72.6%
Women	68.9%	50.8%	58.5%	63.2%	63.7%
Age 18–24	59.5%	37.1%	43.8%	53.8%	53.7%
Age 25–44	80.5%	62.2%	69.6%	74.2%	74.4%
Age 45–64	71.8%	55.5%	62.9%	66.6%	66.3%
Less than high school	55.1%	36.3%	43.3%	50.1%	49.6%
High school/some college	68.7%	47.4%	56.2%	62.4%	61.9%
Associate degree	78.1%	59.7%	67.8%	72.0%	71.3%
Bachelor's degree	82.3%	67.0%	71.7%	76.5%	77.1%
Graduate degree	86.5%	75.0%	80.6%	83.4%	83.8%

NOTE: Estimates show the adjusted employment rate, net of involuntary part-time workers, for each group in February, April, June, October, and December 2020. The adjusted employment rate captures the share of people employed but excluding those absent from work for "other reasons"; we further net out workers who are working part-time for economic reasons, either on a "usual" basis or the week prior to the survey. We believe this measure of employment best captures pandemic-related disruptions. Estimates have been seasonally adjusted via calendar month dummy regression for each group over 2015–2019. The underlying sample is civilian adults age 18–64.

SOURCE: Authors' calculations from the monthly CPS.

Table 1B: Adjusted employment rates: Work groups

	Feb	April	June	Oct	Dec
All	73.9%	55.8%	63.1%	68.1%	68.1%
Managers & Professionals	95.3%	80.6%	86.8%	90.6%	91.7%
Service	88.6%	50.8%	65.2%	77.3%	75.5%
Sales & Administrative	90.7%	68.0%	76.5%	83.9%	84.5%
Agric., Construction, Installation, Maintenance, & Repair	93.2%	66.5%	78.5%	83.3%	83.4%
Production	90.0%	65.1%	78.0%	83.1%	82.8%
Agriculture & Mining	88.0%	80.7%	85.2%	83.5%	85.7%
Construction	93.7%	66.2%	79.4%	84.6%	83.5%
Manufacturing	93.1%	76.2%	84.7%	89.2%	91.5%
Trade	90.4%	66.0%	76.3%	83.3%	84.2%
Transportation & Utilities	92.0%	71.5%	77.7%	82.2%	82.1%
Information	93.8%	75.8%	81.7%	85.4%	83.6%
Finance, Insurance, & Real Estate	97.5%	84.2%	89.5%	93.1%	92.3%
Professional Services	92.3%	77.2%	84.1%	87.2%	87.9%
Education & Healthcare	93.9%	73.2%	83.8%	89.4%	89.8%
Arts, Accommodation, & Food	85.7%	38.3%	51.8%	68.3%	66.4%
Other Services	92.1%	52.0%	66.9%	79.6%	77.3%
Public Administration	96.0%	86.4%	90.9%	92.3%	94.4%
Hourly wage quartile 1	85.4%	51.2%	65.5%	75.4%	74.2%
Hourly wage quartile 2	92.3%	66.3%	77.1%	84.2%	84.6%
Hourly wage quartile 3	95.0%	74.7%	83.2%	88.4%	89.3%
Hourly wage quartile 4	96.4%	85.6%	89.9%	93.0%	93.9%
Teleworkable	94.2%	78.2%	84.9%	89.0%	89.6%
Non-teleworkable	91.0%	63.4%	74.9%	82.7%	82.7%

NOTE: See note to Table 1A. Wage quartiles are based on hourly occupational wages from Occupational Employment Statistics (2019) and are employment-weighted. “Teleworkable” occupations are as in Dingel and Neiman (2020). Note that occupation and industry are asked of the currently employed and those who reported working within the past 12 months (only for outgoing rotation groups for those out of the labor force), but in practice, relatively few individuals not in the labor force have a valid response for these questions, lower than transitions rates would imply should be eligible. Consequently, these numbers are likely biased upward from the truth.

SOURCE: Authors’ calculations from the monthly CPS.

Table 2: 2020 Time Path of Select Employment Indicators, by Race/Ethnicity, Relative to January 2020

