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Earnings business cycles: The Covid recession, recovery, and policy response☆

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ABSTRACT

Using a panel of tax data, we follow individuals' earnings over business cycles. Compared to prior recessions, the Covid policy response and recovery were more progressive. Among workers starting in the bottom quintile, median real earnings including fiscal relief *increased* 66 percent in 2020—after the prior two recessions this measure decreased. This resulted from substantial Covid-era stimulus payments and unemployment insurance. With fiscal relief ending, bottom-quintile earnings in 2022 returned near pre-Covid levels. Among those starting in the top quintile, median real market earnings rose in 2020. Top-quintile earnings subsequently fell, although by less than around previous recessions.

1. Introduction

The Covid recession was historically short, lasting just two months. Nevertheless, the severity of economic disruptions caused many workers' annual market earnings to decline substantially in 2020. While employment and labor income rebounded in 2021 and 2022, fiscal relief declined and inflation increased, offsetting some economic gains. Using a panel of administrative data, we measure the evolution of individual-level earnings over recent recessions and through the first two and a half years of the Covid recovery, both with and without fiscal relief. Compared to prior recessions, the Covid recession was more regressive, but the Covid recovery and policy response were far more progressive.

The data we use offer several advantages relative to other sources. First, we follow the same individuals over time, contrasting with widely available cross-sectional estimates, which compare different individuals over time (*e.g.*, Semega and Kollar, 2022). Second, our estimates use extremely large samples—five percent of workers—that exceed those of available survey data. Third, using independent reporting by employers and governments, we precisely measure earnings and direct fiscal relief from unemployment insurance benefits, stimulus payments, and various tax credits.

Using these data, we find that after declining markedly in 2020, market earnings among low-earning workers increased somewhat in 2021 and significantly in 2022 (after accounting for inflation). Despite

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these improvements, real market earnings among those who were in the bottom quintile before the recession typically remained below their 2019 pre-recession levels in 2021, but were nearly back to pre-recession levels by 2022. Top-quintile workers exhibited the opposite earnings trajectory: their earnings increased in 2020 but declined the next two years as inflation accelerated—although percentage changes were smaller—and ended 2022 farther below pre-recession levels than the bottom quintile.

Incorporating the substantial and progressive direct fiscal relief during this period paints a different picture of how workers fared. For bottom-quintile workers, median real earnings including fiscal relief *increased* 66 percent in 2020. After each of the prior two recessions, this measure decreased. In 2021, market earnings gains mostly offset the partial withdrawal of direct fiscal relief for these low-earning workers. Consequently, earnings after fiscal relief for the bottom quintile remained high in 2021: median earnings after relief among this group was 64 percent above pre-recession levels. However, median earnings after relief for bottom-quintile workers dropped substantially in 2022 due to the withdrawal of relief measures. Top-quintile earnings after relief increased only a few percentage points in 2020 and showed declines in the two recovery years. We perform a similar analysis on the 2001 and 2008 recessions and find meaningfully different patterns. For example, market earnings continued to decrease for bottom-quintile workers in the initial recovery after the Great Recession while earnings for top-quintile workers declined by more around the Great Recession than we saw around the Covid recession.

We consider three measures of the distribution of real earnings changes from the year before to the years after a recession: the share of workers whose earnings increased, the median earnings change by quintile, and the share of workers with large changes in earnings.[1] Results are consistent across these measures: the initial distributional effects of market earnings changes in the Covid recession were more regressive than in prior recessions, whereas both the Covid recovery and direct policy response have been far more progressive.

2. Relation to existing research on earnings during the pandemic

This paper expands upon the research examining earnings trends in the pandemic. Research based on micro-level survey data (Moffitt and Ziliak, 2020; Montenovo et al., 2020; Cortes and Forsythe, 2023b), macro-level administrative data (Berman, 2020; Blanchet et al., 2022), and data from state governments and private companies (Bartik et al., 2020; Cajner et al., 2020; Chetty et al., 2022) consistently found that initial losses were disproportionately among low-wage occupations in 2020. See Cortes and Forsythe (2023b) for a review of the extensive literature on the 2020 downturn. Additionally, Cortes and Forsythe (2023a) and Larrimore et al. (2022a) found that low-earning workers received the bulk of the direct fiscal relief to households and families, offsetting increases in market earnings inequality. Although some work has considered more recent data, existing research has primarily focused on 2020 rather than the subsequent recovery years.

