Earnings Shocks and Stabilization During COVID-19

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Abstract

This paper documents the magnitude and distribution of U.S. earnings changes during the COVID-19 pandemic and how fiscal relief offset lost earnings. We build panels from administrative tax data to measure annual earnings changes. The frequency of earnings declines during the pandemic were similar to the Great Recession, but the distribution was very different. In 2020, workers starting in the bottom half of the distribution were more likely to experience large annual earnings declines and a similar share of male and female workers had large earnings declines. While most workers experiencing large annual earnings declines do not receive unemployment insurance, over half of beneficiaries were made whole in 2020, as unemployment insurance replaced a median of 103 percent of their annual earnings declines. After incorporating unemployment insurance, the likelihood of large earnings declines among low-earning workers was not only smaller than during the Great Recession, but also smaller than in 2019.

Keywords: COVID-19, wage earnings, stimulus checks, unemployment insurance, countercyclical policy
JEL: D31, E24, H53, J30, J65

1. Introduction

The onset of the COVID-19 pandemic in 2020 led to massive disruptions to the labor market in the United States. Over the months of March and April 2020, aggregate employment fell by approximately 20 percent, with many of these job losses occurring among low-wage workers (Cajner et al. 2020). For some workers, these lost earnings were offset by substantial increases in unemployment insurance benefits. However, in survey data annual individual-level earnings changes are rarely measured and unemployment insurance benefits are dramatically underreported. We use administrative earnings and unemployment benefits data to address these limitations and estimate the prevalence of large annual earnings declines during the COVID-19 pandemic. We then estimate the effectiveness of expanded unemployment insurance benefits and Economic Impact Payments ("stimulus" payments) at offsetting earnings declines. While earnings declines were frequent and concentrated among low-earning workers in 2020, after including unemployment benefits with earnings the likelihood of large earnings declines among workers in the bottom half of the earnings distribution was not only smaller than in the Great Recession, but also smaller than in 2019.

Administrative tax data provide among the most comprehensive pictures of annual earning. The Internal Revenue Service (IRS) receives information returns with annual earnings (Form W-2) and unemployment insurance benefits (Form 1099-G) data for all workers and unemployment insurance recipients, even if they do not file an annual federal income tax return. These forms are designed to assist taxpayers when preparing their annual tax returns and provide the IRS with third-party reported income meant to reduce non-compliance. The population of these information returns provide one of the most complete pictures of annual earnings and unemployment insurance receipt in the United States. Since these forms must generally be provided to taxpayers and the IRS in January each year to facilitate tax return preparation, they also are a timely source of data, yielding information on earnings trends shortly after the end of each calendar year.[1] Using these administrative data, we assess individual-level earnings, focusing on trends in labor earnings excluding self-employment income.

Consistent with the magnitude of labor market disruptions during the COVID-19 pandemic, many workers' earnings declined. Relative to the prior year, the share of workers age

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[1] This deadline was moved forward from February 28 to January 31 due to provisions in the Protecting Americans from Tax Hikes Act (PATH Act) of 2015. In limited cases, employers may request a single 30-day extension on this deadline.

25 and over with at least a 10 percent decline in their annual earnings increased by 7 to 8 percentage points in 2020. This frequency of earnings declines was similar to the depths of the Great Recession.

Yet the distribution of earnings declines in 2020 was different. Workers in the bottom two quintiles (wage earnings plus unemployment insurance below $32,900 in 2019) were about 6 percent more likely to experience large earnings declines in 2020 than were workers at the same point in the distribution in 2009. Conversely, workers in the top quintile (earning plus UI over $80,300) were about 16 percent *less* likely to have large earnings declines in 2020 than in the Great Recession.[2] Another difference is that relatively more female workers had large earnings declines in 2020 than in the Great Recession. While the Great Recession affected male workers much more severely, a similar share of male and female workers had large annual earnings declines during the pandemic.

Although earnings declines in 2020 were more common and concentrated among low-earning workers, some earnings declines were offset by increases in unemployment insurance. Most workers with large earnings declines did not receive unemployment insurance because the employment change was voluntary, they did not qualify for benefits, or they did not take up the benefits. However, among those who received benefits, unemployment insurance for the median recipient covered 103 percent of lost annual earnings. This replacement rate is far higher than in previous years and reflects the $600 supplemental weekly unemployment insurance benefits and benefits extensions implemented as part of the Coronavirus Aid, Relief, and Economic Security Act (CARES Act). In addition, most adults received Economic Impact Payments in 2020, which further offset earnings declines.

Although this is the first paper to explore earnings and unemployment insurance trends during the COVID-19 recession using administrative tax data, numerous researchers have considered aspects of these questions using other data. Much of this research has used survey data to monitor employment trends during the recession. This survey-based research has found that there were disproportionately high rates of job losses among workers in low-wage occupations, among those with less education, and among low-income and young workers (Adams-Prassl et al. 2020, Bartik et al. 2020, Berman 2020, Bick and Blanden 2021, Cortes and Forsythe 2020a, Federal Reserve Board 2020, Moffitt and Ziliak 2020, Montenovo et al. 2020). In addition to tracking employment trends, Moffitt and Ziliak (2020) use the COVID Impact Survey to track

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[2] For centile breakpoints in all years, see Appendix Table A1.

social safety net programs during the pandemic, concluding that the magnitude of increases in recipiency rates are consistent with that seen in earlier recessions given the larger increases in unemployment.

Despite these surveys providing valuable information on job losses and take-up of assistance programs, they also face several limitations that IRS data do not. Most surveys provide little information on the magnitude of lost earnings or the share of earnings replaced from public assistance programs. In the widely-used Current Population Survey (CPS), unemployment benefits were underreported by about one-third during the Great Recession (Larrimore, Mortenson, and Splinter 2020), and this survey data may underestimate the effectiveness of these benefits at offsetting lost earnings. Additionally, Rothbaum and Bee (2021) note that survey measurement errors due to non-response may be larger than usual during the pandemic. Administrative tax data do not have these same limitations and can complement the lessons learned about the COVID-19 recession from survey-based research.

In addition to the existing survey-based research, some researchers used other administrative data to monitor the pandemic. Grigsby et al. (2021) use private payroll data, observing that among those who remained employed at the same firm, wage cuts were concentrated among high-wage workers. Others have used data from states and private companies to monitor unemployment insurance receipt during the pandemic. However, they have primarily focused on accurately capturing the trends in claims, rather than the specific dollar amount. For example, Bell et al. (2020) use data from California to provide the demographic profiles and geographic locations of people who received unemployment benefits. Goldsmith-Pinkham and Sojourner (2020) use Google Trends data to monitor and forecast unemployment insurance claims. Marinescu, Skandalis, and Zhao (2020) and Forsythe et al. (2020) have similarly used information about unemployment insurance claims in conjunction with data from Glassdoor and Burning Glass to monitor labor market disruptions.

We build on this research by examining the total amount of unemployment benefits received at the individual level and how these benefits, along with any earnings received during the year, compare to individuals' pre-pandemic earnings in 2019. To our knowledge this is the first

paper to estimate these replacement rates during the pandemic using administrative data.[3] Additionally, through the use of the panel component of tax data, we observe where in the distribution annual earnings declines occurred during the COVID-19 pandemic and the Great Recession. Finally, using estimates of Economic Impact Payments, we illustrate the extent to which these payments further offset earnings declines.

2. Data and Methods

The data used for this paper are primarily comprised of fields found on Form W-2 and Form 1099-G drawn from the population of IRS tax records. Form W-2 captures annual wage and salary earnings and Form 1099-G includes all unemployment insurance benefits received in given year. In 2020, this includes conventional unemployment insurance, expanded payment amounts, and newly eligible individuals under Pandemic Unemployment Assistance. In addition to Forms W-2 and 1099-G, we use the records maintained by the IRS to track Economic Impact Payments sent during 2020. The databases containing information reported on these forms are updated monthly upon processing by the IRS. The data we use include all forms for tax year 2020 that were entered into the IRS system as of June 10, 2021, as well as all forms from prior years. As of this date, there were 235.8 million unique W-2s for 165.6 million workers for tax year 2020.[4] At the same point in 2020, this file included 248.5 million W-2s from tax year 2019, which was just over 95 percent of all Forms W-2 for that year.

To estimate Economic Impact Payments (EIPs), we use IRS records of individual-level payments. Combining the two rounds of EIPs that were distributed in 2020, taxpayers could receive up to $1,800 per non-dependent filer and $1,100 per qualifying child younger than 17 years old.[5] In the case of a married couple filing jointly, we divide their combined EIPs (including payments for dependent children) equally between the two filers.

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[3] Ganong, Noel, and Vavra (2020) and Cortes and Forsythe (2020b) simulate statutory replacement rates using survey data. For recent research on disincentive effects of unemployment insurance benefits during the pandemic, see Bartik et al. (2020) and Finamor and Scott (2021).

[4] "Unique" means only one set of W-2 data is considered for each individual from each employer in each year. Multiple W-2s can be filed by an employer for a single employee, but these are usually duplicative or amendments. To allow for amendments and corrections, we retain the most recent non-missing amount for a given employer-employee combination each year. Individuals can receive W-2s from multiple employers, each of which are included.