	Adjusted Employment Rate						*Permanent Job Loser Share of Population*					
	Overall		Diff: Blacks		Diff: Hispanics		Overall		Diff: Blacks		Diff: Hispanics	
March	-0.0212***	-0.0131***	-0.0087	-0.0048	-0.0277***	-0.0230***	0.0003	-0.0008	0.0011	0.0012	0.0036**	0.0040**
	(0.0019)	(0.0042)	(0.0070)	(0.0068)	(0.0058)	(0.0059)	(0.0006)	(0.0015)	(0.0026)	(0.0026)	(0.0018)	(0.0019)
April	-0.1620***	-0.2023***	-0.0247***	0.0039	-0.0661***	-0.0261***	0.0030***	0.0005	-0.0038	-0.0039	0.0048**	0.0046**
	(0.0026)	(0.0057)	(0.0089)	(0.0087)	(0.0074)	(0.0075)	(0.0007)	(0.0016)	(0.0026)	(0.0026)	(0.0020)	(0.0021)
May	-0.1284***	-0.1539***	-0.0340***	-0.0114	-0.0692***	-0.0445***	0.0044***	0.0022	0.0004	0.0000	0.0050**	0.0052**
	(0.0025)	(0.0055)	(0.0088)	(0.0086)	(0.0074)	(0.0075)	(0.0007)	(0.0017)	(0.0029)	(0.0029)	(0.0021)	(0.0022)
June	-0.0937***	-0.1035***	-0.0275***	-0.0129	-0.0506***	-0.0369***	0.0061***	0.0051***	0.0011	0.0006	0.0112***	0.0119***
	(0.0024)	(0.0053)	(0.0086)	(0.0084)	(0.0071)	(0.0073)	(0.0008)	(0.0018)	(0.0030)	(0.0030)	(0.0024)	(0.0025)
July	-0.0806***	-0.0783***	-0.0333***	-0.0256***	-0.0444***	-0.0372***	0.0065***	0.0047***	-0.0001	-0.0009	0.0082***	0.0075***
	(0.0023)	(0.0051)	(0.0084)	(0.0083)	(0.0069)	(0.0071)	(0.0008)	(0.0018)	(0.0030)	(0.0030)	(0.0023)	(0.0025)
Aug.	-0.0598***	-0.0573***	-0.0283***	-0.0223***	-0.0325***	-0.0277***	0.0087***	0.0088***	0.0060*	0.0049	0.0065***	0.0057**
	(0.0022)	(0.0048)	(0.0079)	(0.0077)	(0.0065)	(0.0067)	(0.0008)	(0.0018)	(0.0033)	(0.0033)	(0.0023)	(0.0025)
Sept.	-0.0477***	-0.0464***	-0.0326***	-0.0241***	-0.0231***	-0.0176***	0.0104***	0.0099***	0.0107***	0.0088***	0.0058***	0.0040*
	(0.0020)	(0.0044)	(0.0073)	(0.0072)	(0.0059)	(0.0061)	(0.0008)	(0.0018)	(0.0033)	(0.0033)	(0.0022)	(0.0024)
Oct.	-0.0440***	-0.0434***	-0.0298***	-0.0223***	-0.0197***	-0.0162***	0.0102***	0.0103***	0.0128***	0.0102***	0.0053**	0.0031
	(0.0020)	(0.0043)	(0.0071)	(0.0070)	(0.0057)	(0.0058)	(0.0008)	(0.0018)	(0.0033)	(0.0033)	(0.0021)	(0.0023)
Nov.	-0.0421***	-0.0367***	-0.0203***	-0.0132*	-0.0192***	-0.0154***	0.0102***	0.0114***	0.0104***	0.0085***	0.0097***	0.0080***
	(0.0020)	(0.0043)	(0.0071)	(0.0070)	(0.0058)	(0.0059)	(0.0008)	(0.0019)	(0.0032)	(0.0032)	(0.0023)	(0.0024)
Dec.	-0.0400***	-0.0400***	-0.0114	-0.0047	-0.0322***	-0.0259***	0.0082***	0.0096***	0.0079**	0.0063**	0.0099***	0.0086***
	(0.0020)	(0.0044)	(0.0071)	(0.0070)	(0.0060)	(0.0061)	(0.0008)	(0.0018)	(0.0031)	(0.0031)	(0.0023)	(0.0025)
Mean: Jan 2020	0.934	0.934	0.894	0.894	0.897	0.897	0.0079	0.0079	0.0145	0.0145	0.0078	0.0078
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

NOTE: The adjusted employment rate is the share of the population, age 18–64, employed, excluding those absent from work for “other” reasons, as well as those employed part-time involuntarily, either on a usual basis or just in the reference week of the survey. The permanent job loser share of the population is the fraction of the 18–64 year-old population that report being unemployed as a result of permanent job loss. Estimates for “Overall” reflect changes relative to January 2020 for racial groups except Blacks and Hispanics; estimates for Blacks and

Hispanics reflect the differential *relative* to the "Overall group. Estimates in columns {1,3,5}, {2,4,6}, {7,9,11}, and {8,10,12} come from four regressions, respectively. Controls include level and monthly interactions of four wage quartiles (based on occupation) and five education categories. Regressions are unweighted, but regressions using sample weights are qualitatively similar and available upon request. Data are first seasonally adjusted via regression adjustment (using data from 2015 to date), but estimates are shown are based on 2020 data only (n = 567,951). Standard errors robust to heteroskedasticity in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
SOURCE: Authors' calculations from the Current Population Survey.

Table 3: Summary Statistics of State-Month Data

	Mean	**Std Dev.**	**P25**	**P75**
Adjusted Emp. Rate	0.656	0.065	0.615	0.698
Adj. Emp. Rate (normed)	−0.063	0.054	−0.091	−0.024
Permanent Unemp. Share	0.012	0.006	0.008	0.016
Perm. Unemp. Share (normed)	0.006	0.006	0.001	0.010
Ln Total Hours	17.88	1.01	17.06	18.55
Ln Total Hours (normed)	−0.086	0.088	−0.132	−0.028
New Case Rate	18.15	22.39	3.84	22.63
New Death Rate	0.293	0.383	0.070	0.364
Restrictions Index	0.450	0.252	0.313	0.625

NOTE: There are 510 observations across 51 states (including DC) and eight months (March through December). Normed values are differenced relative to the January level of the same state. Case and death rates are per 100,000 people. Restriction index ranges from 0 to 1. See text for precise definitions.