The tax data used here track individuals over long time periods and measure individual earnings changes before, during, and after the pandemic shock. These data allow all wage earners (whether they file a tax return or not) to be followed for multiple years, providing precise micro-level earnings changes. In contrast, the Current Population Survey (CPS) can only track individuals for one year and, even then, only for individuals who do not change residence. Major panel surveys, such as the Panel Survey of Income Dynamics, have delayed reporting, smaller samples, and must contend with sample attrition (Fitzgerald et al., 1998). Consequently, we are unaware of other research showing how the same workers from before the pandemic fared two and three years later.

In addition to their ability to accurately track individual earnings over time, tax data also capture unemployment benefits and tax credits that are severely underreported in survey data (Larrimore et al., 2023; Meyer et al., 2020). Survey errors also were larger than usual during the Covid pandemic (Rothbaum and Bee, 2021). Hence, using administrative data avoids the challenges that the pandemic caused for economic surveys.

Although we are unaware of other work documenting the extent to which individual workers saw earnings gains or losses in 2021 and 2022, our findings are consistent with Greig et al.'s (2022) findings on checking account balances. They observed that at the end of 2021, balances were well above their 2019 levels, and these increases were largest among low-income families with bank accounts. Meyer et al. (2022) observed that lower-income groups did not substantially reduce consumption since the pandemic began, suggesting that fiscal relief's income stabilization flowed through to consumption.

Our work also complements the estimates for recent years by Blanchet et al. (2022) and Autor et al. (2023). While they focus on repeated cross-sectional data and we consider panel estimates, the broad conclusions are similar: low-earning workers were most affected by labor market declines early in the pandemic while pandemic relief was progressive. We also each observe that low-earning workers fared well in 2021 and 2022 with the progressive recovery in market earnings. Nevertheless, there are substantial differences in magnitudes when using panel data that follows the same workers over time, including our finding that workers in the top quintile of the pre-pandemic earnings distribution had 2022 real market earnings below their 2019 levels.[2] Conceptually, our panel data estimates follow a specific group of individuals over time, including the impacts of mean reversion when individuals have a temporary increase or decrease in earnings, while cross-sectional estimates look at the same segment of the distribution each year to reflect cross-sectional inequality at each point in time.

Our estimates on market earnings patterns in prior recessions are also consistent with earlier findings using administrative earnings data. Guvenen et al. (2014) estimated that during recessions, earnings increases among high-earning workers become less frequent and earnings losses among low-earning workers become more frequent. McKinney et al. (2022) also observed procyclical skewness of annual earnings changes. Our findings on the effects of tax and transfer policies are also consistent with findings from other countries (Busch et al., 2022).

Relative to our earlier research in Larrimore et al. (2022a), we see our contributions as threefold. First, as discussed above, with two additional years of data we can consider earnings patterns through the initial years of the Covid recovery. These additional years are important as more recent earnings growth had notably different distributional effects than in the first year of pandemic. Hence, these findings can help in understanding the distributional effects of the inflationary period that are the subject of recent policy discussions (Acs and Wheaton, 2023; Jayashankar and Murphy, 2023). Second, we consider the magnitude of earnings changes—as measured by median changes within quintiles—alongside the frequency of large increases and decreases that were previously observed for only 2020. Doing so provides a more nuanced picture of how workers throughout the distribution fared over this period. Finally, to provide additional historical context, we compare the Covid recession and recovery to both of the prior business cycles.

3. Administrative tax data panel

This paper builds on the data and methods from Larrimore et al. (2022a), which used a random five-percent sample of all individuals

[1] In the online appendix, we also consider a fourth measure—the distribution-wide progressivity of earnings changes based on Gini coefficients. The results using this measure are consistent with those presented here.

[2] For comparisons of our panel and cross-sectional findings and to the Blanchet et al. (2022) results for labor earnings, see online appendix Table A4.

