

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 different. In 2020, workers starting in the bottom half of the distribution were more likely to experience an earnings decline of at least 10 percent. 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 105 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

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1. Introduction

The onset of the COVID-19 pandemic in 2020 led to massive labor market disruptions in the United States. Over March and April 2020, aggregate employment fell by approximately 20 percent, with many job losses occurring among low-wage workers (Cajner et al. 2020). For some workers, lost earnings were offset by substantial increases in unemployment insurance benefits. However, most survey data do not capture individual-level earnings changes and substantially underreport unemployment benefits. 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 extent that expanded unemployment insurance benefits and Economic Impact Payments (“stimulus” payments) offset the frequency of observed declines. While earnings declines were common and concentrated among low-earning workers in 2020, after including unemployment benefits the likelihood of an earnings decline of at least 10 percent among workers in the bottom half of the distribution was not only smaller than in the Great Recession, but also smaller than in 2019.

Administrative tax data provide one of the most comprehensive pictures of annual earnings. The Internal Revenue Service (IRS) receives information returns with annual earnings (Form W-2) and unemployment insurance benefits (Form 1099-G) for all workers and unemployment insurance recipients, even if they do not file a federal income tax return (Form 1040). These forms are designed to help taxpayers prepare their annual tax returns and provide the IRS with third-party reported income to reduce non-compliance. 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 data source, yielding information on earnings shortly after the end of each calendar year. We use these data to measure individual-level earnings from wages and salaries, excluding self-employment.¹

Consistent with the magnitude of labor market disruptions during the pandemic, many workers’ earnings declined. Relative to 2019, the share of workers age 25 and over with at least a 10 percent decline in annual earnings increased by between 7 and 8 percentage points in 2020. This frequency of earnings declines was similar to that at the depths of the Great Recession.

Yet the distribution of earnings declines in 2020 was different. Workers in the bottom two quintiles (earnings plus unemployment insurance below \$32,900 in 2019) were about 7 percent more likely to experience large earnings declines (of at least 10 percent) in 2020 than were workers at the same point in the distribution in 2009. Conversely, workers in the top quintile (earnings plus unemployment insurance over \$80,300) were about 16 percent *less* likely to have large earnings declines in 2020 than in 2009 during the Great Recession. Another difference is that while the Great Recession affected male workers more severely, slightly more female than male workers had large annual earnings declines during the pandemic.

¹ This paper focuses on what we can learn from IRS information return data that is available much earlier than the tax return data needed to consider self-employment income, although we plan to consider broader definitions in future work.

Although earnings declines in 2020 were common and concentrated among low-earning workers, some declines were offset by unemployment benefits. Most workers with large earnings declines did not receive unemployment insurance because the employment change was voluntary, they did not qualify, or they did not take up benefits. However, among those with large earnings declines who received benefits, unemployment insurance for the median recipient replaced 105 percent of lost annual earnings. This rate is far higher than in previous years and reflects the \$600 supplemental weekly unemployment insurance benefits and 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.

While 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 used survey data to monitor employment trends during the recession. This survey-based research has found disproportionately high rates of job losses among workers in low-wage occupations, with less education, with low-income, or who are younger (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, Montenegro et al. 2020). Moffitt and Ziliak (2020) also use the COVID Impact Survey to track social safety net programs during the pandemic, concluding that the magnitude of increases in reciprocity rates are consistent with earlier recessions.

Despite providing valuable information on job losses and take-up of assistance programs, surveys 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. We find that the widely-used Current Population Survey (CPS) underreports more than half of unemployment benefits during the recession. Consequently, it will underestimate the effectiveness of these benefits at offsetting lost earnings. Additionally, Rothbaum and Bee (2021) note that survey non-response errors may be larger than usual during the pandemic. Administrative tax data do not have these same limitations and can complement lessons learned about the COVID-19 recession from surveys.

In addition to survey-based research, others have used data from states and private companies to monitor unemployment insurance receipt during the pandemic and capture the trends in claims. For example, Bell et al. (2020) use California data to explore the demographic profiles of unemployment benefit recipients. 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) similarly use 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 individual-level unemployment benefit receipt 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.² Additionally, using the panel component of tax data, we observe where in the distribution annual earnings declines occurred during the pandemic. Finally, using estimates of Economic Impact Payments, we illustrate the extent to which these payments further offset earnings declines.

2. Data and Methods

This paper primarily uses data 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. Form 1099-G includes all unemployment insurance benefits received. In 2020, this includes conventional benefits, expanded payment amounts, and newly eligible individuals. In addition, we use IRS records tracking Economic Impact Payments (EIPs) sent during 2020. Our data include all forms entered into the IRS system as of September 17, 2021. As of this date, there were 241.4 million unique W-2s for 168.7 million workers for tax year 2020.³ At the same point in 2020, this file included 254.2 million W-2s from tax year 2019, which was nearly 98 percent of all W-2 forms for that year.

To estimate 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 under age 17.⁴ In the case of a married couple filing jointly, we divide combined EIPs (including payments for dependent children) equally between the two filers. Since we observe actual EIP receipt, eligible individuals who did not receive an EIP payment in 2020 are correctly captured as having not received one, although some may have later received a recovery rebate credit in 2021 when filing their tax return.

We draw a random 5 percent sample of all individuals appearing in tax data from 2003 to 2020, which is sufficiently large to have minimal sampling error. The sampling procedure—based on the last three digits of masked individual Taxpayer Identification Numbers—is representative of the resident U.S. population (Cilke 2014; Larrimore, Mortenson, Splinter 2021) and similar data are used in Mortenson, Schramm, and Whitten (2019) and Goodman et al. (2021). Before drawing the sample, all 1099-G and W-2 forms are retrieved from the population of tax records, as well as individuals' sex, birthday, and date of death from the Social Security Administration's DM-1 file. To avoid earnings fluctuations among young adults with loose labor force connections, we restrict

² Ganong, Noel, and Vavra (2020) and Cortes and Forsythe (2020b) simulate statutory replacement rates using survey data. Bartik et al. (2020) and Finamor and Scott (2021) study disincentive effects of unemployment benefits during the pandemic.

³ "Unique" means only one Form W-2 is considered for each individual from each employer in each year. An employer can file multiple W-2s for a single employee, in which case we retain the most recent non-missing amount for an employer-employee combination. Individuals can receive W-2s from multiple employers, each of which are included.

⁴ The Consolidated Appropriations Act of 2021 was signed into law in December, creating the second round of EIPs. EIP distributions began immediately: "The IRS reports issuing 147 million advance payments...totaling \$142 billion as of December 29, 2020." (Treasury Inspector General for Tax Administration 2021, pg. 3). We include these second round EIPs if paid in 2020.

our sample to adults aged 25 and older. To capture the effects of recessions on retirement, we include anyone under age 100, although in the online appendix, we also provide results for just prime-age adults. These results are qualitatively similar, although large earnings declines are less common among prime-age adults and the frequency of large earnings declines among low-earners is somewhat closer in 2009 and 2020 for prime-age adults than for all adults.

We construct two-year panels from these data to track annual earnings and unemployment benefits from one year to the next for the same individuals. These panels include anyone in year $t-1$ with wage or unemployment benefits reported on Form W-2 or 1099-G. Included individuals are followed in the subsequent year t . Individuals are included if they have earnings or unemployment benefits 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 total observations between 2003 and 2020.

All data are analyzed at the individual level. W-2 and 1099-G forms are aggregated across all sources to measure each individual's total earnings and total unemployment benefits. We do not consider other income sources or the sharing of resources between people since the information necessary to do so is not in the information returns used for this paper (for tax-unit level income mobility estimates in earlier years, see Larrimore, Mortenson, and Splinter 2016). All amounts are adjusted to 2020 price levels using the chained-CPI and earnings changes always refer to real inflation-adjusted changes.

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 1099-G can be treated as having zero (reported) earnings and unemployment benefits in that year (although many have income from non-wage sources). However, prior to the completion of data processing, taxpayers may have no Form W-2 because it has not yet been processed. Additionally, some workers with multiple jobs may have just one Form W-2 processed, and therefore appear to have lower earnings than actually earned. Since one contribution of this paper is providing an earlier analysis of annual earnings trends, it is necessary to estimate how many people have missing earnings due to processing delays and how this affects the 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 W-2 forms 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 workforce exits. These exits are based on historical results. Since 2004, the share of adults who were working in one year but not the next ranged from 6.3 percent (in 2018) to 8.9 percent (in 2009). We treat this as the likely range of actual workforce exits in 2020.⁵ Based on

⁵ Consistent with our findings and this assumption, Von Wachter (2021) estimates a smaller decline in 2020 of the employment-to-population ratio than in 2009.