SOURCES: Chetty et al. (2020), Fullman et al. (2020), authors' calculations from the monthly CPS.

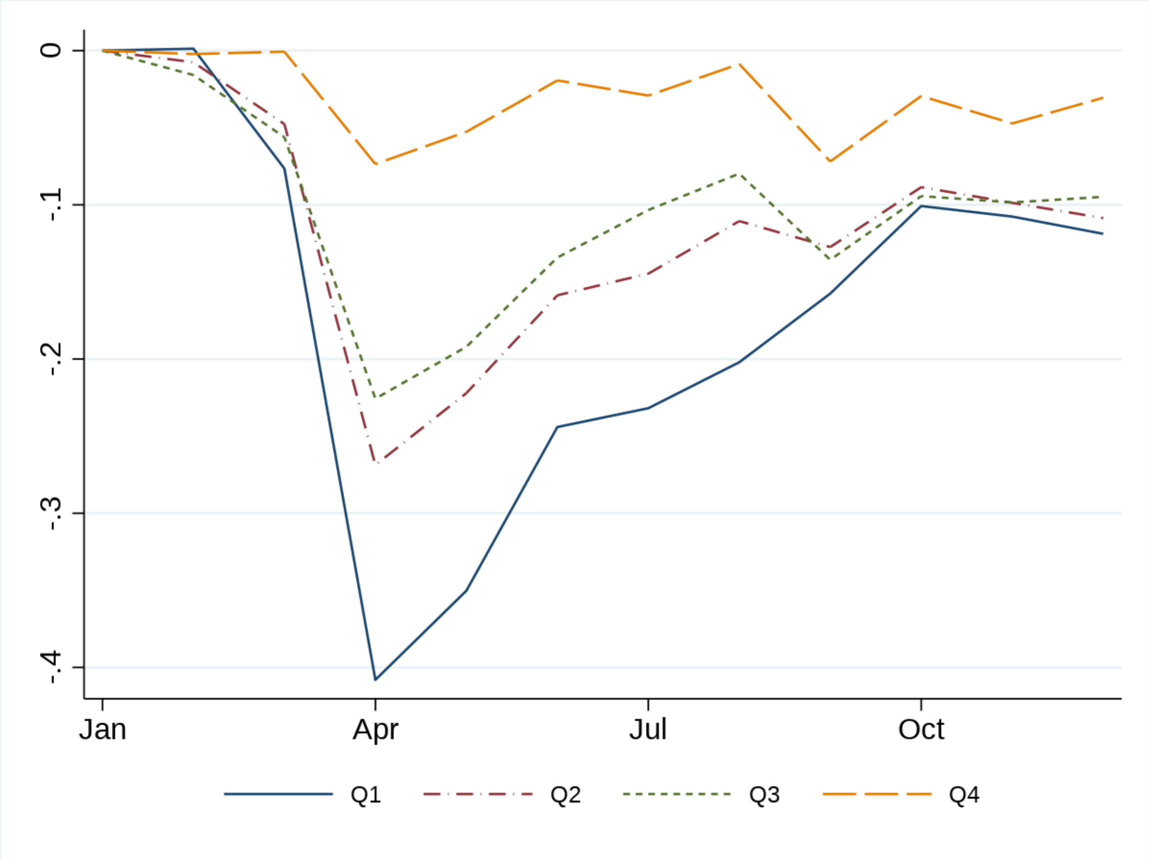
Table 4: State-Level Employment Indicators and COVID Case Rates, Death Rates, and Economic Restrictions

	Adjusted Employment Rate				*Permanent Job Loser Share of Population*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
New case rate	0.0008***	0.0004***	0.0004***	0.0003**	−0.0000	−0.0000	−0.0000	−0.0000
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
New case rate, *t-1*		0.0007***	0.0004***			−0.0001**	−0.0000	
		(0.0001)	(0.0001)			(0.0001)	(0.0000)	
New case rate, *t-2*			0.0007**				−0.0001	
			(0.0004)				(0.0000)	
New death rate	−0.0280***	−0.0222***	−0.0226***	−0.0184***	0.0010*	0.0004	0.0004	−0.0006
	(0.0057)	(0.0049)	(0.0048)	(0.0049)	(0.0006)	(0.0005)	(0.0005)	(0.0006)
New death rate, *t-1*		−0.0204***	−0.0128***			0.0019**	0.0013	
		(0.0043)	(0.0034)			(0.0007)	(0.0008)	
New death rate, *t-2*			−0.0228***				0.0020**	
			(0.0049)				(0.0008)	
Restriction index	−0.0625***	−0.0493***	−0.0473***	−0.0464***	0.0051**	0.0029	0.0019	0.0024
	(0.0160)	(0.0139)	(0.0145)	(0.0222)	(0.0023)	(0.0019)	(0.0017)	(0.0025)
Restriction index, *t-1*		−0.0115	0.0022			0.0026	−0.0004	
		(0.0131)	(0.0091)			(0.0022)	(0.0018)	
Restriction index, *t-2*			−0.0149				0.0049*	
			(0.0116)				(0.0026)	
Cum case rate				0.0000				−0.0000
				(0.0000)				(0.0000)
Cum death rate				−0.0003***				0.00005***
				(0.0001)				(0.00001)
Cum restriction index				−0.0004				0.0003
				(0.0062)				(0.0010)
Mean: Jan 2020	0.719	0.719	0.719	0.719	0.0067	0.0067	0.0067	0.0067
R^2	0.6645	0.6774	0.6833	0.69030	0.3313	0.3397	0.3485	0.3896