[5] The second round of EIPs were included in the Consolidated Appropriations Act of 2021, which was signed into law on December 27, 2021. EIP distributions began almost immediately, as "[t]he IRS reports issuing 147 million advance payments…totaling $142 billion as of December 29, 2020." (Treasury Inspector General for Tax Administration 2021,

We draw a random 5 percent sample of all individuals appearing in tax data from 2003 to 2020. The sampling procedure—based on the last four digits of masked individual Taxpayer Identification Numbers—forms an unbalanced panel that is approximately representative of the resident U.S. population of individuals in each year (Cilke 2014; Larrimore, Mortenson, Splinter 2021).[6] Before drawing the sample, all Form 1099-Gs and Form W-2s are retrieved from the population of tax records, as well as individuals' sex, date of birth, and date of death from the Social Security administration's DM-1 file. To avoid capturing earnings fluctuations among young adults with loose labor force connections, we restrict our sample to adults aged 25 and older.[7]

We construct two-year panels from these data to track annual earnings and unemployment insurance benefits from one year to the next for the same individuals. These panels include any individual in year $t–1$ with wage or unemployment insurance benefits reported on Form W-2 or Form 1099-G. Included individuals are followed in the subsequent year t. Individuals are included in the panel if they have earnings or unemployment insurance in $t–1$, even if they do not have income from either source in year t. Individuals reported as deceased by the end of year t are excluded. The resulting data contain around 120 million observations, total, between 2003 and 2020.

All data are analyzed at the individual level. While each Form W-2 and Form 1099-G reflects amounts paid from a single employer or entity, these amounts are aggregated across all sources to capture each individual's total earnings and total unemployment insurance benefits. We focus exclusively on individual-level earnings, unemployment insurance, and EIP payments, and do not consider other sources of income or the sharing of resources within households that can affect financial well-being.[8] All amounts are adjusted to 2020 price levels using the chained CPI and descriptions of earnings changes always refer to the real inflation-adjusted changes.

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pg. 3). We include these second round EIPs if paid in 2020, recognizing that some payments were not received until 2021.

[6] Similar data have been used and described in Goodman et al. (forthcoming).

[7] In order to capture the effect of recessions on retirement, our upper age limit is 100. However, restricting the sample to just prime-age workers produces qualitatively similar findings. For details, see Appendix Figures A7 and A8.

[8] While total earnings aggregated to the tax unit or household level are also important, doing so requires information from annual tax returns, such as Form 1040, to have complete information about who individuals live with or with whom they file their taxes. However, 2020 tax return data is not yet available. For earlier estimates at the tax unit level, see Larrimore, Mortenson, and Splinter (2016), which estimates the stabilization effects of federal income taxes at both the individual and tax-unit levels.

A. Estimating Earnings Declines and Exits from the Labor Force Using Early W-2 Data

Because the IRS data represent a population-level panel, once IRS data files are complete, individuals who did not receive either a Form W-2 or a Form 1099-G can be treated as having zero (reported) earnings and unemployment insurance benefits in that year.[9] However, prior to the completion of data processing, taxpayers may have no Form W-2 either because they actually had zero reportable earnings or because their Form W-2 has not yet been processed. Additionally, in some instances workers with multiple jobs may have just one Form W-2 processed, and therefore appear to have lower earnings than they actually earned. It is, therefore, necessary to estimate how many people have missing earnings due to processing delays and the effect of their inclusion on the final earnings distribution.

We estimate the effect of these late-processed returns for tax year 2020 in three steps. First, we estimate the number of people with Forms W-2 that were not yet processed by the IRS as the difference between the total number of prior-year workers with no Form W-2 in the early data and estimated labor force exits. These exits are based on historical results. Since 2004, the share of adults who were working in one year but not the next has been between 6.3 percent (in 2018) and 8.9 percent (in 2009). While recognizing that the large declines in employment in 2020 may result in a higher share of exits than normal, we treat this as the likely range of actual exits from the workforce in 2020.[10] Based on Form W-2 data through June 10, 2021, 8.8 percent of people who had a Form W-2 in 2019 did not yet have a Form W-2 processed for 2020. While this falls within the historical range, there are likely remaining Forms W-2 to be processed. Comparing the 8.8 percent to the historical range of 6.3 to 8.9 percent, we assume that up to 2.5 percent of people who were working in 2019 had a 2020 Form W-2 that was not yet processed. This results in our estimate of how many potential late-processed forms remain.[11] In order to also match where in the distribution late-processed forms fall, this procedure is applied separately at each centile of the distribution, giving us a centile-by-centile estimate of forms we expect to be processed late.

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[9] However, they may have received income from other non-wage sources or had wages not reported on a Form W-2. For example, some individuals may have started a business or began receiving income from sources other than wages such as Social Security or pension income. Individuals who emigrated from the United States will also appear as having zero earnings using this approach, since foreign earnings do not appear on Form W-2.

[10] This appears to be a reasonable assumption. Relative to mid-2009, von Wachter (2021) estimates a smaller decline in 2020 of the employment-to-population ratio (4 vs. 5 percentage points).

[11] Considering processing rates in 2019 provides context. In 2019, 1.7 percent of workers with 2018 earnings had late processed forms, suggesting that our estimated range is consistent with recent IRS processing schedules.

The second step in the estimation process is to determine the likely earnings for individuals with no Form W-2 in the data but who were imputed as having late-processed forms. We do so using the distribution of earnings changes for those with late-processed forms in years since 2016.[12] Between 2016 and 2019, an average of 22.8 percent of people who had no Form W-2 as of June 10, but whose Form W-2 was processed later in the year, had an annual earnings decline of at least 10 percent. Among this same group, 49 percent had either an earnings decline of less than 10 percent or an earnings increase of less than 10 percent and 28.2 percent had an increase of at least 10 percent. We assume that the earnings changes for those with late-arriving forms will follow this same distribution in 2020.

Finally, we recognize that the early data can also bias earnings changes due to late-processed forms. Between 2016 and 2019, 3 percent of people with large earnings declines based on their Form W-2 data processed by June 10 had late-processed forms that increased their earnings such that their annual earnings were either little changed for the year (1.6 percent) or increased by at least 10 percent (1.4 percent). We therefore scale back the share reported with large earnings declines by 3 percent to reflect these revisions in the updated data.

We test these procedures by comparing early and final data in 2019. Using the methods described here, early filed data for 2019 suggest that between 25.3 and 26.7 percent of workers in 2018 had earnings declines of at least 10 percent in 2019. The final 2019 data show that 25.6 percent had earnings declines of at least 10 percent, falling within the predicted range.

3. Results

A. Distribution of Earnings Changes

Figure 1 displays the share of workers with large earnings increases and large earnings declines, where large changes are defined as at least a 10 percent change (large declines also include those going from positive to zero earnings). In recent years, just over one-fourth of workers usually have a large earnings decline (Figure 1). In 2019, for example, 25.6 percent of workers had earnings declines of this magnitude. This high share of workers with large earnings losses is a standard result. The Congressional Budget Office (2008) estimates that about one fifth of prime-

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[12] Only years since 2016 are used here because in prior years employers had additional time to provide Forms W-2.

age workers had real annual earnings decreases of at least 25 arc percent between 1985 and 2003, with little fluctuation over business cycles.[13]

During the two most recent recessions, about one-third of workers had large earnings declines. In 2009, at the depths of the Great Recession, 33 percent of workers had large earnings declines, which was the highest share with earnings declines observed between 2004 and 2019. In 2020, between 32 and 34 percent of workers had large earnings declines.[14] The share with large earnings declines in recent expansionary years can be thought of as a baseline level. In 2020, the increase in the share with large earnings declines from the 2019 "baseline" was 6.5 to 8.4 percentage points. In 2009, during the Great Recession, the increase in the share with large earnings declines relative to 2007 was 5.5 percentage points. Hence, the share with large earnings declines were similar in the two recessions but the COVID recession produced a somewhat larger shock relative to the pre-recession baseline.[15]

Conversely, the share with large earnings *increases* in 2020 greatly exceeded that seen in the Great Recession. In 2020, between 28 and 29 percent of workers experienced large earnings increases—down only slightly from the 30 percent with large earnings increases in 2019. In 2009, only 24 percent experienced a large earnings increase. This is the first indication of a difference between the Great Recession and COVID-19 recession: while large earnings declines were similarly common in 2020 and 2009, large earnings increases were more common in 2020 than in 2009.

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[13] These short-term earnings decreases are associated not only with unemployment spells, but also with common events: changing jobs or industry, moving across state lines, being 50 years or older, and divorce (Larrimore, Mortenson, and Splinter 2016).

[14] The similarity in the share of workers with large earnings declines in 2020 and 2009 also holds when considering a higher threshold for defining a large decline. In both 2020 and 2009 about 24 percent of workers had annual earnings declines of at least 25 percent (Appendix Figure A1).

[15] For comparison, von Wachter (2021) estimates employment-to-population ratio declines of 4 and 5 percentage points for mid-2009 and 2020. Therefore, the increase in the share with large earnings declines was somewhat larger than the decline in the average employment to population ratios. This is, at least in part, because the large-earnings-decline measure includes some people who were only temporarily laid off or furloughed. We note, however, that this measure misses the sharp increase in people who were laid off for a short period early in the pandemic whose *annual* earnings decline was less than 10 percent.