Form W-2 data through September 17, 2021, 7.2 percent of people with a 2019 Form W-2 did not yet have a processed 2020 Form W-2. Comparing the 7.2 percent to the historical range of 6.3 to 8.9 percent, we are well within the historical range but assume that up to 0.9 percent of people who were working in 2019 may have a 2020 Form W-2 that was not yet processed. This bounds our estimated range of how many potential late-processed forms remain.⁶ In order to 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 late-processed forms. Although we currently estimate relatively few Form W-2s remain to be processed, this procedure is particularly important for using earlier data to estimate the final distribution. In April, when we were first able to observe W-2 data, 11.9 percent of people with a 2019 W-2 did not yet have one for 2020, but this approach allowed us to obtain an estimate the distribution of earnings declines that is extremely similar to the distribution we see with more complete data from September (see the online appendix for details).

The second step is to determine the likely earnings for individuals 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 2016.⁷ Between 2016 and 2019, an average of 24.9 percent of people with no Form W-2 as of September, but whose Form W-2 was processed later in the year, had an annual earnings decline of at least 10 percent. We assume that the distribution of earnings changes for those with late-arriving forms will be similar in 2020.

We test these procedures by comparing early and final data in 2019. Using the methods described here, data for 2019 as of September 2020 suggested that between 25.4 and 25.6 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 changes, defined as a change of 10 percent or more (large declines also include those going from positive to zero earnings). In recent years, around one-fourth of workers had large earnings declines. 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 (see CB0 2008).⁸

During the two most recent recessions, about one-third of workers had large earnings declines. The 33 percent of workers who had large earning declines in 2009, during the Great

⁶ In addition to people who have no earnings because their form has not been processed, a small number of people had only one of multiple W-2 forms processed. Based on prior-year data, we estimate that 0.3 percent of people with large earnings declines based on September data will have another form arrive that shows their earnings did not substantially decline.

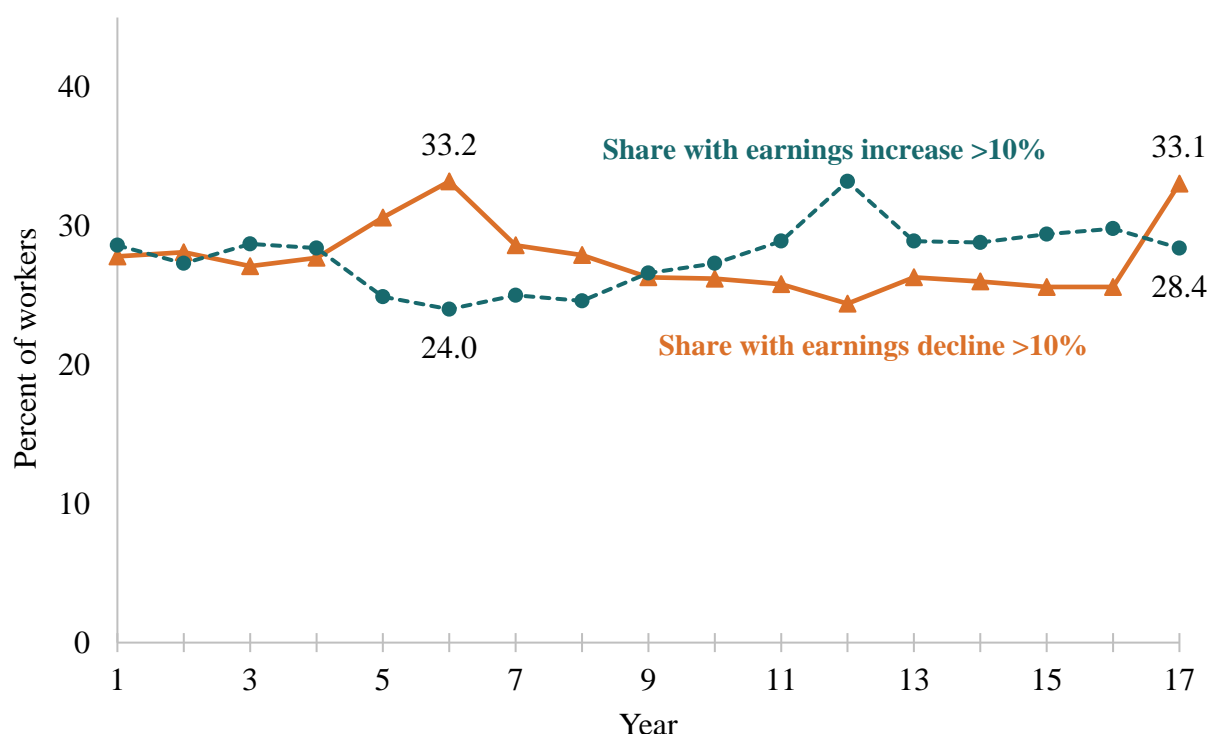
⁷ Only years since 2016 are used here because the Form W-2 deadline was moved forward in the Protecting Americans from Tax Hikes Act of 2015.

⁸ These earnings losses are associated unemployment spells, but also with changing jobs or industry, interstate moves, older age, and divorce (Larrimore, Mortenson, and Splinter 2016).

Recession, and in 2020 were the highest shares observed since 2004.⁹ In 2020, the increase in the share with large earnings declines from the 2019 “baseline” was 7.5 percentage points.¹⁰

Conversely, the share with large earnings *increases* in 2020 greatly exceeded that seen in the Great Recession. In 2020, 28 percent of workers experienced large earnings increases—down 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 2009.¹¹

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. The 2020 point estimates reflect the midpoints of the expected ranges based on the data as of September 2021.

⁹ In all cases, point estimates are the midpoint of our expected range for 2020 after the imputation. This range is usually relatively small—our expected range in 2020 based on the September data was 32.6 percent to 33.5 percent. 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.

¹⁰ For comparison, von Wachter (2021) estimates employment-to-population ratio declines of 4 and 5 percentage points for mid-2009 and 2020. The greater increase in the share with large earnings declines is in part because the large-earnings-decline measure includes some people who were only temporarily laid off or furloughed. We note, however, that our measure misses people laid off for a short period whose *annual* earnings decline was less than 10 percent.

¹¹ In addition to current workers with earnings increases, some people enter the workforce after not working the prior year. Since this paper focuses on earnings declines, these individuals are not in our sample, although this is another margin where workers may be affected.

A second difference is that the adverse employment and earnings effects of the COVID-19 recession were more concentrated among low-earning workers than in the Great Recession. Panel A of Figure 2 displays the share of workers with at least a 10 percent annual decline in earnings, ranked by their prior-year earnings (defined as individual-level earnings plus unemployment insurance to maintain consistent centile rankings throughout the paper).¹² Three years are displayed: 2009, 2019, and 2020.¹³ Relative to 2019, large earnings declines were more prevalent throughout the distribution in the two recession years. But the two recessions differ from each other. In the COVID-19 recession, workers with earnings in the bottom two quintiles of the distribution were 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, 51.4 percent experienced large earnings declines in 2020, compared to 48.2 percent in 2009. Similarly, among workers in the second quintile, 39.7 percent experienced large earnings declines in 2020, compared to 37.4 percent in 2009. Hence, in the bottom two quintiles, workers were 6 to 7 percent (2 to 3 percentage points) more likely to experience large earnings declines in 2020 than during the Great Recession. Among higher-earning workers, however, 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.

The distribution of earnings increases differs substantially from the distribution of earnings decreases. Panel B of Figure 2 shows that workers in the bottom quintile of the prior-year earnings distribution were similarly likely to experience large earnings increases in 2009 and 2020, but above the 20th percentile, workers were more likely to see a large increase in 2020. Workers in the top half of the earnings distribution in 2020 were 33 percent (6 percentage points) more likely to have large earnings increases than similar wage workers in the Great Recession. This provides further evidence of how adverse earnings repercussions of the COVID-19 recession were concentrated among lower-earning workers.

One potential concern with comparing to 2009 is that the labor market challenges from the Great Recession extended over multiple years so one-year earnings changes may understate its severity. We therefore also considered two-year earnings changes from 2007–2009 and 2018–2020. When doing so, the two years of the Great Recession are collectively more severe than the start of the COVID-19 recession (see the online appendix for details). The overall frequency of earnings losses exceeding 10 percent from 2007–2009 (39.4 percent of workers) exceeds the

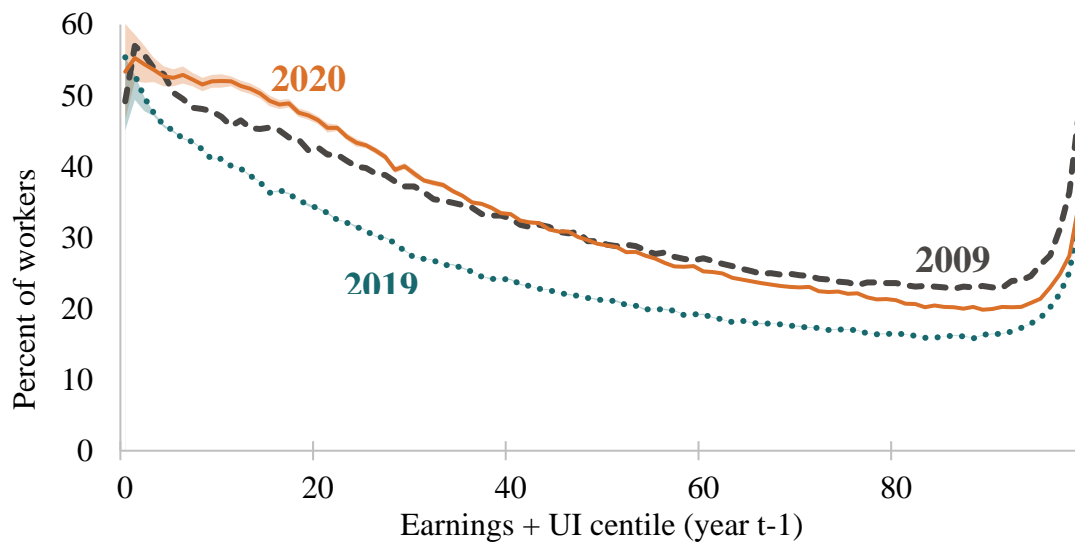
¹² In the small number of cases where an individual has only unemployment insurance income in year $t-1$, they are treated as not having a large earnings decline since prior-year earnings were zero.