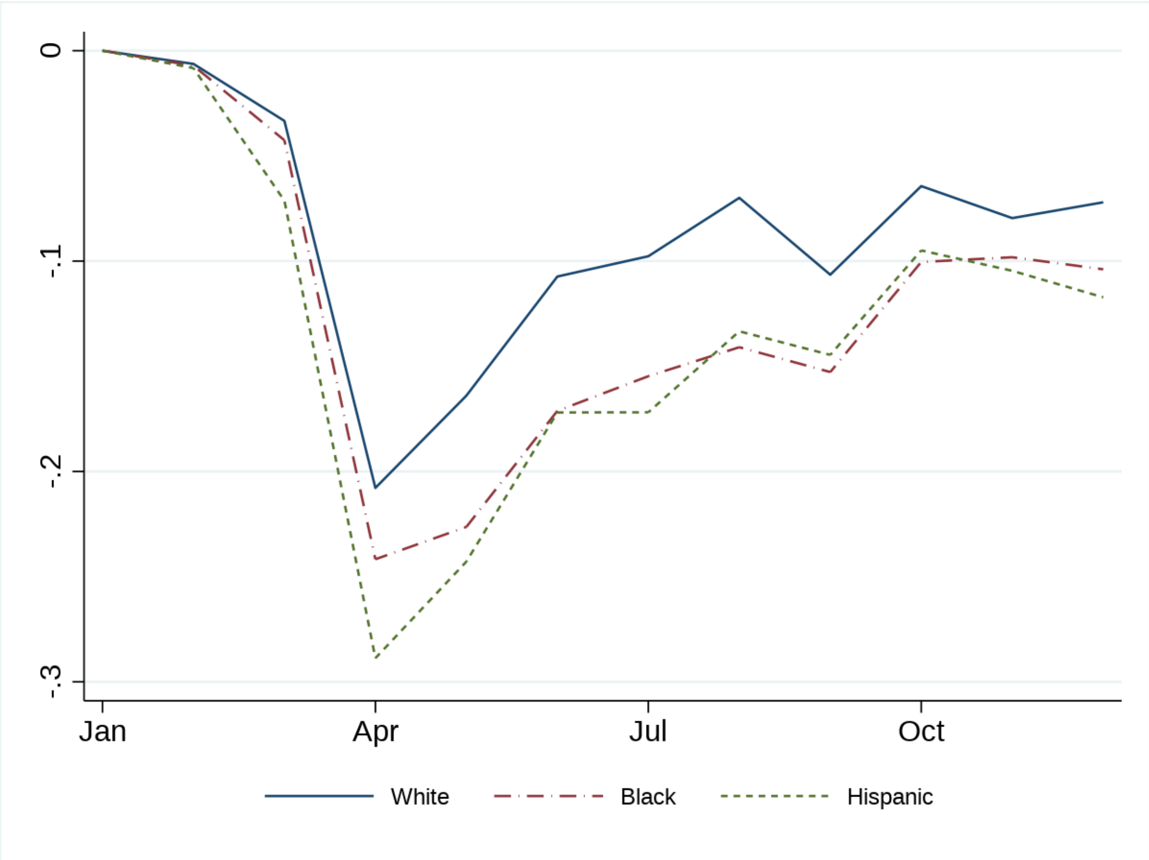
NOTE: The adjusted employment rate is the share of the population, age 18–64, employed, excluding those absent from work for "other" reasons, as well as those employed part-time involuntarily, either on a usual basis or just in the reference week of the survey. The permanent job loser share of the population is the fraction of the 18–64 year-old population that report being unemployed as a result of permanent job loss. Each column is from a separate regression of state-level outcomes ranging from March through December 2020, for n = 510 observations in specifications without leads and 459 observations for specifications with leads. See text for precise definitions of covariates. Regressions are weighted by the number of individual observations contributing to each state-month cell; standard errors robust to heteroskedasticity and clustered on state in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

SOURCE: Chetty et al. (2020), Fullman et al. (2020), and authors' calculations from the Current Population Survey.