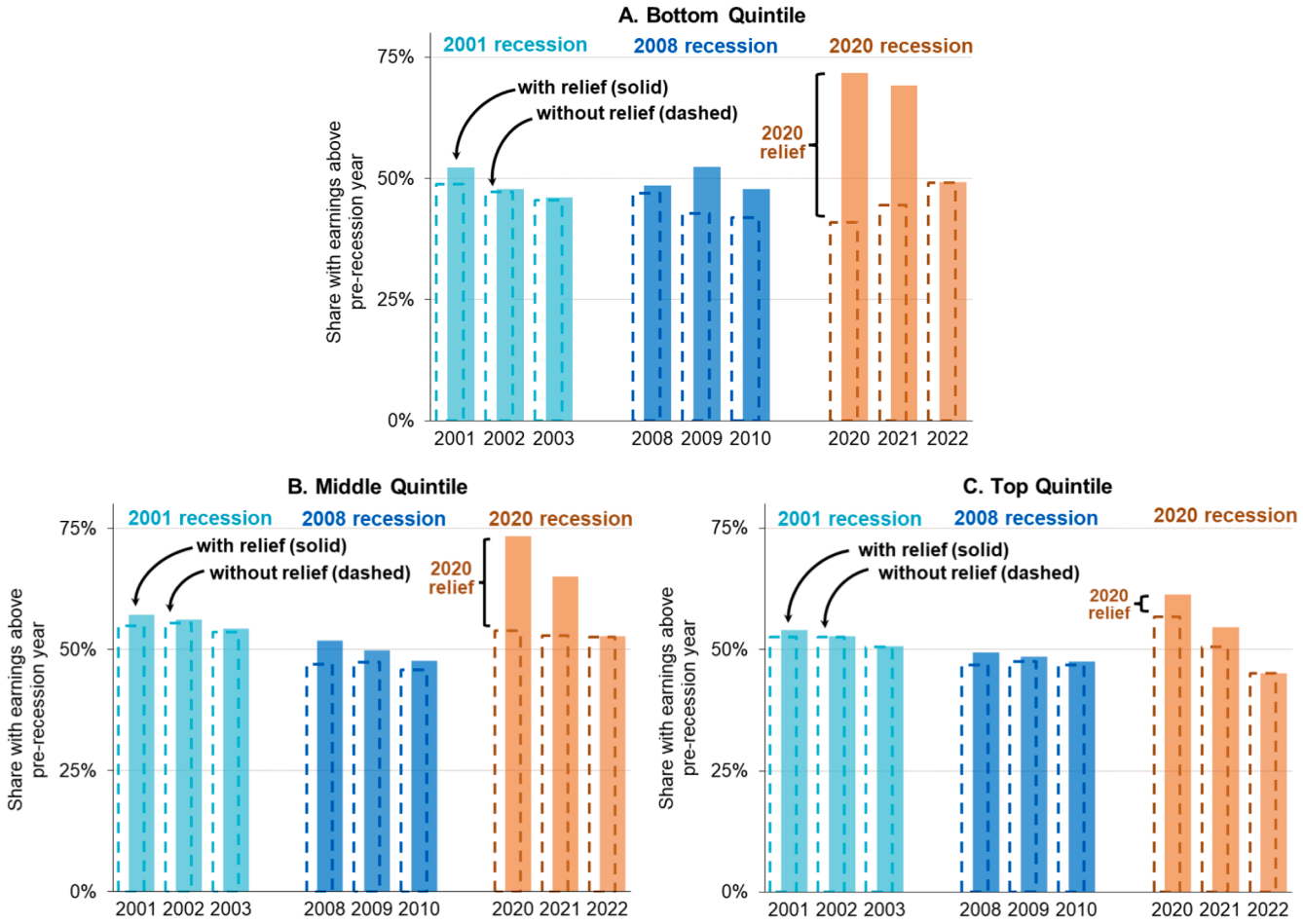

Fig. 1. Share of workers with real earnings at pre-recession level or higher, by earnings quintile. *Note*: Among workers aged 24 to 99 with earnings or unemployment benefits in pre-recession year and alive at end of specific year. Quintiles (with and without relief) are based on wages in pre-recession years (2000, 2007, and 2019). Earnings are indexed with the chained CPI-U. *Source*: Authors' calculations using tax data.

appearing in IRS tax data (Internal Revenue Service and Joint Committee on Taxation, 2022). The extremely large size of our sample—over 6 million workers each year—results in extremely small sampling error for all estimates. We extend the analysis forward to 2021 and 2022 to consider the Covid recovery and back to 1999 to allow for comparisons with the 2001 recession.