¹³ 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).

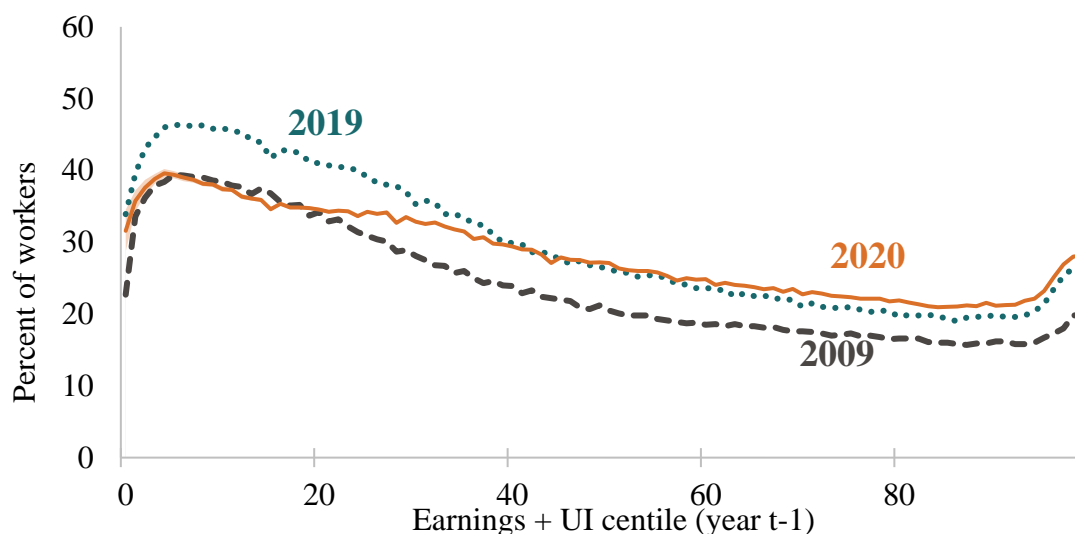
frequency from 2018–2020 (35.6 percent). However, we confirm that relative to the Great Recession the earnings losses in the COVID-19 recession were disproportionately concentrated among low-earning workers. Low-earnings had similar rates of *two-year* declines in earnings from 2018–2020 as 2007–2009, whereas high-earning workers had lower rates of two-year earnings declines from 2018–2020.

Figure 2. Share of workers with at least a 10 percent annual earnings decrease or increase (by prior-year earnings + UI)

Panel A. Share with at least a 10 percent annual earnings decrease



Panel B. Share with at least a 10 percent annual earnings increase



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 September and the 2020 line is the midpoint of the expected range as of early September 2021.

B. Earnings Declines by Sex and Parental Status

Early survey data in the COVID-19 recession suggested that furloughs and job losses were particularly prevalent among female workers, unlike the Great Recession (Alon et al. 2020, Albanesi and Kim 2021). Additionally, recognizing that childcare responsibilities often fall predominantly on mothers, women indicated that 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).

We find that the repercussions of the COVID-19 recession across male and female workers differed substantially from the Great Recession. In the Great Recession, 35.6 percent of male workers experienced large earnings declines, compared to 30.6 percent of female workers. In the COVID-19 recession, earnings declines were more similar for male and female workers: 32.8 percent of males who were working experienced a large earnings decline compared to about 33.4 percent of female workers. However, while women were slightly more likely to experience earnings declines overall, at almost all points in the earnings distribution, males were more likely to have large earnings declines than females. For example, 30.9 percent of males in the middle quintile of the earnings distribution had large earnings declines compared to 27.6 percent of females. The finding that females are slightly more likely to experience large earnings declines while being less likely to experience declines after controlling for prior-year earnings occurs because males are generally higher in the earnings distribution and the likelihood of annual earnings declines is decreasing in earnings.

We also find evidence that mothers of school-age children were somewhat slightly more likely to experience large earnings declines. When assigning children based on prior-year tax returns (therefore missing the small number among non-filer working mothers), among mothers whose youngest child is of primary-school age (age 6 to 12), there was an 8.3 percentage point increase in the share having large earnings declines in 2020 relative to 2019. This is slightly above that seen for females without children (7.8 percentage point increase) or mothers of children under age 6 (7.3 percentage point increase), consistent with a school closure effect. However, we cannot rule out that this finding is attributable to other individual characteristics, as suggested by Furman, Kearney, and Powell (2021).

C. Unemployment Insurance Effects on Earnings Declines

The CARES Act included several provisions to 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.¹⁴ As a result of these additional benefits, the share of

¹⁴ Unemployment benefits were expanded to cover independent contractors with Pandemic Unemployment Assistance. 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, such as the Paycheck Protection Program that may have mitigated job separations that otherwise would have occurred (Granja et al. 2020).

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.

In the IRS data, we observe just over 44 million unemployment insurance recipients received \$548 billion of benefits in 2020.¹⁵ This matches the Bureau of Economic Analysis' estimate that \$549 billion of benefits were paid in 2020. However, this is far above the \$218 billion of benefits paid to 24 million recipients observed in the CPS. Consequently, this suggests that the CPS understated unemployment insurance benefits by 60 percent in 2020, nearly double the underreporting rate observed by Larrimore, Mortenson, and Splinter (2020) during the Great Recession.

What share of workers with large earnings declines received unemployment insurance benefits? Evidence from survey data previously found that most unemployed workers did not receive unemployment benefits (Bitler, Hoynes, and Schanzenbach 2020, Moffit and Ziliak 2020). Similarly, we find that more than half of workers with large earnings declines did not receive unemployment insurance benefits in 2020, as only 42 percent of these workers received benefits.¹⁶ 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 only those laid off. Hence, we should not expect all people with earnings declines to receive unemployment insurance benefits. The 42 percent of workers with large earnings declines who received unemployment insurance benefits is much higher than the 9 percent in 2019 and the 27 percent during the Great Recession in 2009. As seen in panel A of Figure 3, the likelihood of receiving unemployment insurance in 2020, conditional on having a large earnings decline, is greatest among workers in the 2nd and 3rd quintiles of the distribution.

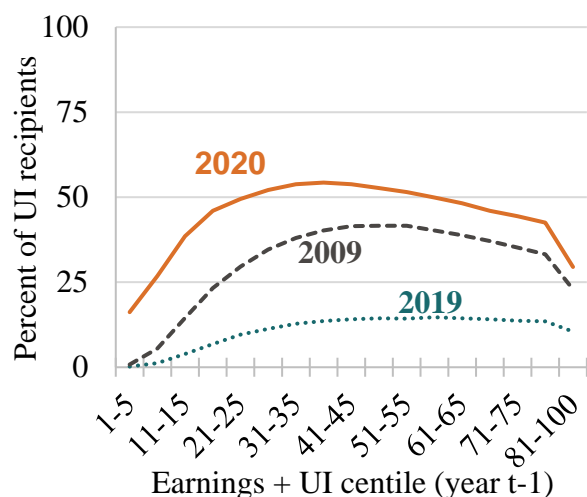
Among those who received unemployment insurance benefits, the share of lost earnings that were replaced was far higher in 2020 than in previous years. This is consistent with the supplemental unemployment insurance benefits provided. When interpreting these results, we emphasize that because earnings 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. However, it provides advantages since the ratio also reflects weeks with no unemployment benefits due to gaps in coverage or benefit expiration.