Figure 1. Share of workers with earnings changes (by year)
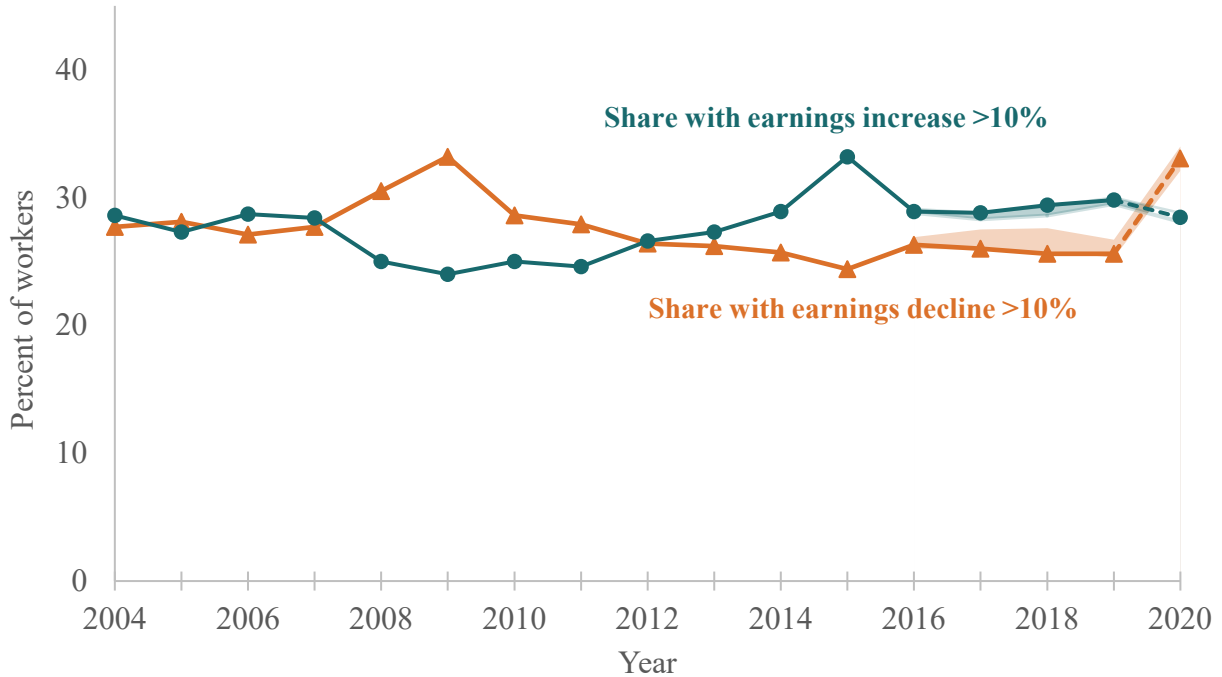
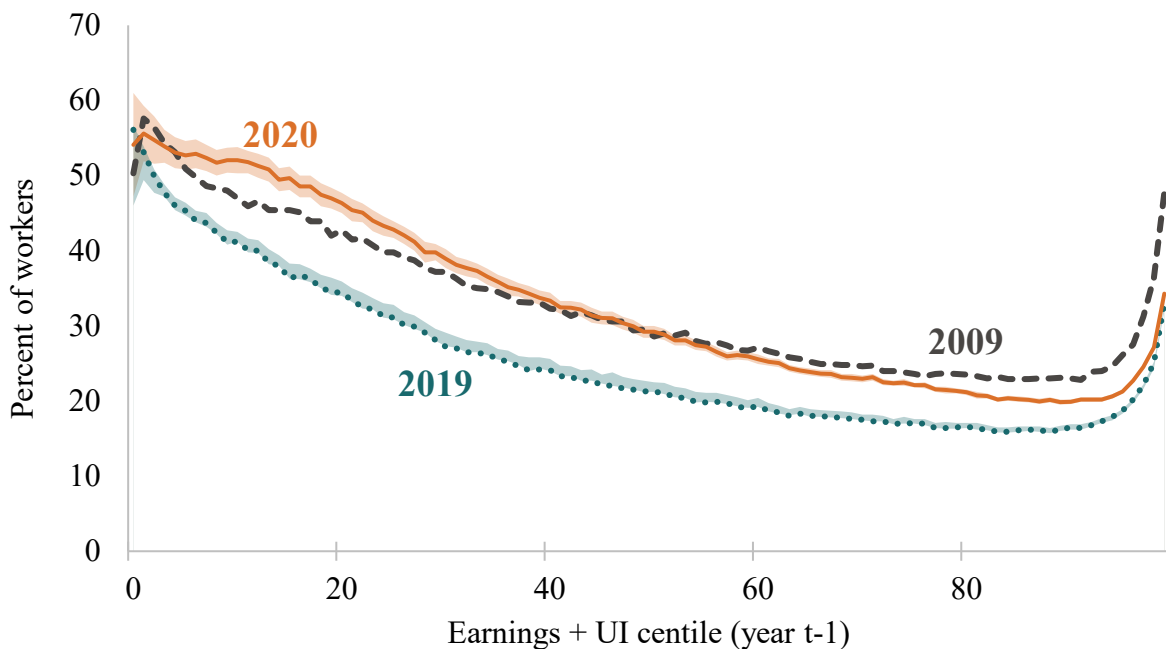Source: Authors' calculations using IRS data from Form W-2.
Note: Among workers ages 25 and older with earnings or unemployment income in year t-1. Shaded region reflects the expected range based on data as of early June of the following year. The 2020 point estimate reflect the midpoint of the expected range based on the data as of June 2021.

A second difference is that the adverse employment and earnings effects of the COVID-19 recession were more heavily concentrated among low-earning workers than in the Great Recession. Figure 2 displays the share of workers with at least a 10 percent annual decline in earnings, ranked by their prior-year earnings (defined by individual-level earnings plus unemployment insurance to maintain consistent centile rankings throughout the paper). Three years are displayed: 2009, 2019, and 2020.[16] Relative to 2019, large earnings declines were more prevalent throughout the distribution in the two recession years. But the two recessions also differ from each other. In the COVID-19 recession, workers with earnings in the bottom two quintiles of the distribution were slightly more likely to have large earnings declines than workers at the same point in the earnings distribution during the Great Recession. Among workers in the bottom quintile, 51.5 percent

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[16] 2009 is displayed for the Great Recession because it had the most severe earnings declines. 2019 is shown as the most-recent non-recession year prior to the COVID-19 recession. The pattern in Figure 2—more losses at the bottom and top of the distribution—resembles the pattern of standard deviations in annual earnings changes in Guvenen et al. (2018).

experienced large earnings declines in 2020, compared to 48.4 percent in 2009.[17] Similarly, among workers in the second quintile, 39.6 percent experienced large earnings declines in 2020, compared to 37.3 percent in 2009. Hence, in the bottom two quintiles, workers were about 6 percent (2 to 3 percentage points) more likely to experience large earnings declines in 2020 than during the Great Recession. However, among higher-earning workers, large earnings declines were less common than during the Great Recession. Workers in the top quintile were about 16 percent (4 percentage points) *less* likely to experience large earnings declines in 2020 than were workers at the same point in the distribution in 2009.

Figure 2. Share of workers with at least a 10 percent decline in annual earnings (by prior year earnings + UI)

Source: Authors' calculations using IRS data from Form W-2 and 1099-G.
Note: Among workers ages 25 and older in year t with earnings or unemployment benefits in year t-1. Shaded region reflects the expected range based on data as of early June of the following year. The 2020 line is the midpoint of the expected range as of early June 2021.

The distribution of earnings increases differs substantially from the distribution of earnings decreases. In 2020, workers in the bottom quintile of the prior-year earnings distribution were similarly likely to experience earnings increases than in 2009, but above the 20th percentile, workers were more likely to see a large increase. Workers in the top half of the earnings

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[17] Point estimates for 2020 are based on the midpoints of the expected range.

distribution in 2020 were 34 percent (6 percentage points) more likely to have large earnings increases than similar wage workers in the Great Recession (Appendix Figure A2). In fact, the 24 percent of workers in the top half of the distribution with large earnings increases in 2020 was above the 22 percent of workers in the top half of the distribution with large earnings increases in 2019.[18] This provides further evidence of the extent to which the adverse earnings repercussions of the COVID-19 recession were concentrated among lower-earning workers.

B. Earnings Declines by Sex and Parental Status

Early evidence in the COVID-19 recession from survey data suggested that furloughs and job losses were particularly prevalent among female workers, which is a divergence from the Great Recession (Alon et al. 2020, Albanesi and Kim 2021). Additionally, recognizing that childcare responsibilities often fall predominantly on mothers, women indicated that the lack of in-person schooling and childcare disruptions exacerbated these difficulties (Federal Reserve Board 2021). However, many job losses were short-term, resulting in an employment-to-population ratio annual decrease of only 0.6 percentage points more for women than men (6.2 versus 5.6 percentage points) (Furman, Kearney, and Powell 2021).

Splitting the sample by sex, we find that the COVID-19 recession affected female and male workers similarly, in contrast to the Great Recession.[19] In the Great Recession, 35.7 percent of male workers experienced a large earnings decline, compared to 30.6 percent of female workers. In the COVID-19 recession, earnings declines did not meaningfully differ by sex: about 33 percent of both males and females who were working in 2019 experienced large earnings declines in 2020 (Figure 3). However, the overall prevalence of earnings declines masks differences between the sexes. At almost all points in the earnings distribution, males were more likely to have large earnings declines than females in 2020. For example, 31.2 percent of males in the middle quintile of the earnings distribution had large earnings declines compared to 27.5 percent of females. The similar overall likelihoods of large earnings declines among males and females occurs because males are generally higher in the earnings distribution and the likelihood of earnings declines is decreasing in earnings. For details, see Appendix Figures A3.

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[18] Reflecting that many workers near the lower tail of the distribution are part-time or part-year workers, the bottom quintile has the greatest likelihood of both large earnings increases and large earnings decreases in all years.

[19] The indicator of sex used here is from the Social Security Administration's data master file.