3.1. Tax data sources

Annual wages and salaries ("earnings") are measured from Form W-2, and unemployment insurance benefits are measured primarily using Form 1099-G. Estimates from IRS audit studies suggest that these information returns are extremely comprehensive with respect to wages and only miss an estimated 1 percent of earnings. However, because some states had incomplete reporting of unemployment insurance, we supplement the unemployment benefits data with self-reported amounts on Form 1040. Recognizing that taxpayers have no incentive to over-report unemployment insurance benefits, we use their self-reported Form 1040 reported benefits if larger than that reported on their Form 1099-G.[3] To incorporate measures of stimulus payments and other fiscal relief observed in tax data, we use Form 1040 tax returns and IRS transaction file data, as discussed below. As with earnings and unemployment insurance information, these stimulus payments and tax credits are based on actual values in the administrative data.

3.2. Panel of Individual-Level Earnings Measures

All main estimates are based on multi-year panels of earnings and direct fiscal relief. These panels include anyone in the initial year with wages or unemployment benefits, even if they have no income from either source in subsequent years. We focus on those with this labor market attachment in years just prior to recessions (2000, 2007, and 2019). While we allow for exits (earnings of zero dollars), we do not consider new entry into the labor force of those who were not working before the recession.[4] Doing so provides us with a clean sample of pre-recession workers prior to each recession to follow over time who

[3] Incorporating self-reported information from Form 1040 did not substantially affect observed unemployment benefits—increasing them by about 1 percent in 2020 and 3 percent in 2021. Total unemployment benefits after incorporating 1040 self-reporting were $567 billion and $324 billion, close to the $537 billion and $321 billion reported in national accounts.

[4] We do allow for re-entry into the labor market of people who were working before the recession, left the labor force, and re-entered in a later year. Entry and exit rates are largely similar each year from 1999 through 2022 and therefore do not appear to substantially affect our results. For example, entry rates range from 4.3 to 5.9 percent with an average of 5.4 percent. See online appendix Figs. A2 and A3.

have an observed labor force attachment.[5] The sample is limited to adults aged 24 or older in the initial year, just prior to each recession. In all results, we exclude those who are deceased at the end of the observation period. This age range avoids large earnings fluctuations among young workers and retains earnings declines among retirees who were working before the pandemic.[6]

All data are at the individual level. Individual-level totals for earnings and unemployment insurance benefits are obtained by aggregating all W-2 forms and 1099-G forms.[7] Stimulus payments and other tax credits come from IRS transaction files and Form 1040. These stimulus payments and tax credits are determined at the tax-unit level and then divided equally between spouses for tax units filing joint returns. This equal split accords with the per-person basis of most of these policies, which are described below. Our individual-level earnings definition excludes other income sources and generally ignores tax-unit sharing, which requires tax return data that is not yet sufficiently available for 2022 (for estimates accounting for tax-unit sharing in 2020, see Larrimore et al., 2022b). Inflation-adjusted values are based on the chained-CPI.

Once the sampled IRS data are complete, they represent a population-level panel. To provide timely estimates, we use June 2023 data (the most recent available) even though some 2022 forms are yet to be processed by the IRS. In these data, some workers with 2022 earnings appear to have no earnings (because forms have not yet been processed) and some with multiple jobs have just one processed Form W-2, resulting in artificially lower earnings. We account for this by estimating the number of people with not-yet-processed 2022 W-2 forms and the earnings on those forms. This imputation is based on historical patterns of late-processed forms based on age, prior-year wages, and W-2 presence in the current tax year (see online Appendix B for details and for the distribution of people with imputed forms by wage bin). We estimate that our data include about 97.5 percent of all 2022 Form W-2s that will be received. Consequently, since our data are nearly complete, the imputation has relatively modest effects. Among base-year 2019 workers, total 2022 wages increase 3.2 percent. These imputations increased average wages among the bottom quintile by $1,100 and average wages among the top quintile by $3,100. Preliminary estimates of median earnings changes in 2021 by quintile using this imputation approach closely matched the final values reported here, increasing the confidence in this procedure.