¹⁵ As of September 17, 2021, there were 41 million people with processed Forms 1099-G for tax year 2020, with benefits totaling \$503 billion. However, the data appear incomplete, especially for New York State. We therefore supplement the 1099-G data with information from Form 1040 where people self-report unemployment insurance receipts. In cases where a filer reports unemployment insurance on Form 1040 but does not have a corresponding 1099-G, we include their self-reported unemployment insurance benefits. For married couples with unemployment insurance on their Form 1040 and no 1099-G with unemployment insurance, we allocate the unemployment insurance to the spouse with an earnings decline if only one had lost earnings and otherwise split it equally. Including these benefits from Form 1040 results in \$548 billion in benefits in 2020.

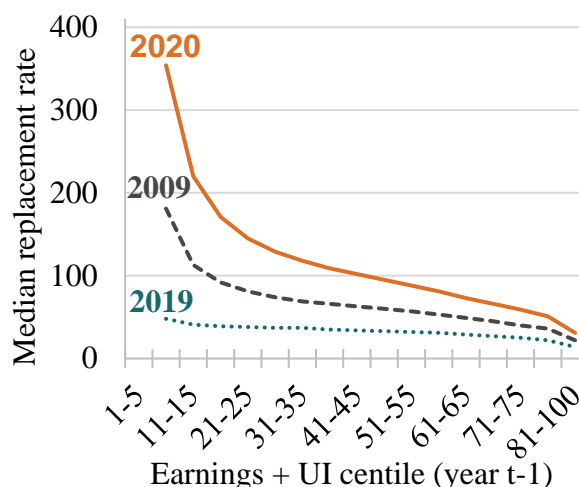
¹⁶ Among unemployment insurance recipients, 57 percent had wage earnings declines of at least 10 percent, 19 percent had earnings decreases or increases of less than 10 percent, and 17 percent had earnings increases of at least 10 percent.

Figure 3.
Unemployment Insurance Reciprocity and Replacement Rates (by prior-year earnings + UI)

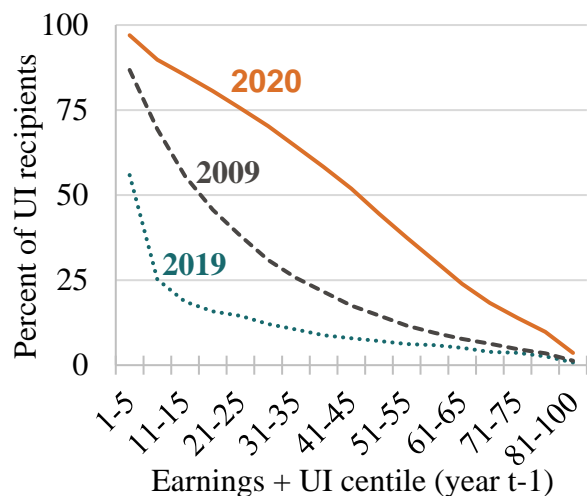
Panel A. Share of workers with large earnings declines who receive UI benefits



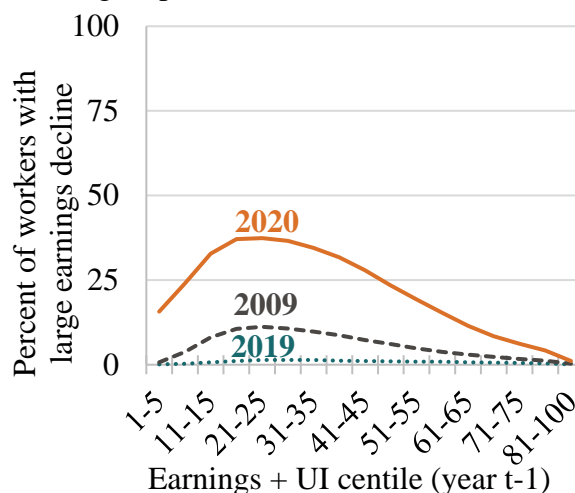
Panel B. Median replacement rate among UI recipients with large earnings decline



Panel C. UI recipients with large earnings declines who have a complete earnings replacement



Panel D. Share of all Workers with large earnings declines who have a complete earnings replacement



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. 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. Results for the median replacement rate are suppressed for the bottom 5 percent due to the low baseline earnings resulting in particularly large median replacement rates.

Unemployment insurance beneficiaries who suffered large annual earnings declines in 2020 saw a median of 105 percent of their lost earnings covered by unemployment insurance. 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 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 still well below those in 2020.

Consistent with the high median replacement rate in 2020, benefits frequently exceeded 100 percent of lost annual earnings. In 2020, 52.8 percent of unemployment insurance beneficiaries with large annual earnings declines received benefits that met or exceeded their annual earnings decrease. In 2009, the analogous share was 19.2 percent, and in 2019 only 7.7 percent of workers received complete replacement.¹⁷

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 beneficiaries had higher shares of lost earnings replaced and were the most likely to completely replace their lost earnings (panels B and C of Figure 3). Among unemployment insurance recipients in the bottom quintile of the 2019 earnings distribution with large earnings declines in 2020, 86.3 percent received enough unemployment insurance benefits to completely replace their lost earnings (which averaged \$5,500 for the bottom quintile). The corresponding estimates for unemployment insurance recipients in the middle quintile and top quintile were 42 percent and 3.6 percent, respectively. In 2009 and 2019, low-earning unemployment insurance recipients were also most likely to have a complete earnings replacement, but the shares with complete earnings replacement were well below that seen in 2020.

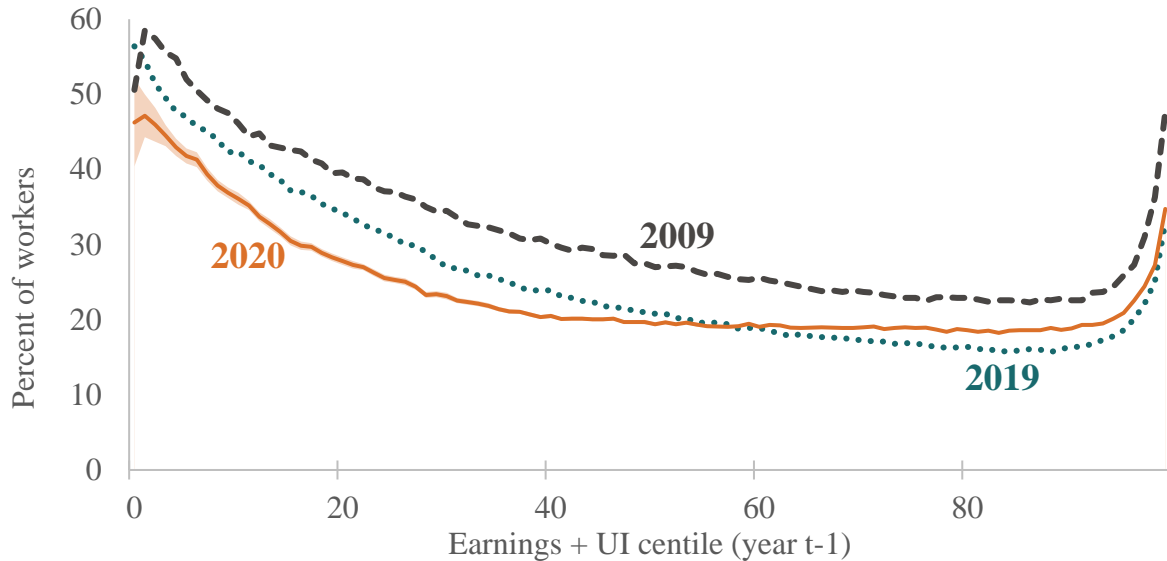
Complete earnings replacement is far less common, however, when recognizing that nearly 6 out of 10 workers with large earnings declines did not receive unemployment insurance (in some cases because they were not eligible for benefits). Among all workers with large earnings declines in 2020, only 22 percent had a complete replacement of lost wages. Among the bottom quintile, where high replacement rates were more common (but unemployment insurance reciprocity rates are low), 27 percent of workers with large earnings declines had a complete replacement from unemployment benefits (panel D of Figure 3). 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 reciprocity 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. Panel A of Figure 4 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.