Figure 3. Share of workers with at least a 10 percent annual earnings decline (by sex and year)
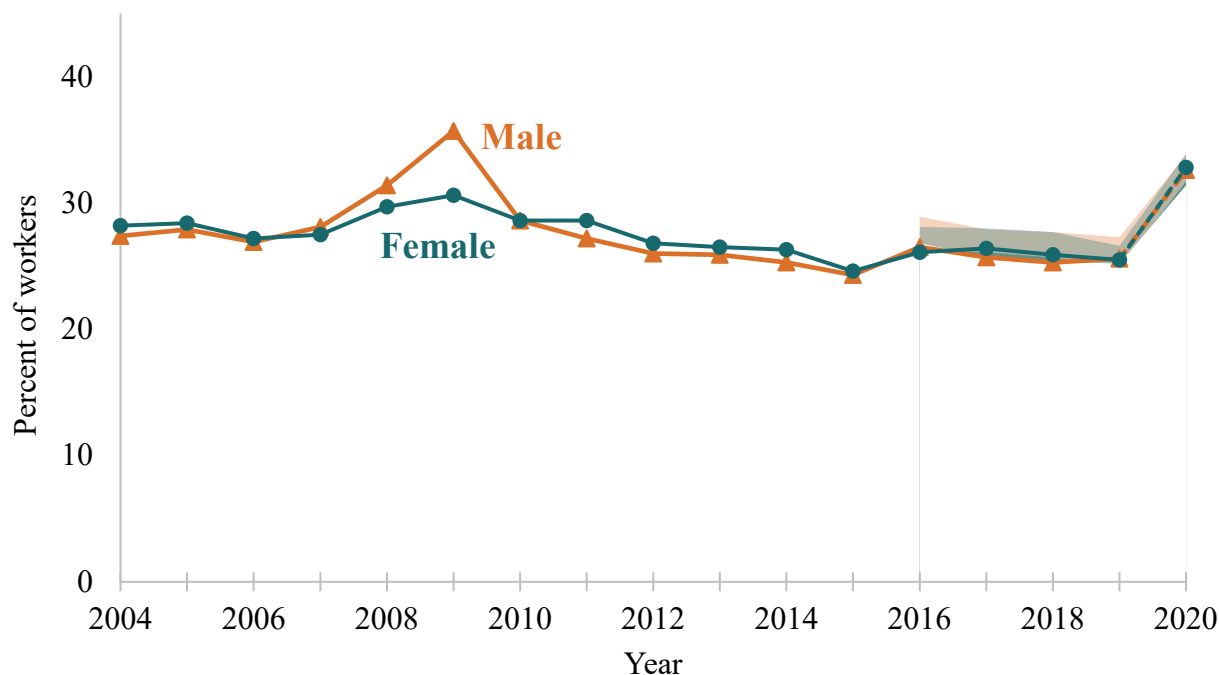
Source: Authors' calculations using IRS data from Forms W-2.
Note: Among workers ages 25 and older with earnings or unemployment income in year t-1. Shaded regions reflect the expected range based on data as of early June after the end of the tax year. The 2020 point estimates reflect the midpoint of the expected range based on the data as of June 2021.

We also find evidence that mothers of school-age children were slightly more likely to experience large earnings declines. Among mothers whose youngest child is age 6 to 12, those most likely to have been affected by school closures, there was an 8.3 percentage point increase in the share having a large earnings decline in 2020 relative to 2019. Among mothers of older children, ages 13 to 16, there was an 8.2 percentage point increase. These increases are slightly above that seen for females without children (7.6 percentage point increase) or mothers of children under age 6 (7.1 percentage point increase), consistent with a school closure effect (see Appendix Figure A4).[20] However, Furman, Kearney, and Powell (2021) note that elevated rates of labor force declines among mothers were not specifically due to childcare challenges, so the higher likelihood of large earnings declines among mothers of school-age children that we observe may be due to other factors as well.

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[20] Among males the share increased less for those with children ages 6 to 12 (7.0 percentage points) than for those without children (7.5 percentage points).

C. Effect of Unemployment Insurance Offsetting Earnings Declines

The CARES Act included several provisions to directly provide resources to individuals after a job loss. These included an expansion of eligibility for unemployment insurance as well as a $600 per week addition to standard weekly benefits.[21] As a result of these additional benefits, the share of lost earnings replaced by unemployment insurance was far higher in 2020 than in other recent years. However, a large share of workers whose earnings declined did not receive benefits.

To measure the degree to which unemployment insurance replaced lost earnings, we first consider the share with large earnings declines who received unemployment insurance benefits. Evidence from survey data has previously found that most unemployed wage and salary workers did not receive unemployment insurance benefits (Bitler, Hoynes, and Schanzenbach 2020, Moffit and Ziliak 2020). We find that about 37 percent of workers with large earnings declined received unemployment insurance benefits in 2020, while the remainder of workers with large earnings declines in the IRS data did not receive these benefits.[22] However, we cannot separately identify workers who are laid off from those who voluntarily quit, retired, or had an earnings decline without leaving their job, and therefore this considers all workers with large earnings declines and not just those who lost a job.[23] Hence, we should not expect all people with earnings declines to receive unemployment insurance benefits even with complete take up among those who are eligible. The 37 percent of workers with large earnings declines who received unemployment insurance benefits is an increase from the 9 percent in 2019 and the 27 percent observed during the Great Recession in 2009. It is also likely that the share of those with large earnings declines

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[21] Unemployment benefits were expanded to cover independent contractors and others with Pandemic Unemployment Assistance, but these recipients will be excluded from our 2020 sample, unless they had either earnings or unemployment benefits in 2019. Other provisions of the CARES Act provided indirect benefits to workers. For example, the Paycheck Protection Program provided incentives to employers to retain their employees (Granja et al. 2020). Other aspects of the CARES Act and other parts of the social safety net are important areas for further research.

[22] Some workers with either small changes in earnings or increases in earnings also received unemployment insurance benefits. Among unemployment insurance recipients, 64.4 percent had earnings declines of at least 10 percent, 18.8 percent had earnings decreases or increases of less than 10 percent, and 16.8 percent had earnings increases of at least 10 percent.

[23] We also do not attempt to identify fraudulent payments. In January 2021, California reported it paid at least 10 percent ($11 billion) of its unemployment insurance benefits to fraudulent claims since the pandemic began and believes the amount could be as high as 27 percent (Department of Labor Office of the Inspector General 2021). To the extent that fraudulent payments reached the recipient whose Social Security Number is on the Form 1099-G, our results will still reflect the actual effects of these benefits. However, if fraudulent payments went to another individual falsifying a Social Security Number, it would result in an overstatement of the effectiveness of these benefits at offsetting earnings declines.

who received unemployment insurance benefits will increase further as additional forms reporting these benefits are processed by the IRS.[24]

Among those who received unemployment insurance benefits, the share of lost earnings that were replaced was far higher in 2020 than in previous years. This is consistent with the supplemental unemployment insurance benefits provided to recipients. When interpreting these results, we emphasize that because earnings on tax forms is an annual measure it differs from statutory unemployment insurance replacement rate calculations that compare weekly unemployment insurance benefits to weekly wages while working. Consequently, this annual measure could be higher or lower than statutory replacement rates due to earnings changes unrelated to the layoff that workers experience. However, it provides advantages since the ratio also reflects weeks with no unemployment benefits due to gaps in coverage or the expiration of benefits.

Unemployment insurance beneficiaries who suffered large annual earnings declines in 2020 saw a median of 103 percent of their lost earnings covered by unemployment insurance (Appendix Table A2).[25] This replacement of lost earnings far exceeds that seen in previous years when unemployment insurance benefits were less generous. In 2019, the median replacement rate was 29 percent among unemployment insurance recipients with large earnings declines. During the Great Recession and its aftermath, the median replacement rates were higher—56 percent in 2009 and 64 percent in 2010—but were still well below those in 2020.

Consistent with the high median replacement rate in 2020, benefits exceeded 100 percent of lost annual earnings for many recipients. In 2020, 51.5 percent of unemployment insurance beneficiaries with large annual earnings declines received unemployment insurance benefits that met or exceeded their annual earnings decrease. In 2009, the analogous share was 19.1 percent (at

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[24] As of June 10, 2021, there were 42 million people with processed Forms 1099-G for tax year 2020, with benefits totaling $493 billion. It is unknown how many unprocessed Forms 1099-G remain, but they appear mostly to be from a few states. For context, at the peak in May 2020 the number of weekly continuing claims peaked at just under 31 million recipients (Department of Labor 2020). Federal Reserve Board (2021) and U.S. Census Bureau (2021) surveys show that 36 and 39 million people reported receiving unemployment benefits in 2020. However, estimates from Kevin Corinth, Bruce Meyer, and Derek Wu using Daily Treasury Statements find that $581 billion of benefits were paid in 2020, which suggests that while we already observe more recipients than in surveys, our preliminary data may still underestimate unemployment benefits by about 15 percent and our estimate of how much these benefits offset earnings declines represents a lower bound.

[25] Because the imputation method used can only capture ranges of changes rather than precise amounts, we cannot use the imputed data to estimate replacement rates. Consequently, estimates of replacement rates are among those with 1099-G data as of June 10, without additional imputations of earnings or unemployment benefits from late returns.

which time the American Recovery and Reinvestment Act temporarily provided $25 per week of supplemental benefits), and in 2019 approximately 7.5 percent of workers received complete replacement.[26]

Because the supplemental unemployment insurance benefits from the CARES Act in 2020 were a fixed weekly amount and not tied to wages while working, low-earning unemployment insurance beneficiaries were the most likely to have a complete replacement of their lost earnings (Figure 4). Among unemployment insurance recipients in the bottom quintile of the 2019 earnings distribution with large earnings declines in 2020, 85.2 percent received enough unemployment insurance benefits to completely replace their lost earnings (which averaged $5,650 for the bottom quintile). The corresponding estimates for unemployment insurance recipients in the middle quintile and top quintile were 40.1 percent and 3.5 percent, respectively.