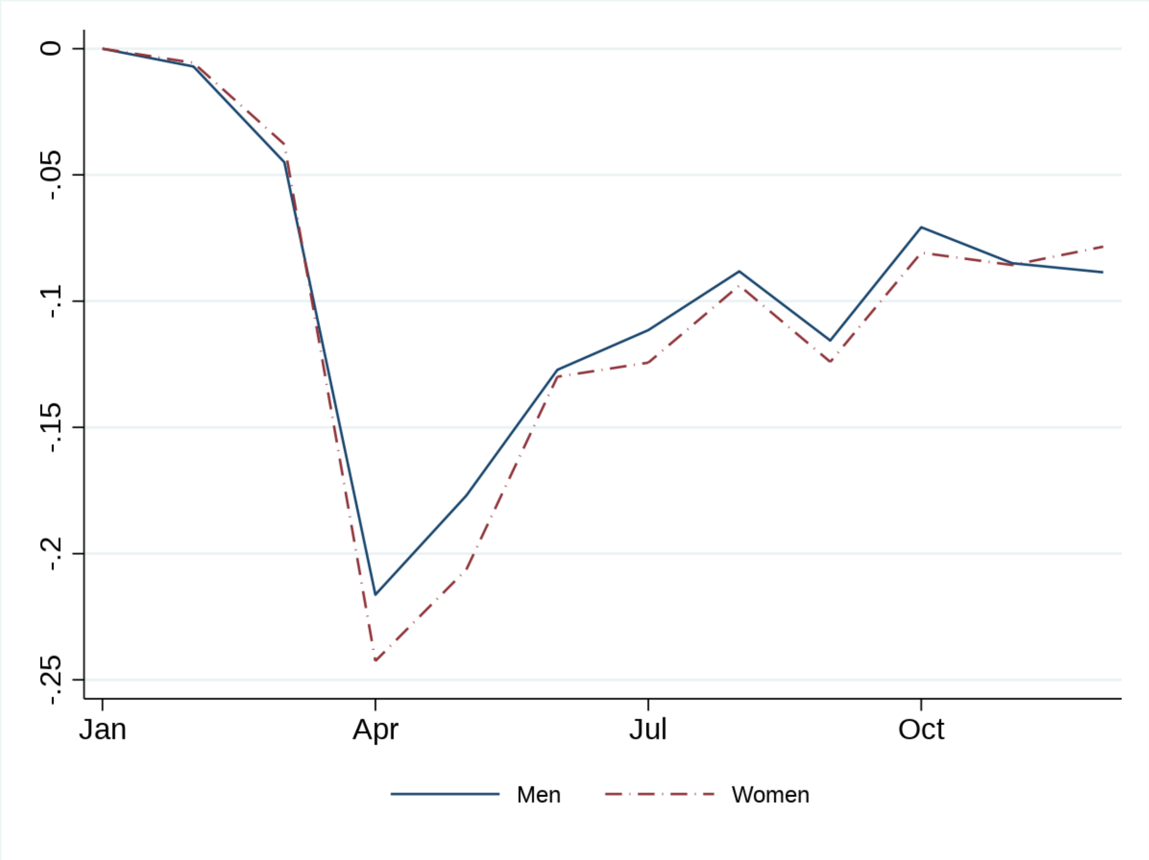
Appendix Figure 1A: Total Weekly Hours, by Occup. Wage Quartile (Norm. to Jan. 2020)



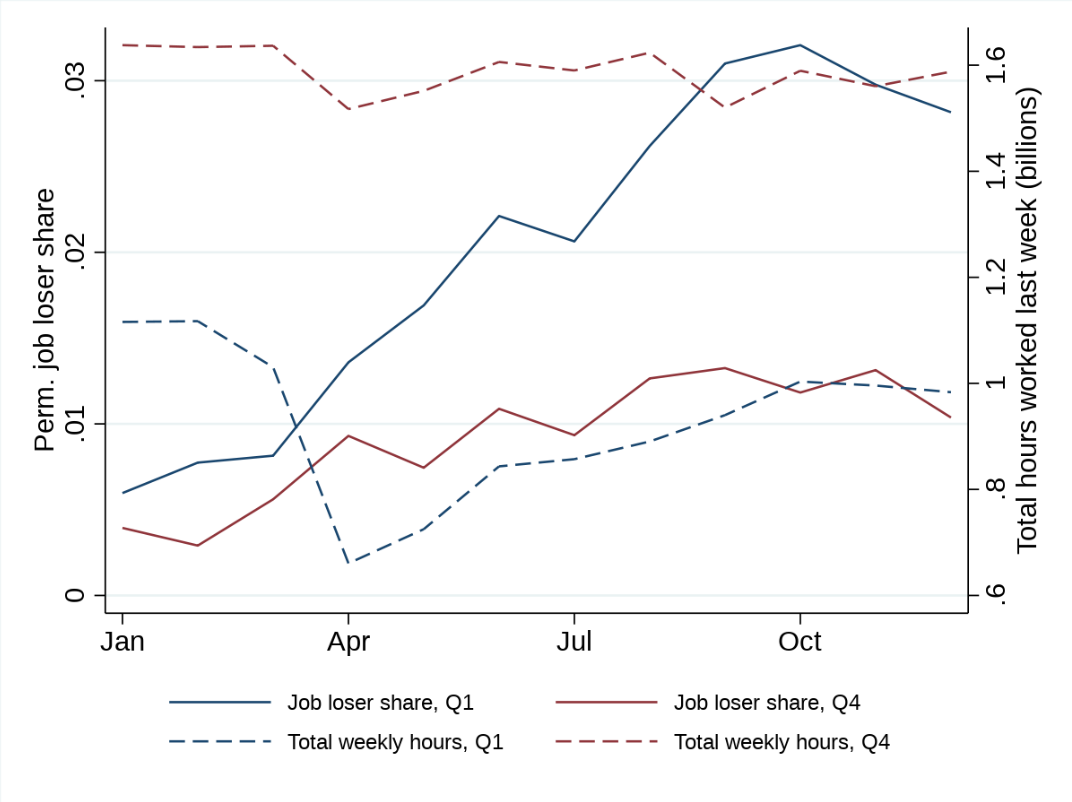
Appendix Figure 1B: Total Weekly Hours, by Race/Ethnicity (Norm. to Jan. 2020)