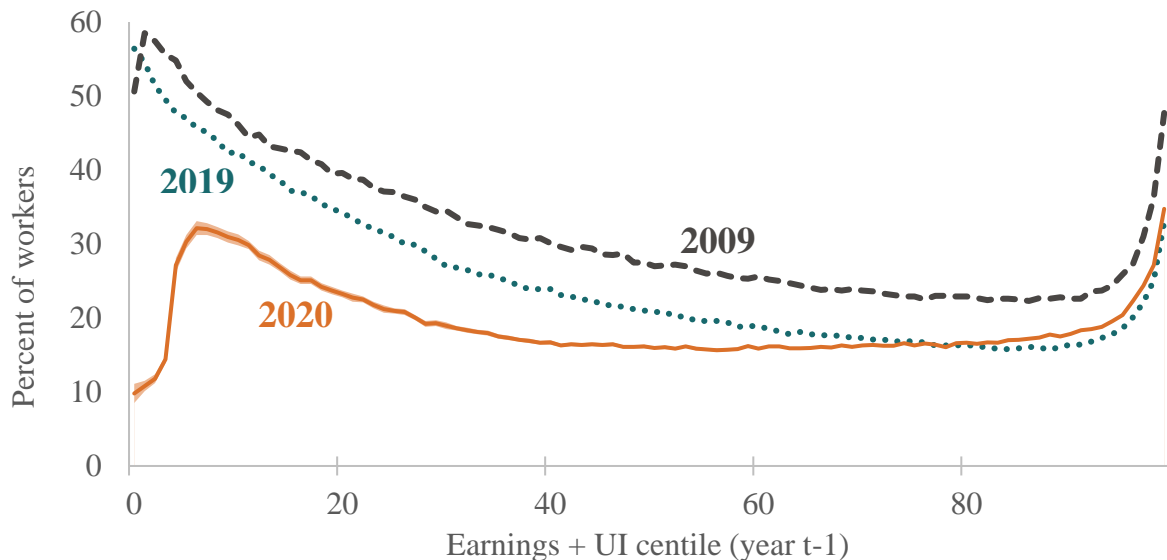
¹⁷ Workers can have over a 100 percent annual wage replacement even if statutory replacement rates are below 100 percent because we focus on annual rather than weekly measures. For example, a worker may have a replacement rate of over 100 percent if the duration of unemployment is long relative to prior-year weeks worked.

Figure 4. Share of workers with at least a 10 percent decline in annual earnings plus public support programs (by prior-year earnings + UI)

Panel A. Share with at least a 10 percent decline in annual earnings + UI



Panel B. Share with at least a 10 percent decline in annual earnings + UI + EIP



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 September and the 2020 line is the midpoint of the expected range as of early September 2021.

Large earnings declines after including unemployment insurance were *less* common in 2020 than in 2019 among those in the bottom two quintiles of the distribution. Yet, large earnings declines remained more common in 2020 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 2020.¹⁸

D. Economic Impact Payments Effects on Earnings Declines

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

As seen in panel B of Figure 4, EIPs dramatically reduce the likelihood of large declines among workers at the bottom of the distribution, for whom these payments represent a large share of earnings. Table 1 shows the share of workers in each quintile of the prior-year distribution with large earnings declines in 2020 when considering wages, wages plus unemployment insurance benefits, and wages plus unemployment insurance and EIPs. 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	51.4	37.0	24.9	42.2	43.3	48.2	47.6
2nd quintile	39.7	23.6	19.5	28.5	28.3	37.4	34.6
Middle quintile	29.2	19.7	16.1	21.3	21.0	29.6	27.6
4th quintile	23.1	18.9	16.2	17.6	17.4	24.8	23.8
Top quintile	21.8	20.6	19.6	18.3	18.2	25.9	25.6
Overall	33.1	24.0	19.3	25.6	25.6	33.2	31.8

Source: Authors' calculations using IRS data from Forms W-2, 1099-G, 1099-SSA, and 1040.

Note: 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 September 2021.

¹⁸ In addition to comparing the share with a large earnings changes, in the online appendix we also consider the median change by vigintile of the distribution. This further confirms that the COVID-19 recession particularly affected the earnings of low-earning workers but that enhanced unemployment benefits helped offset these regressive effects.

In 2020, the inclusion of unemployment insurance benefits reduces the share with large earnings declines from 33.1 percent to 24 percent. This reduction was concentrated among workers in the bottom three quintiles of the distribution. When also including the effects from EIPs, only 19.3 percent of workers experienced large declines. In the bottom quintile, EIPs reduced the likelihood of large declines by just over 12 percentage points, from 37 percent to 24.9 percent. The pronounced effect in this range reflects that the bottom quintile had annual wage earnings plus unemployment insurance of less than \$16,600 in 2019. Hence, the \$1,800 per adult EIPs represented a sizeable share of earnings among this group and often made up for any lost earnings.

When including the EIPs, the overall likelihood of large earnings declines in 2020 was below that seen in 2019 (19.3 percent versus 25.6 percent). Additionally, the progressive nature of these benefits helped offset the regressive nature of lost earnings. In 2020, workers in the bottom quintile of the earnings distribution were just 5 percentage points more likely to have large earnings declines than were workers overall (24.9 percent versus 19.3 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.¹⁹ Consequently, after incorporating policy responses from unemployment insurance and EIPs, large earnings declines were both less common and 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 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 supplemental unemployment insurance benefits, as well as 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.

¹⁹ 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 stimulus measures during the Great Recession, see Larrimore, Burkhauser, and Armour (2015).

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For helpful comments and discussions, we thank Thomas Barthold, David Buchholz, Richard Burkhauser, Jim Cilke, Kevin Corinth, Meredith Decker, Tim Dowd, Peter Ganong, Geoffrey Gee, Ed Harris, Thomas Hertz, Kimberly Kreiss, Bruce Meyer, James Pearce, Kevin Pierce, John Sabelhaus, Claudia Sahm, Mike Zabek, Jim Ziliak, Eric Zwick, anonymous referees, and participants of the 2021 IRS-Census Income Measurement Workshop, National Tax Association Conference, and Haverford College seminar series. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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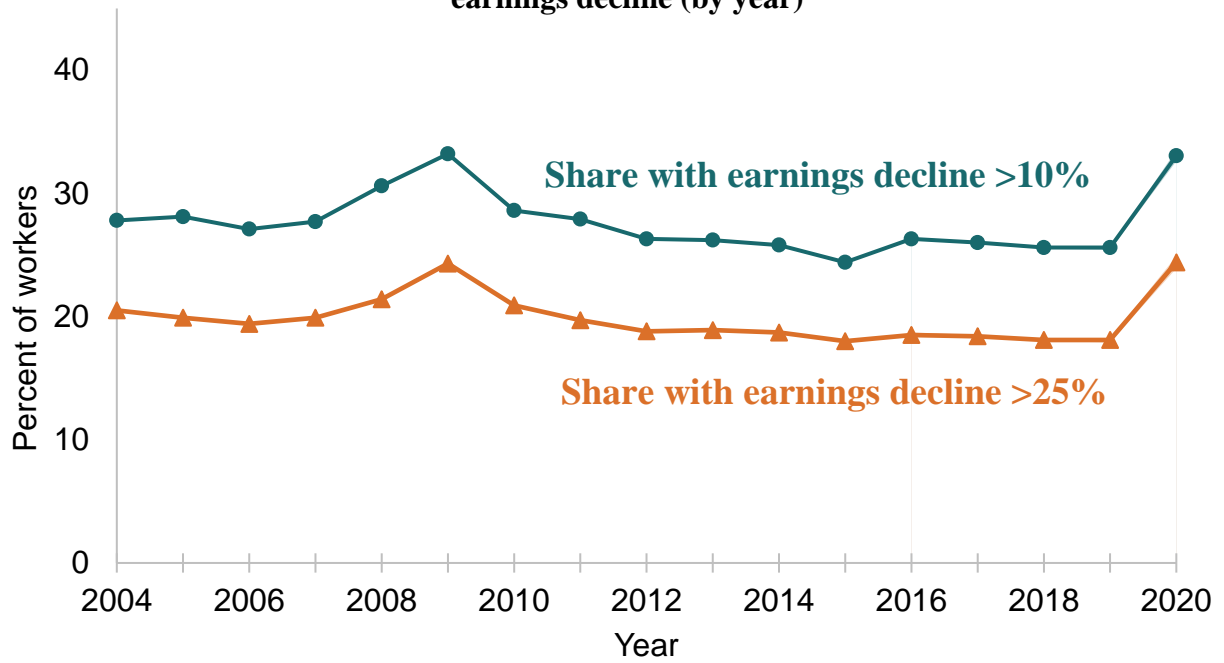
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ONLINE APPENDIX