Figure 4. Share of UI recipients with at least a 10 percent annual earnings decline who have a complete earnings replacement from UI benefits (by prior-year earnings + UI)
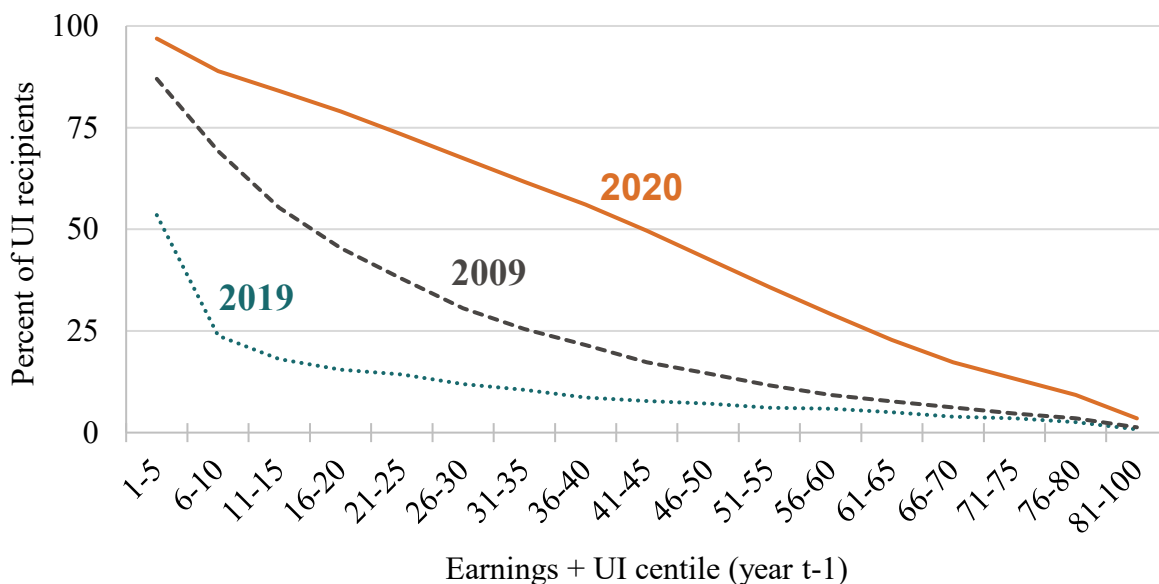
Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older with earnings or unemployment income in year t-1 who had at least a 10 percent earnings decline and received unemployment insurance benefits. Due to small sample sizes in some years, results are presented for 5 centile groups, except the top quintile which is aggregated into a single quintile.

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[26] Workers can have over a 100 percent annual wage replacement even if statutory replacement rates are below 100 percent because we are focused on annual rather than weekly measures. For example, a worker who works part of the year in 2018 and receives unemployment in 2019 may have a replacement rate of over 100 percent if the duration of unemployment is long relative to the weeks worked in the prior year.

In 2009 and 2019, low-earning unemployment insurance recipients were most likely to have a complete earnings replacement. For the bottom quintile, 52.8 percent of unemployment insurance recipients with large earnings declines had a complete earnings replacement in 2009, and 18 percent did in 2019. However, beyond the lowest centiles, the shares with complete earnings replacement were well below that seen in 2020.

Complete earnings replacement is far less common, however, when recognizing that nearly two-thirds of individuals with large earnings declines did not receive unemployment insurance (in some cases because the earnings declines was not the result of a job loss that would make them eligible for unemployment insurance benefits). Among all workers with large earnings declines in 2020, only 18.8 percent had a complete replacement of lost wages. Even among the bottom quintile, where high replacement rates were more common (but unemployment insurance recipiency rates are low), only 23.9 percent of workers with large earnings declines had a complete replacement from unemployment benefits based on the data from early June (Appendix Figure A5). Hence, the relatively low share of workers with lost earnings who receive unemployment insurance benefits dramatically reduces the likelihood that benefits will make up for lost earnings.

Despite low recipiency rates, the progressivity of unemployment insurance benefits in 2020 largely offset the regressive nature of the COVID-19 recession and the disproportionate effects that it had on low-earning workers. Figure 5 shows the share of workers at each prior-year earnings centile who had large earnings declines after adding unemployment insurance benefits to wage earnings. In 2020, the frequencies of large earnings declines *when including unemployment benefits* are below that from the Great Recession through the entire distribution. Comparing to 2019, large earnings declines after including unemployment insurance were actually *less* common in 2020 among those in the bottom two quintiles of the distribution than they were in 2019. Yet, large earnings declines remained more common among those higher in the distribution where unemployment benefits reflected a smaller share of lost earnings. Hence, the enhanced unemployment insurance benefits more than offset the concentration of lost earnings among low-earning workers in 2020.[27]

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[27] Additionally, as noted in the data discussion, since the Form 1099-G data is not complete, we consider this a lower bound on the extent to which lost earnings were offset by unemployment insurance benefits.

Figure 5. Share of workers with at least a 10 percent decline in annual earnings plus UI (by prior year earnings + UI)
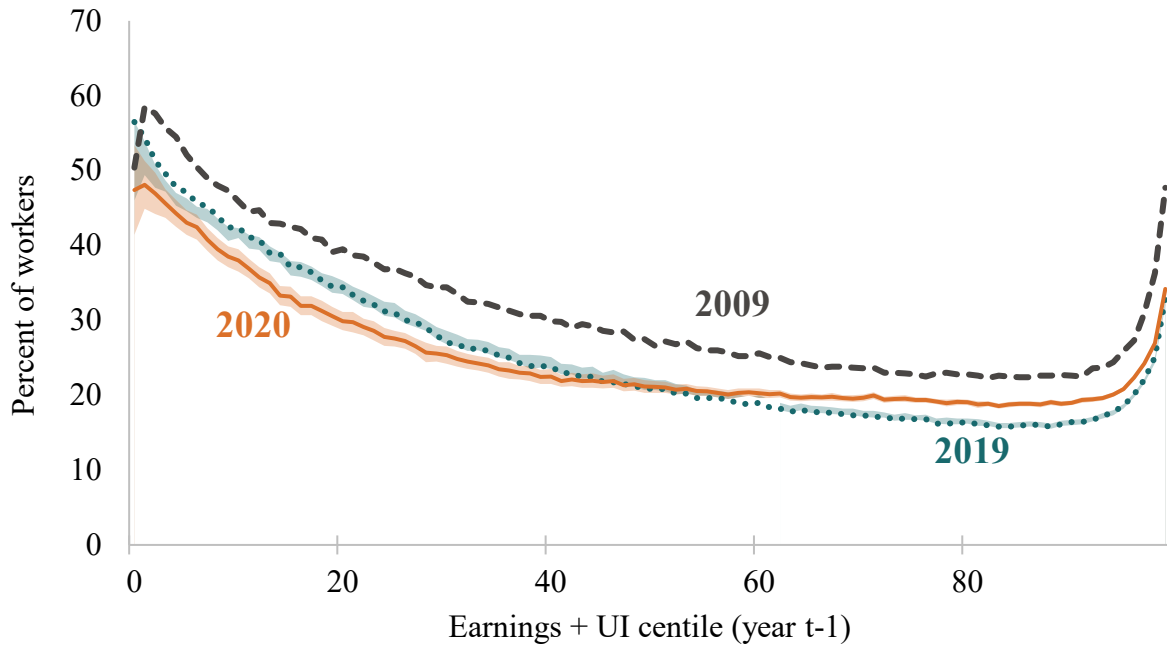
Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older in year t with earnings or unemployment income in year t-1. Shaded region reflects the expected range based on Form W-2 data as of early June of the following year. The 2020 line is the midpoint of the expected range as of early June 2021.

D. Effect of Economic Impact Payments Offsetting Earnings Declines

Most people in 2020 received Economic Impact Payments totaling $1,800 per adult and $1,100 per (qualifying) child. These benefits went to all adults who met the eligibility criteria, a portion of which was income-based, but were not directly tied earnings losses. Nevertheless, they provided additional financial support to individuals who experienced an earnings decline. Furthermore, because Economic Impact Payments were the same amount for all eligible individuals, other than high-income individuals above phase-out thresholds, they represented a larger percentage of pre-pandemic income for low-earning individuals than for higher-earning individuals.

Table 1 shows the share of workers in each quintile of the prior-year income distribution who had large earnings declines in 2020 when considering just wages, wages plus unemployment insurance benefits, and wages plus unemployment insurance and Economic Impact Payments.[28]

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[28] For the centile-level distribution of large declines when including the Economic Impact Payments, see Appendix Figure A6.

For comparison, it also shows the share with large earnings declines in each quintile under the first of these two definitions in 2009 and 2019.

Table 1. Share of workers in each prior year earnings + UI quintile with at least a 10 percent decline in earnings including and excluding public assistance programs

	2020			2019		2009	
	Earnings only	Earnings + UI	Earnings + UI + EIP	Earnings only	Earnings + UI	Earnings only	Earnings + UI
Bottom quintile	51.5	38.7	26.7	42.3	43.3	48.4	47.5
2nd quintile	39.6	25.8	21.7	28.5	28.3	37.3	34.5
Middle quintile	29.3	21.2	17.7	21.3	21.0	29.5	27.5
4th quintile	23.2	19.6	17.0	17.6	17.3	24.7	23.7
Top quintile	21.7	20.7	19.7	18.3	18.2	25.9	25.5
Overall	**33.1**	**25.2**	**20.6**	**25.6**	**25.6**	**33.2**	**31.7**

Source: Authors' calculations using IRS data from Forms W-2, 1099-G, 1099-SSA, and 1040.
Notes: Among workers ages 25 and older with wages or unemployment insurance (UI) benefits in year *t–1*. Quintiles are defined based on wages plus unemployment benefits in year *t-1*. 2020 values are the midpoints of expected ranges as of early June 2021.