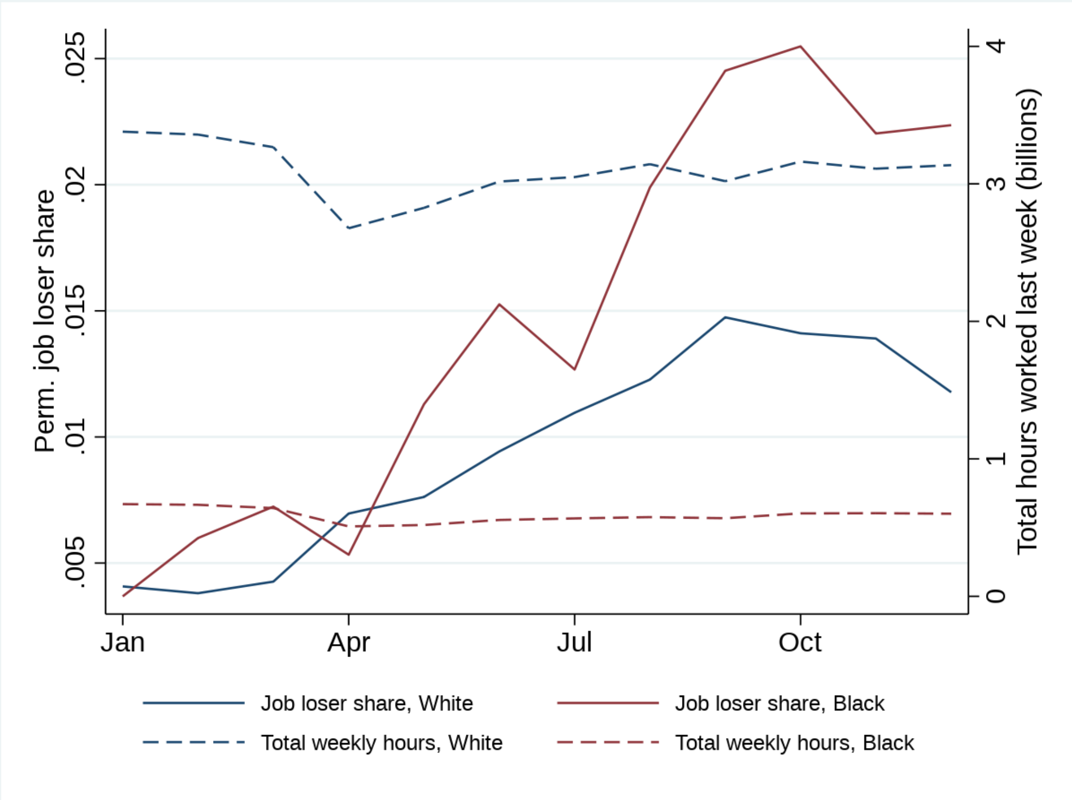
Appendix Figure 1C: Total Weekly Hours, by Gender (Norm. to Jan. 2020)