Earnings Shocks and Stabilization During COVID-19

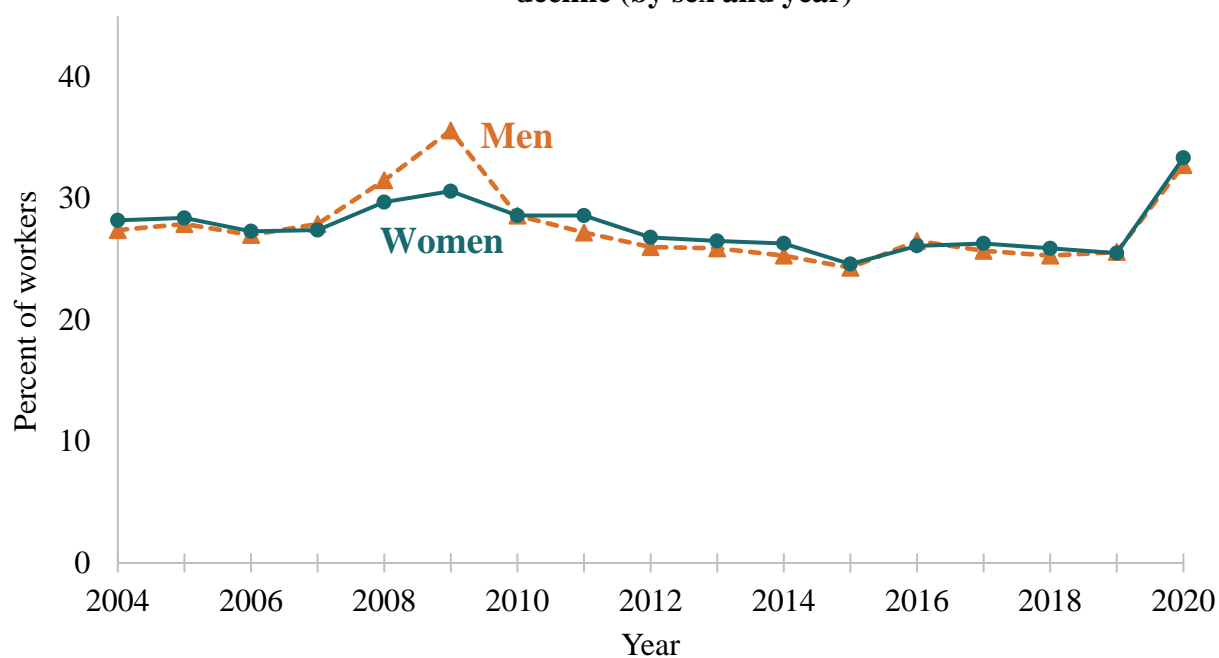
Figure A1. Share of workers with at least a 10 or 25 percent annual earnings decline (by year)



Source: Authors' calculations using IRS data from Form W-2.

Note: Among workers ages 25 and older with earnings or unemployment income in year $t-1$. The 2020 point estimate reflects the midpoint of the expected range based on the data as of September 2021.

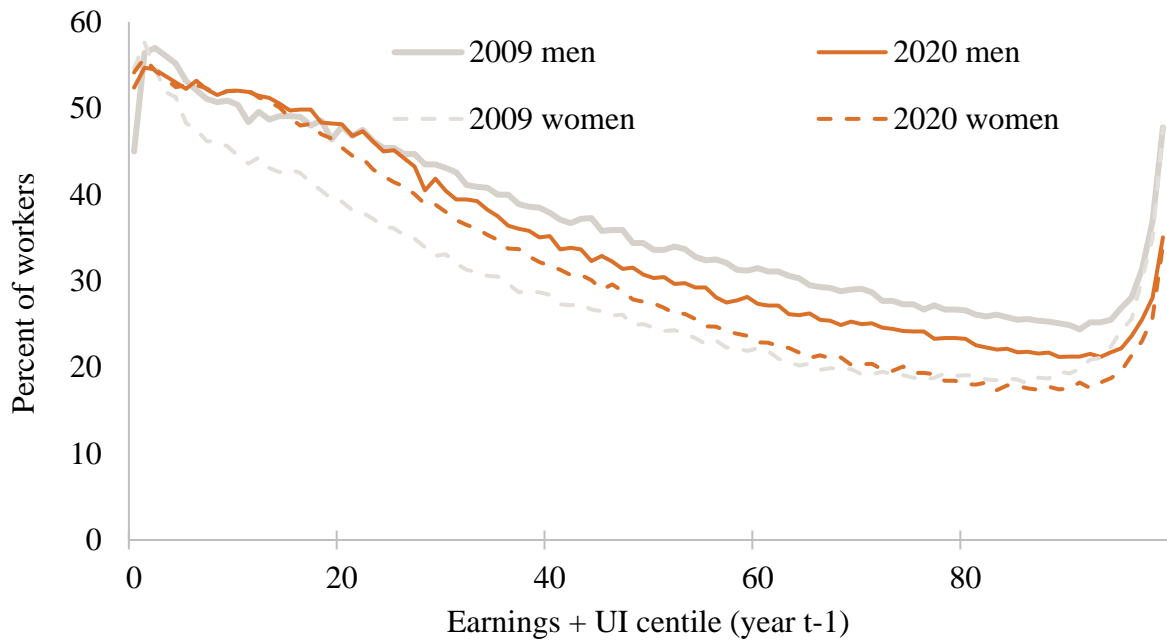
Figure A2. Share of workers with at least a 10 percent annual earnings decline (by sex and year)



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. The 2020 point estimates reflect the midpoint of the expected range based on the data as of September 2021.

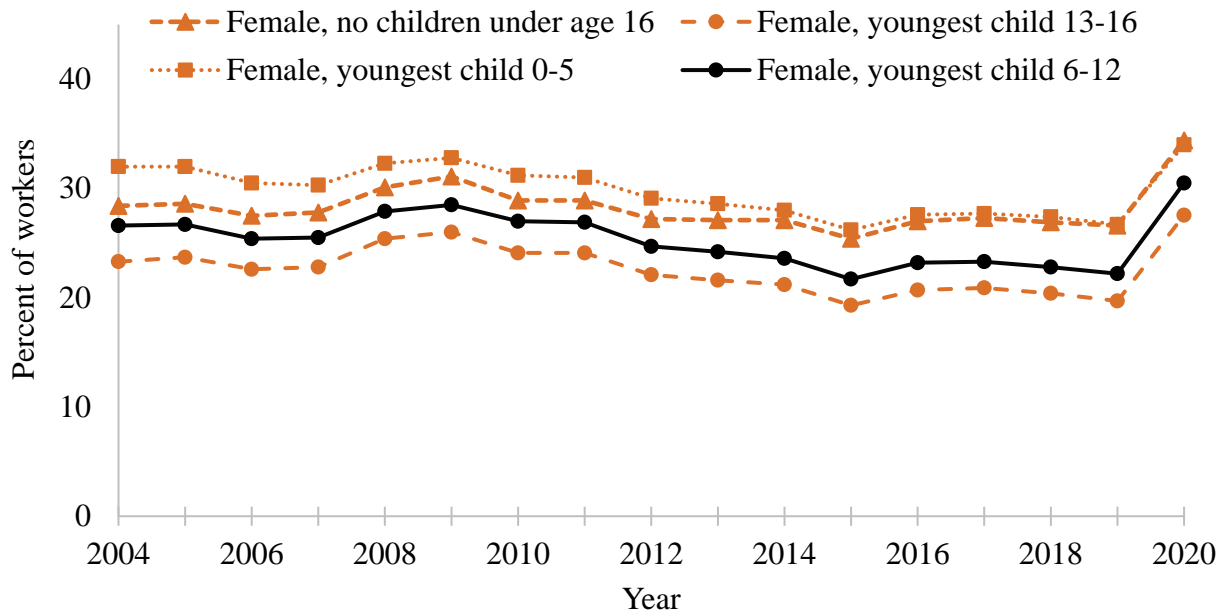
Figure A3. Share of workers with at least a 10 percent annual earnings decline (by sex and prior year earnings + UI)



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 September 2021.

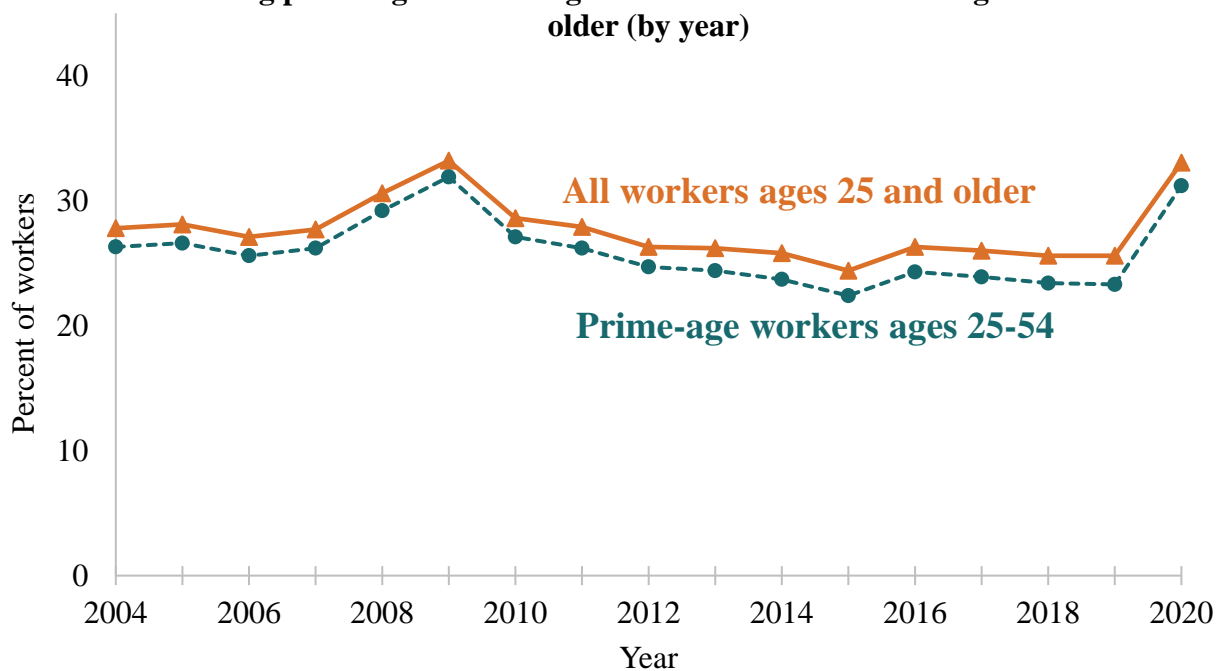
Figure A4. Share of female workers with at least a 10 percent annual earnings decline (by age of youngest child)



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 September 2021.