In 2020, the inclusion of unemployment insurance benefits reduces the share with large earnings declines from 33.1 percent to 25.2 percent. This reduction was concentrated among workers in the bottom three quintiles of the earnings distribution. The Economic Impact Payments reduced the frequency of large earnings declines even further—especially among those in the bottom quintile. When including the offsetting effects from Economic Impact Payments, only 20.6 percent of workers experienced large declines. These benefits also reduced the likelihood of large declines in the bottom quintile by 12 percentage points, from 38.7 percent to 26.7 percent. The pronounced effect in this range reflects that the bottom quintile had annual earnings (wage earnings plus unemployment insurance) of less than $16,700 in 2019. Hence, the $1,800 per adult Economic Impact Payment represented a sizeable share of earnings among this group and often made up for any lost earnings.

When including the Economic Impact Payments, the overall likelihood of large earnings declines was below that seen in 2019 (20.6 percent versus 25.6 percent). Additionally, the progressive nature of these benefits even further offset the regressive nature of lost earnings. In 2020, workers in the bottom quintile of the earnings distribution were just 6.1 percentage points more likely to have large earnings declines than were workers overall (26.7 percent versus 20.6 percent). For comparison, in 2019, workers in the bottom quintile were 17.7 percentage points

more likely to have large earnings declines than workers overall, and during the Great Recession they were 15.8 percentage points more likely to have large earnings declines.[29] Consequently, after reflecting these public policy responses, large declines were less concentrated among the bottom of the distribution than in other recent years.

4. Conclusion

The COVID-19 recession was notable for the uneven nature of employment losses and earnings declines. Although the overall share of workers with large annual earnings declines was similar in 2020 to that seen in the Great Recession, the distribution of these earnings declines was quite different. In 2020, workers with earnings in the bottom two quintiles were more likely to have experienced large earnings declines than in the Great Recession, whereas workers in the top quintile were less likely to have experienced large earnings declines than in the Great Recession.

However, the progressive nature of the supplemental unemployment insurance benefits, as well as the Economic Impact Payments, offset the regressive distribution of large earnings declines in 2020. Once incorporating these benefits, the frequency of large earnings declines for the bottom quintile of the distribution was below that seen in 2019. Consequently, while the COVID-19 recession was remarkable for the extent to which it disproportionately affected lower-earning workers, the targeting of the fiscal response towards the lower end of the distribution was effective at limiting the frequency of large earnings declines among these low-earning workers.

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[29] During the Great Recession, the Economic Stimulus Act of 2008 provided taxpayers with up to $600 per person, with modest earnings requirements to receive the full benefit. We do not consider these stimulus payments here since they occurred in 2008. For additional details on these payments, as well as other stimulus measures during the Great Recession such as the payroll tax holiday, see Larrimore, Burkhauser, and Armour (2015).

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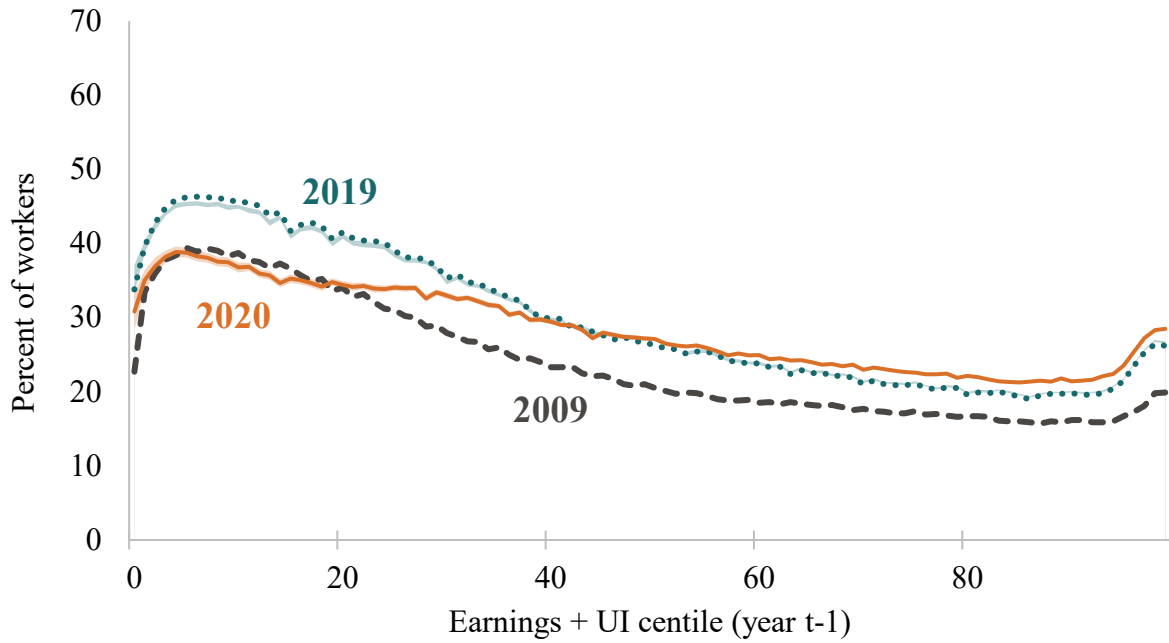
Figure A1. Share of workers with at least a 10 or 25 percent annual earnings decline (by year)
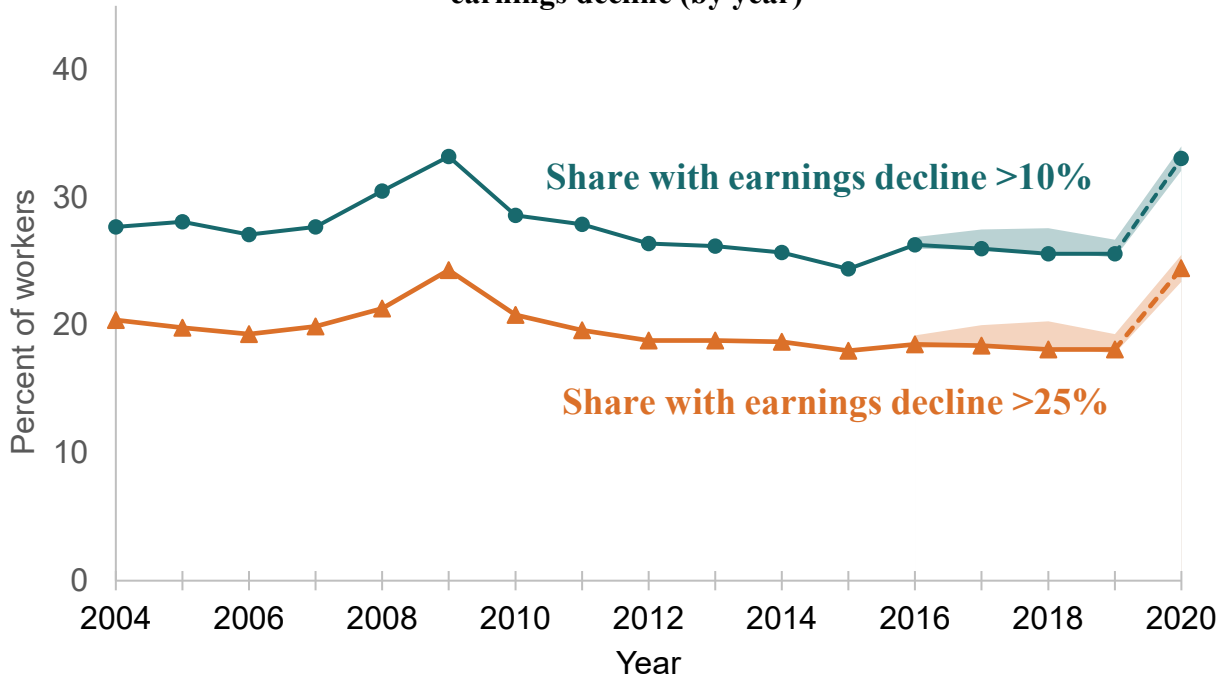
Source: Authors' calculations using IRS data from Form W-2.
Note: Among workers ages 25 and older with earnings or unemployment income in year t-1. Shaded regiosn reflect the expected ranges based on data as of early June after the end of the tax year. The 2020 point estimate reflects the midpoint of the expected range based on the data as of June 2021.
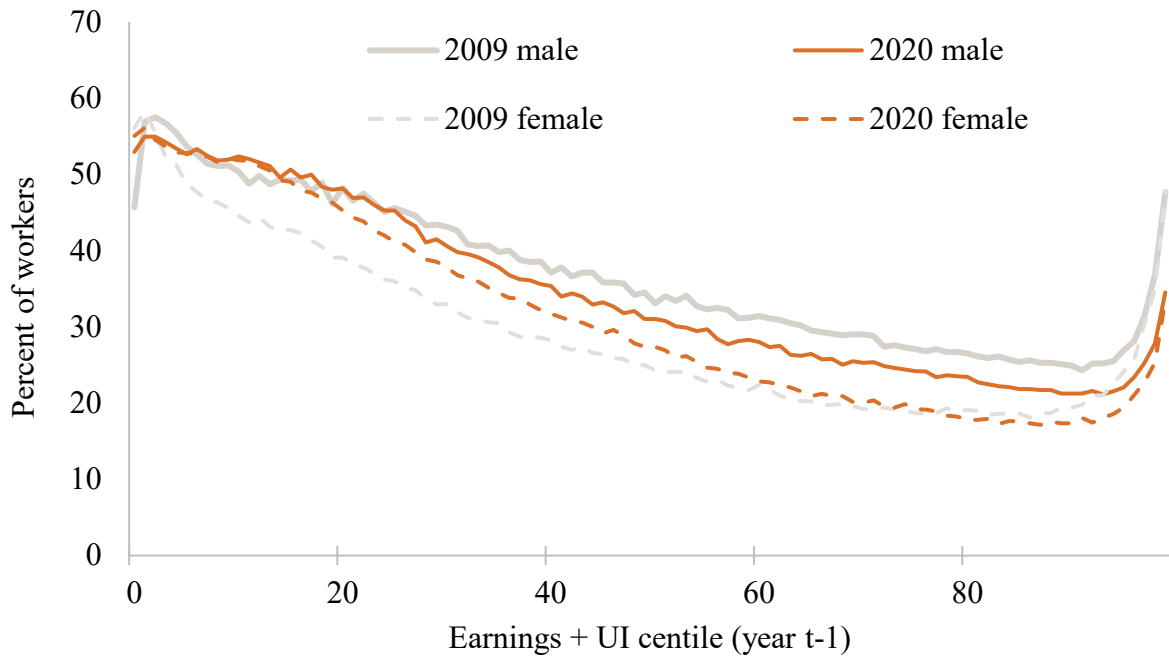
Figure A2. Share of workers with at least a 10 percent annual earnings increase (by prior year earnings + UI)

Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older in year t with earnings or unemployment income in year t-1. Shaded regions reflect the expected ranges based on data as of early June after the end of the tax year. The 2020 line is the midpoint of the expected range as of early June 2021.
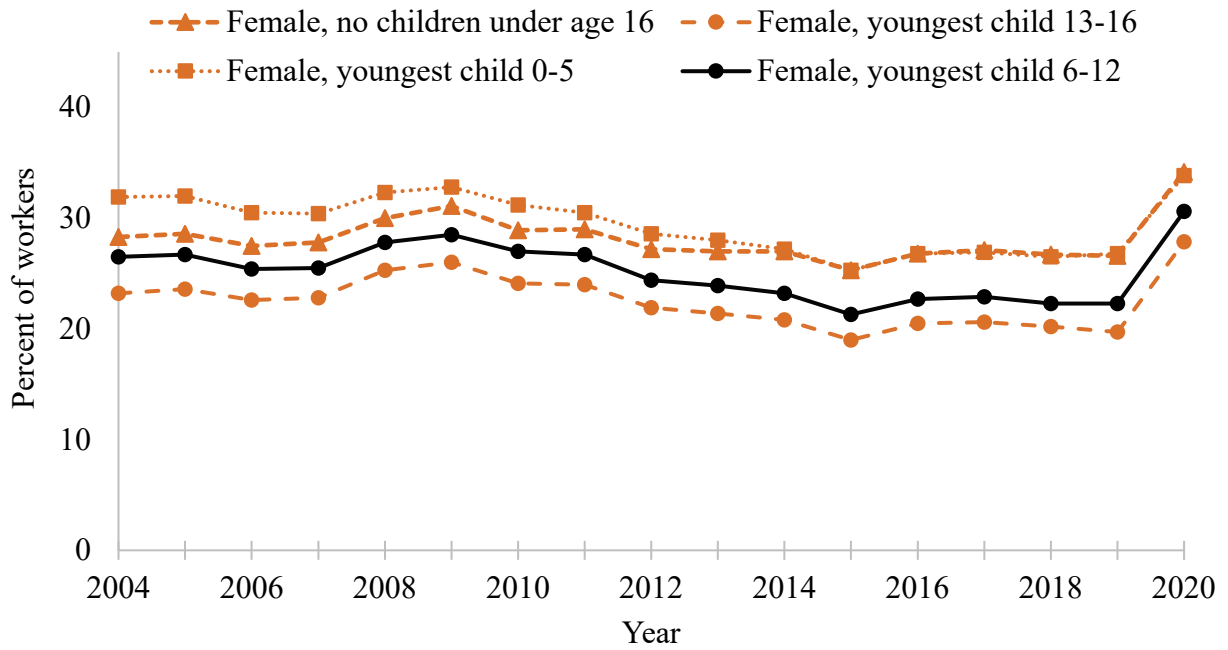
Figure A3. Share of workers with at least a 10 percent annual earnings decline (by sex and prior year earnings + UI)

Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older in year t with earnings or unemployment income in year t-1. The 2020 lines reflect the midpoint of the expected range as of June 2021.
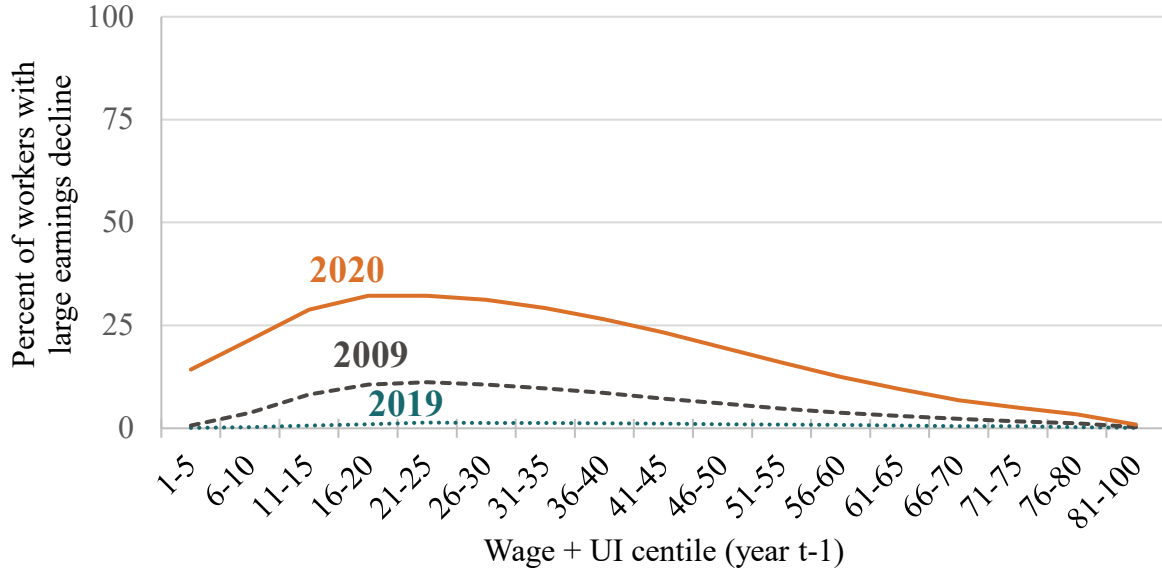
Figure A4. Share of female workers with at least a 10 percent annual earnings decline (by age of youngest child)

Source: Authors' calculations using IRS data from Forms W-2 and individual tax returns.
Note: Among workers ages 25 and older with earnings or unemployment income in year t-1. Child age is as of the end of the prior calendar year, based on information reported on dependent children on individual tax returns in that year. The 2020 point estimates reflect the midpoint of the expected range based on the data as of June 2021.

Figure A5. Share of workers (UI recipients and non-recipients) with at least a 10 percent annual earnings decline who have a complete earnings replacement from UI benefits (by prior-year earnings + UI)

Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older with wages or unemployment income in year t-1 with at least a 10 percent annual earnings decline in year t. Due to small sample sizes in some years, results are presented for 5 centile groups, except the top quintile which is aggregated into a single quintile.