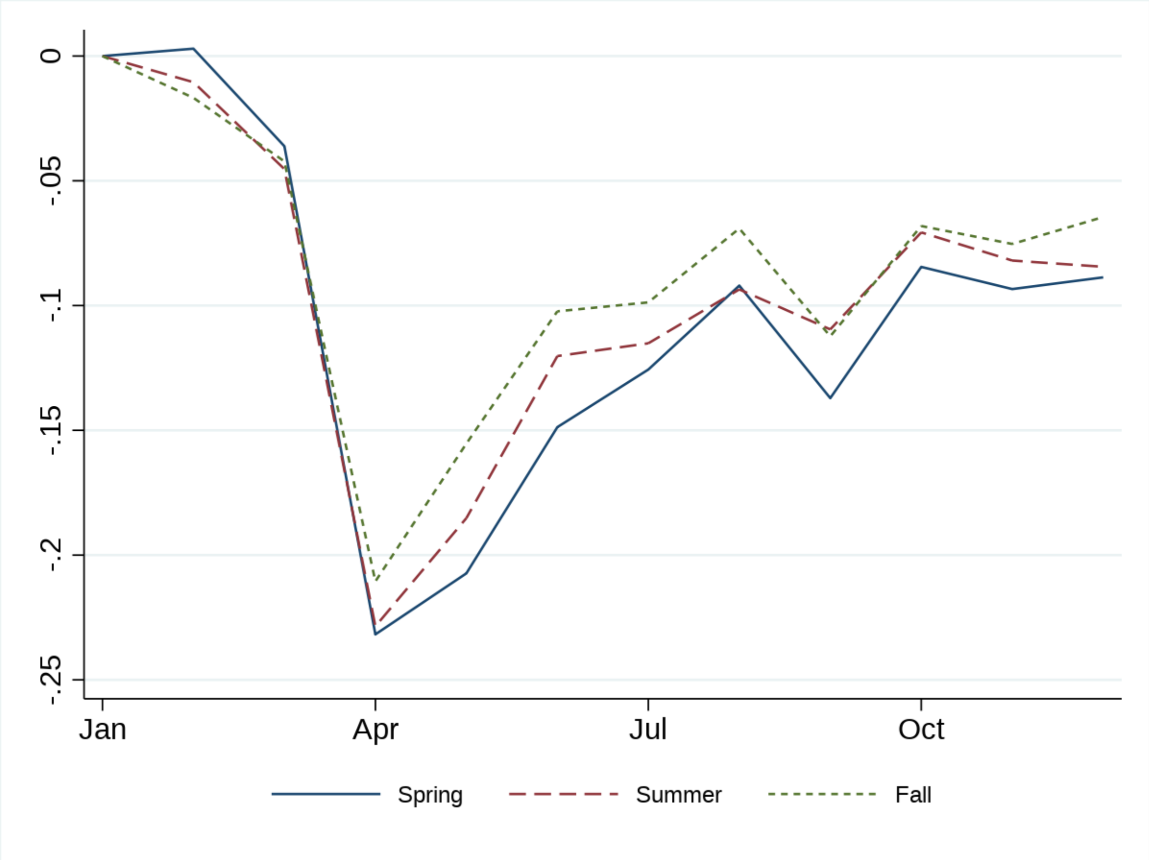
Appendix Figure 2A: Job Loser Share of Population and Total Weekly Hours, by Select Wage Quartile



Appendix Figure 2B: Job Loser Share of Population and Total Weekly Hours, by Race



Appendix Figure 3: Total Weekly Hours, by State COVID Group (Normalized to Jan. 2020)



Appendix Table 1: State Groups by COVID Caseload Peak Timing

Spring States	Summer States	Fall States
Colorado	Alabama	Alaska
Connecticut	Arizona	Indiana
Delaware	Arkansas	Kentucky
District of Columbia	California	Maine
Illinois	Florida	Montana
Iowa	Georgia	New Hampshire
Louisiana	Hawaii	North Dakota
Maryland	Idaho	Oregon
Massachusetts	Kansas	South Dakota
Michigan	Mississippi	Vermont
Minnesota	Missouri	West Virginia
Nebraska	Nevada	Wisconsin
New Jersey	New Mexico	Wyoming
New York	North Carolina	
Pennsylvania	Ohio	
Rhode Island	Oklahoma	
Virginia	South Carolina	
	Tennessee	
	Texas	
	Utah	
	Washington	

SOURCE: Authors' calculations from COVID case rates as provided by Opportunity Insights: https://github.com/OpportunityInsights/EconomicTracker.

Appendix Table 2A: Permanent Unemployed Share of Population: Demographic groups

	Feb	April	June	Oct	Dec
All	0.37%	0.74%	1.21%	1.59%	1.45%
Whites	0.38%	0.70%	0.94%	1.41%	1.18%
Blacks	0.60%	0.53%	1.53%	2.55%	2.24%
Hispanics	0.23%	1.02%	1.80%	1.62%	1.75%
Men	0.41%	0.86%	1.46%	1.81%	1.59%
Women	0.33%	0.62%	0.96%	1.38%	1.31%
Age 18–24	0.49%	0.92%	1.40%	1.23%	1.16%
Age 25–44	0.39%	0.79%	1.40%	1.76%	1.64%
Age 45–64	0.31%	0.62%	0.93%	1.53%	1.34%
Less than high school	0.59%	0.94%	1.09%	1.82%	1.38%
High school/some college	0.43%	0.68%	1.31%	1.82%	1.79%
Associate degree	0.30%	0.68%	0.93%	1.36%	1.26%
Bachelor’s degree	0.35%	0.89%	1.47%	1.58%	1.36%
Graduate degree	0.17%	0.69%	0.75%	1.08%	0.85%

NOTE: Estimates show the share of the population reporting permanent layoff, for each demographic group, in February, April, June, October, and December 2020. We believe this measure of unemployment best captures long-term pandemic-related disruptions. Estimates have been seasonally adjusted via calendar month dummy regression for each group over 2015–2019. The underlying sample is civilian adults age 18–64.

SOURCE: Authors’ calculations from the monthly CPS.