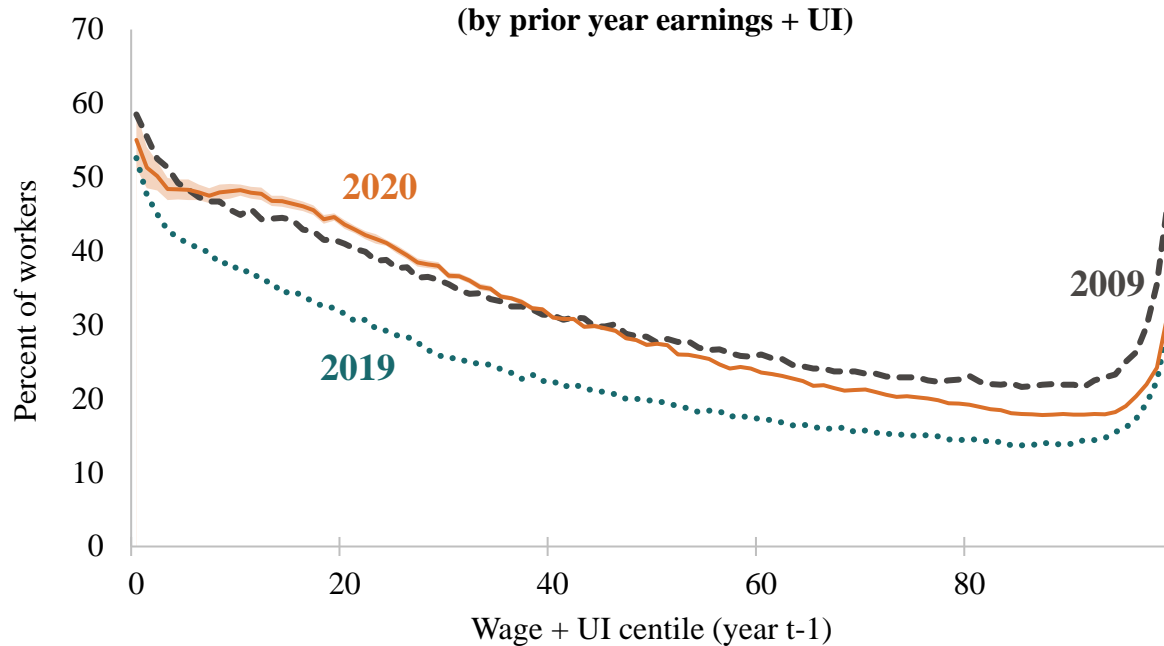
Figure A5. Share of workers with at least a 10 percent earnings decline among prime-age workers aged 25 to 54 and all workers ages 25 and older (by year)



Source: Authors' calculations using IRS data from Form W-2.

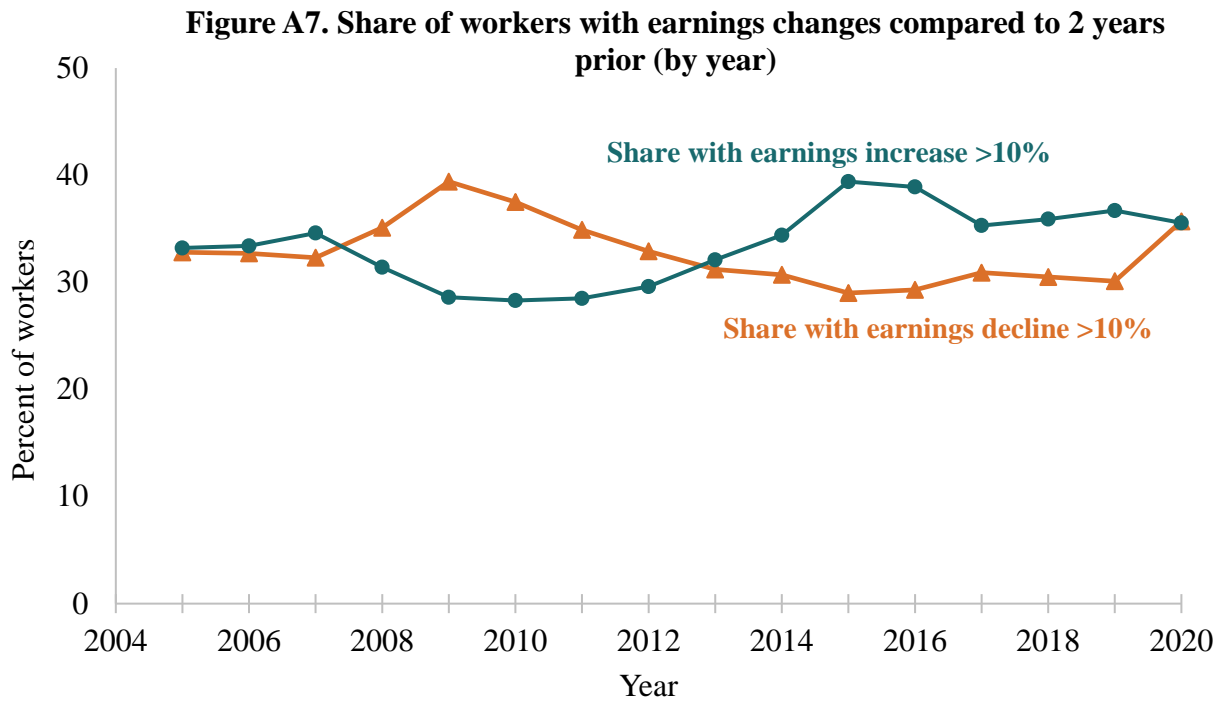
Note: Among workers ages 25 to 54 in year t with earnings or unemployment income in year $t-1$. The 2020 point estimate is the midpoint of the expected range as of early September 2021.

Figure A6. 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.

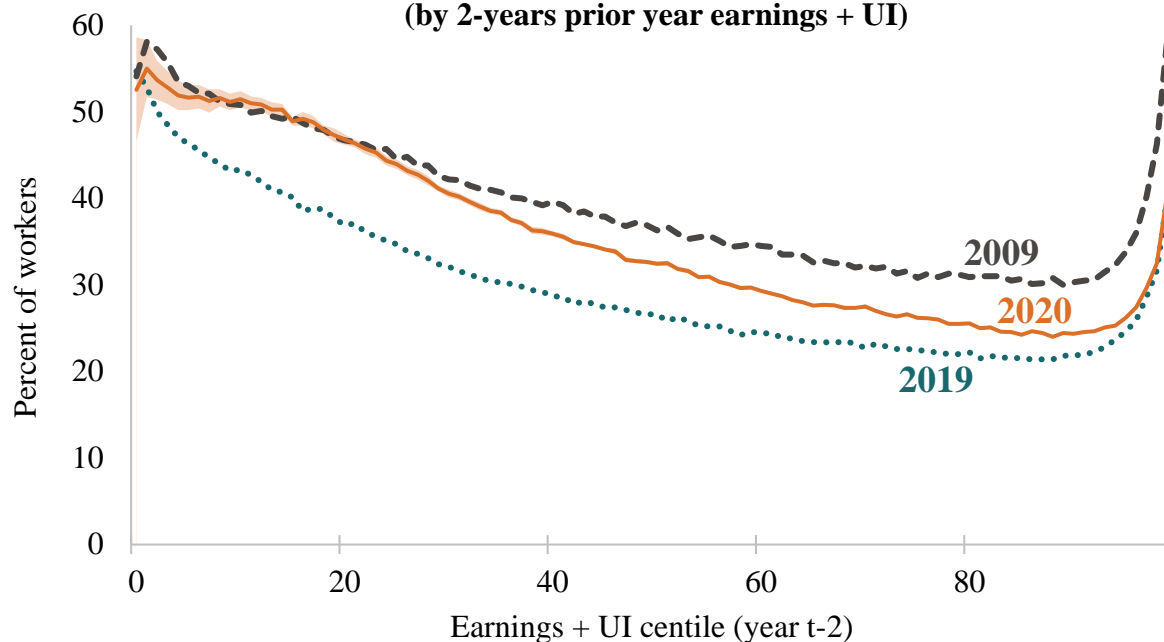
Note: Among workers ages 25 to 54 in year t with earnings or unemployment income in year $t-1$. Shaded region reflects the expected range based on data as of early September. The 2020 line is the midpoint of the expected range as of early September 2021.