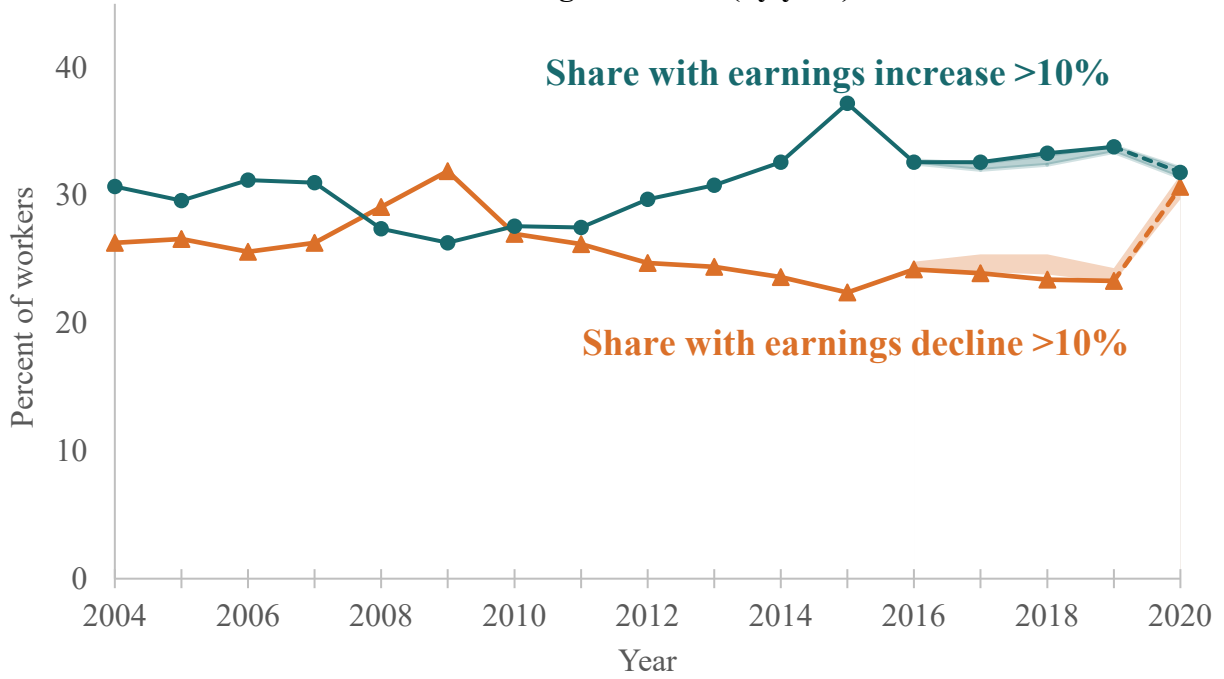**Figure A6. Share of workers with at least a 10 percent decline in annual earnings + UI + EIP (by prior year wages + UI)**
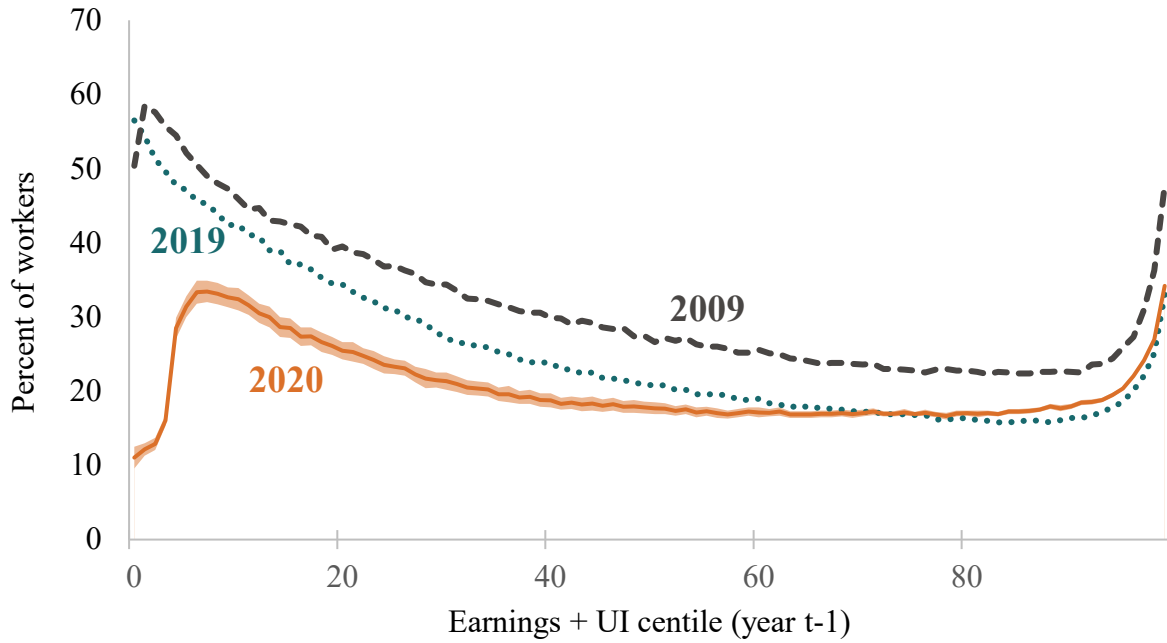
Source: Authors' calculations using IRS data from Forms W-2 and 1099-G.
Note: Among workers ages 25 and older in year t with earnings or unemployment income in year t-1. Shaded region reflects the expected range based on data as of early June. 2020 line is the midpoint of the expected range as of early June.

Figure A7. Share of workers with earnings changes among prime-age workers aged 25 to 54 (by year)

Source: Authors' calculations using IRS data from Form W-2.
Note: Among workers ages 25 to 54 in year t with earnings or unemployment income in year t-1. Shaded region reflects the expected range based on data as of early June after the end of the tax year. The 2020 point estimate is the midpoint of the expected range as of early June 2021.

Figure A8. Share of workers with at least a 10 percent decline in annual earnings among prime age workers ages 25 to 54 (by prior year earnings + UI)
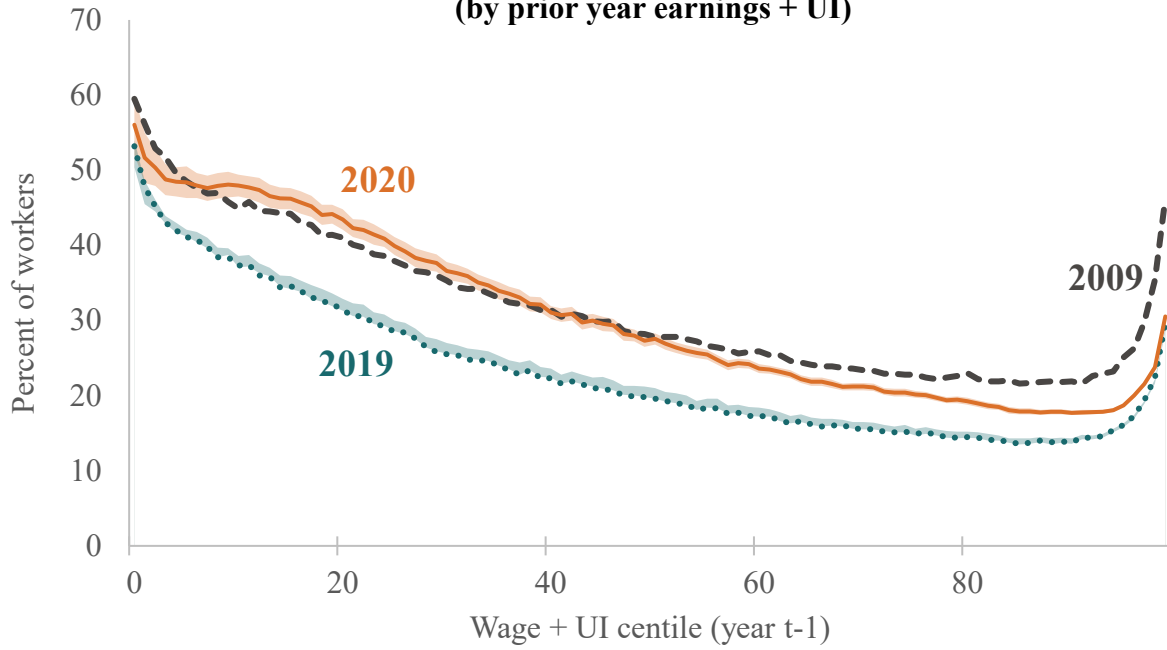
Source: Authors' calculations using IRS data from Form W-2 and 1099-G.
Note: Among workers ages 25 to 54 in year t with earnings or unemployment income in year t-1. Shaded region reflects the expected range based on data as of early June after the end of the tax year. The 2020 line is the midpoint of the expected range as of early June 2021.

Table A1. Summary of the earnings plus unemployment insurance distribution (by year)

	P20	P40	Median	P60	P80	5% Sample Count
2003	14,107	29,444	37,018	45,431	70,129	6,143,465
2004	13,907	29,545	37,241	45,797	70,959	6,202,507
2005	14,119	29,670	37,334	45,855	71,240	6,290,818
2006	14,334	29,926	37,620	46,226	72,110	6,397,812
2007	14,365	30,044	37,823	46,565	72,875	6,460,785
2008	14,278	29,647	37,354	46,080	72,389	6,512,357
2009	14,702	29,192	36,813	45,569	72,148	6,494,349
2010	14,199	28,412	36,080	44,930	71,844	6,585,934
2011	13,753	28,105	35,802	44,658	71,681	6,588,618
2012	13,726	28,310	36,050	44,892	72,151	6,632,243
2013	13,861	28,698	36,514	45,376	72,927	6,671,999
2014	14,041	29,259	37,167	46,148	74,160	6,725,158
2015	14,862	30,465	38,524	47,736	76,693	6,815,665
2016	15,211	30,875	38,854	48,074	77,010	6,920,432
2017	15,574	31,394	39,432	48,793	77,790	7,006,263
2018	16,026	32,001	40,080	49,484	78,799	7,101,070
2019	16,700	32,896	40,995	50,533	80,296	7,164,505
2020	18,134	33,331	41,272	50,647	80,639	7,346,924

Source: Authors' calculations using IRS data.
Notes: Among workers with positive earnings or unemployment insurance benefits in the specified year. Values reflect wage earnings as reported on Form W-2 plus unemployment insurance benefits as reported on Form 1099-G. Individuals without a Form W-2 or Form 1099-G as of June 2020 are excluded. All dollar amounts in chained-CPI adjusted 2020 dollars. Dollar amounts are blurred by averaging the five closest observations to a given centile breakpoint. The sample counts are reported in the final column. The sampling rate is 5 percent.

Table A2. Distribution of lost earnings replaced by unemployment insurance among individuals with at least a 10 percent earnings decline

	P10	P25	Median	P75	P90
2004	7	16	32	55	94
2005	7	16	33	54	92
2006	7	17	33	56	95
2007	7	16	33	55	91
2008	7	19	38	60	101
2009	12	30	56	85	152
2010	15	35	64	122	282
2011	12	30	55	101	221
2012	11	27	53	90	179
2013	10	24	46	75	140
2014	6	15	30	52	89
2015	7	16	31	53	89
2016	6	14	30	51	86
2017	6	14	30	51	88
2018	6	14	29	51	88
2019	6	14	29	50	86
2020	23	54	103	179	349

Source: Authors' calculations using IRS data.

Notes: Includes individuals with at least a 10 percent decline in Form W-2 wage earnings. Replacement rates are calculated as annual unemployment insurance benefits in year t divided by the change in wage earnings between year t–1 and year t. Centiles reflect the distribution of the individual-level replacement rates. Replacement rates are blurred by averaging the five closest observations to a given centile breakpoint.