Appendix Table 2B: Permanent Unemployed Share of Population: Work groups

	Feb	April	June	Oct	Dec
All	0.37%	0.74%	1.21%	1.59%	1.45%
Managers & Professionals	0.36%	0.89%	1.11%	1.31%	1.20%
Service	0.51%	1.10%	2.16%	2.87%	2.84%
Sales & Administrative	0.58%	1.04%	1.76%	2.22%	1.82%
Agric., Construction, Installation, Maintenance, & Repair	0.14%	0.79%	1.30%	1.75%	1.99%
Production	0.80%	0.88%	1.98%	2.99%	2.58%
Agriculture & Mining	0.66%	0.54%	1.51%	1.96%	2.05%
Construction	0.13%	1.03%	1.17%	1.56%	2.08%
Manufacturing	0.63%	0.71%	1.80%	2.23%	1.65%
Trade	0.66%	1.25%	1.94%	2.41%	1.89%
Transportation & Utilities	0.42%	0.75%	2.06%	2.01%	2.27%
Information	0.58%	1.29%	1.11%	2.31%	2.84%
Finance, Insurance, & Real Estate	0.00%	1.14%	0.82%	1.71%	1.52%
Professional Services	0.88%	1.15%	1.69%	2.17%	1.66%
Education & Healthcare	0.28%	0.44%	0.96%	0.97%	0.92%
Arts, Accommodation, & Food	0.53%	1.90%	3.36%	4.53%	4.79%
Other Services	0.42%	1.08%	1.45%	2.65%	2.21%
Public Administration	0.21%	0.26%	0.00%	0.65%	0.35%
Hourly wage quartile 1	0.77%	1.36%	2.22%	3.21%	2.82%
Hourly wage quartile 2	0.55%	0.87%	1.70%	2.27%	2.11%
Hourly wage quartile 3	0.26%	0.63%	1.18%	1.39%	1.44%
Hourly wage quartile 4	0.29%	0.93%	1.09%	1.18%	1.04%
Teleworkable	0.41%	0.94%	1.31%	1.73%	1.30%
Non-teleworkable	0.50%	0.94%	1.70%	2.21%	2.25%

NOTE: See note to Appendix Table 2A. Wage quartiles are based on hourly occupational wages frm Occupational Employment Statistics (2019) and are employment-weighted. "Teleworkable" occupations are as in Dingel and Neiman (2020). Note that occupation and industry are asked of the currently employed and those who reported working within the past 12 months (only for outgoing rotation groups for those out of the labor force), but in practice, relatively few individuals not in the labor force have a valid response for these questions, lower than transitions rates would imply should be eligible. Consequently, these numbers are likely biased upward from the truth.

SOURCE: Authors' calculations from the monthly CPS.

Appendix Table 3: 2020 Time Path of Additional Employment Indicators, by Race/Ethnicity, Relative to January 2020

	Weekly Hours					
	Overall		Diff: Blacks		Diff: Hispanics	
March	−0.97***	−0.60**	−0.07	0.05	−0.66**	−0.66**
	(0.12)	(0.24)	(0.38)	(0.37)	(0.30)	(0.31)
April	−5.64***	−7.48***	−0.82**	0.07	−2.09***	−0.90***
	(0.13)	(0.27)	(0.42)	(0.41)	(0.34)	(0.34)
May	−4.36***	−5.78***	−1.33***	−0.67	−2.11***	−1.59***
	(0.13)	(0.27)	(0.42)	(0.41)	(0.34)	(0.34)
June	−3.13***	−2.96***	−0.57	−0.37	−1.09***	−1.38***
	(0.13)	(0.27)	(0.42)	(0.41)	(0.34)	(0.34)
July	−2.95***	−1.69***	−0.29	−0.50	−0.74**	−1.48***
	(0.13)	(0.27)	(0.42)	(0.41)	(0.34)	(0.34)
Aug.	−2.10***	−1.71***	−0.69*	−0.80**	−0.43	−1.04***
	(0.13)	(0.26)	(0.41)	(0.40)	(0.32)	(0.33)
Sept.	−2.88***	−3.07***	−0.74*	−0.72*	0.06	−0.44
	(0.12)	(0.24)	(0.38)	(0.37)	(0.30)	(0.31)
Oct.	−1.62***	−2.02***	−0.65*	−0.40	−0.16	−0.36
	(0.12)	(0.24)	(0.38)	(0.37)	(0.29)	(0.30)
Nov.	−1.76***	−1.93***	−0.27	−0.08	−0.23	−0.49
	(0.12)	(0.24)	(0.37)	(0.37)	(0.29)	(0.30)
Dec.	−1.50***	−2.33***	−0.27	−0.05	−0.95***	−0.83***
	(0.12)	(0.25)	(0.38)	(0.37)	(0.30)	(0.31)
Mean: Jan 2020	36.2	36.2	33.7	33.7	33.8	33.8
Controls	No	Yes	No	Yes	No	Yes

NOTE: See note to Table 2. Weekly hours are hours worked in the reference week, including zeros for the non-employed, if they were recent labor force participants who listed an occupation (this includes the unemployed and those out of the labor force in outgoing rotation groups who worked within the past 12 months).
SOURCE: Authors' calculations from the Current Population Survey.