Source: Authors' calculations using IRS data from Form W-2.

Note: Among workers ages 25 and older with earnings or unemployment income in year $t-2$. The 2020 point estimate reflect the midpoint of the expected range based on the data as of September 2021.

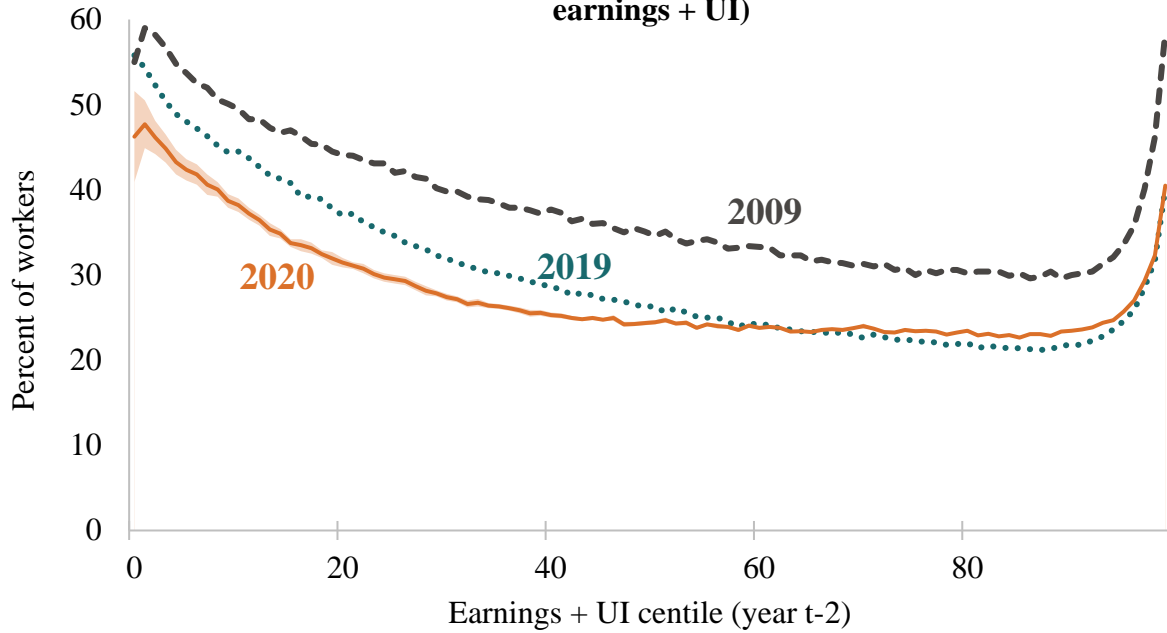
**Figure A8. Share of workers with at least a 10 percent decline in annual earnings compared to 2 years prior
(by 2-years prior year earnings + UI)**



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 September. The 2020 line is the midpoint of the expected range as of early September 2021.

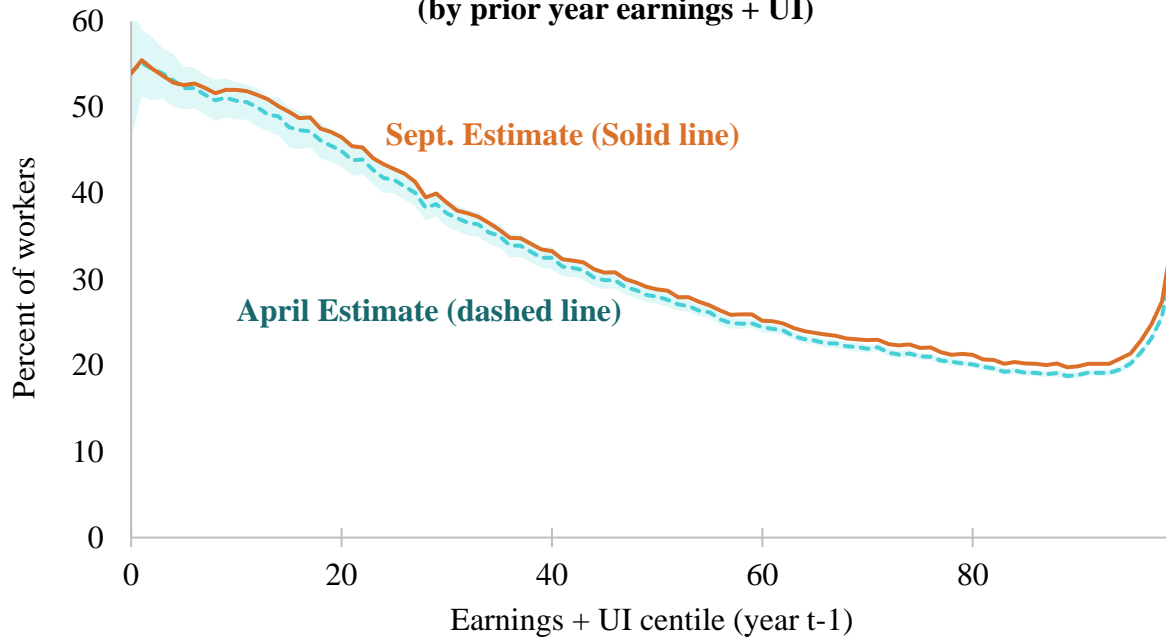
Figure A9. Share of workers with at least a 10 percent decline in annual earnings plus UI compared to 2 years prior (by 2-year prior year earnings + UI)



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 September. The 2020 line is the midpoint of the expected range as of early September 2021.

Figure A10. Share of workers with at least a 10 percent change in annual earnings in 2020 based on early IRS data (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 April 2020 data. Each line is the midpoint of the expected range as of the specified month.

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

	P20	P40	Median	P60	P80	5% Sample Count
2003	13,970	29,333	36,919	45,339	70,039	6,146,504
2004	13,771	29,440	37,149	45,712	70,876	6,205,424
2005	13,995	29,577	37,254	45,781	71,168	6,294,701
2006	14,191	29,824	37,532	46,140	72,030	6,401,767
2007	14,334	30,026	37,808	46,550	72,860	6,464,797
2008	14,190	29,577	37,289	46,016	72,319	6,516,850
2009	14,635	29,138	36,765	45,524	72,100	6,496,590
2010	14,128	28,348	36,024	44,875	71,783	6,591,565
2011	13,685	28,001	35,705	44,569	71,588	6,600,094
2012	13,647	28,250	35,996	44,841	72,099	6,638,026
2013	13,797	28,646	36,468	45,335	72,883	6,676,471
2014	13,977	29,210	37,124	46,108	74,118	6,728,667
2015	14,801	30,417	38,481	47,693	76,650	6,818,828
2016	15,139	30,823	38,806	48,029	76,961	6,924,718
2017	15,516	31,356	39,396	48,760	77,758	7,008,922
2018	15,971	31,964	40,045	49,451	78,768	7,102,884
2019	16,642	32,857	40,960	50,499	80,256	7,168,873
2020	18,549	33,556	41,384	50,648	80,379	7,491,746

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 September 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	25	57	105	182	354

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.

Table A3.
Median Annual Percentage Changes in Earnings Measures (by prior-year earnings + UI)

Centile of prior year earnings + UI	Percent change in earnings			Percent change in earnings + UI		
	2009	2019	2020	2009	2019	2020
1-5	-10.1	-1.5	-38.4	-10.6	-1.6	10.3
6-10	-11.8	2.2	-21.4	-3.4	1.1	28.3
11-15	-4.3	3.2	-13.6	0.4	2.6	25.4
16-20	-1.2	3.1	-7.0	0.4	2.8	18.3
21-25	-0.7	3.2	-2.9	0.4	3.1	14.0
26-30	-0.4	3.2	-0.9	0.4	3.1	10.9
31-35	0.0	3.0	0.2	0.4	2.9	8.1
36-40	0.4	2.6	0.8	0.5	2.6	6.7
41-45	0.4	2.2	1.2	0.5	2.2	5.4
46-50	0.4	2.1	1.4	0.7	2.0	4.5
51-55	0.5	2.0	1.6	0.7	2.0	3.7
56-60	0.7	1.9	1.8	0.8	1.9	3.4
61-65	0.8	1.8	1.9	0.9	1.8	3.0
66-70	1.0	1.8	2.0	1.1	1.8	2.8
71-75	0.9	1.6	1.9	1.0	1.6	2.5
76-80	1.0	1.6	1.9	1.1	1.6	2.4
81-85	0.9	1.5	2.0	1.0	1.5	2.2
86-90	0.9	1.4	2.0	0.9	1.4	2.2
91-95	0.8	1.4	2.0	0.8	1.4	2.1
96-100	0.3	1.1	1.7	0.3	1.1	1.8

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. Median earnings changes are based on IRS data as of September 2021 without imputations for late-arriving forms. Percentage changes are blurred by averaging the five closest observations to the median.