In our final data, aggregate real wage earnings increased by 4.9 percent between 2019 and 2021. This increase is relatively close to the 4.4 percent increases in aggregate real earnings in the National Income and Products Accounts over this period.[8]

3.3. Direct Fiscal Relief Considered During Recent Recessions

Total direct fiscal relief observed in tax data increased across the last three recessions. This relief was about $200 billion in 2001–2003, $500 billion in 2008–2010, and $1,900 billion in 2020–2022.[9] While we only consider the effects of direct relief here, the effects of indirect relief programs, such as the Paycheck Protection Program, are discussed in online Appendix D.

Larger Covid-era fiscal relief mostly resulted from expanded unemployment insurance benefits and stimulus payments. The over $900 billion of unemployment insurance benefits from 2020 to 2022 far exceeded the $350 billion from 2008 to 2010 and was over six times the amount distributed from 2001 to 2003.

Stimulus payments also increased over the last three recessions. The 2001 stimulus checks totaled $38 billion and approximately two-thirds of tax units received a payment of $300 per adult (Greg and Violante, 2014). The 2008 checks totaled $96 billion and maximum amounts were generally $600 per adult and $300 per child younger than 17 years old (Parker et al., 2013). The 2020 checks totaled $413 billion. Combining the first and second rounds, total checks were usually $1,800 per adult and $1,100 per child. In 2021, additional stimulus checks were distributed, including $408 billion from third-round payments that were usually $1,400 per adult and dependent. Additionally, we account for stimulus check "true-ups" on tax returns in the year when the payment is received (Splinter, 2023).

Several other provisions that provided relief during the Great Recession and Covid recession are also included. The making work pay credit for 2010 and 2011 totaled $60 billion each year and was $400 per adult worker (subject to an income phase out). The payroll tax holiday for 2012 and 2013 reduced employee payroll taxes by $100 billion each year and consisted of a two-percentage point tax rate reduction, which we estimate using individual-level W-2 earnings. In 2021, most parents received advance child tax credits (CTCs) of $1,800 per qualifying child under age six and $1,500 per qualifying child under age 18.[10]

Our measure of fiscal relief has some limitations. First, some direct fiscal relief measures, such as SNAP benefits, do not appear in tax data because they are not taxed and are not administered by the IRS. Including these benefits would further increase the progressivity of relief. Second, small business owners benefitted from forgiven Paycheck Protection Program loans. Since this paper focuses on employee wages and these loans are not captured on individual tax records, they are not included here, although we provide preliminary estimates of this indirect relief in online Appendix D. Third, estimating effects of relief on market earnings are beyond the scope of this paper. For example, the substantial unemployment insurance benefits, which could exceed earnings while working (Ganong et al., 2020), likely affected some people's job search decisions and labor market tightness (Marinescu et al., 2021).

4. Estimates of earnings changes and relief across business cycles

To show the evolution of earnings over recent business cycles, we follow individual workers over time. For each recession, workers are grouped into quintiles or percentiles of the pre-recession earnings distribution. These rankings are consistent across all figures, maintaining the same rankings when looking at earnings changes with and without

[5] Additionally, those not working before the recession would always appear at the bottom of the pre-recession earnings distribution despite substantial earnings potential.

[6] This captures accelerated retirements from the Covid recession (Domash and Summers, 2022). Results for working-age adults (ages 25–59) in 2020 were similar to those for all adults over age 24 (Larrimore et al., 2022a).

[7] We focus on Medicare Wages (Box 5) on Form W-2, which is the broadest wage measure on the form. We retain the most recent Form W-2 with a non-missing amount for each individual from each employer in each year. Expanded unemployment insurance included Pandemic Unemployment Assistance payments to independent contractors, although our sample definition means these recipients are only included if they had earnings or unemployment benefits in the initial year. W-2 forms exclude self-employment income, although we estimate transitions into and out of self-employment (as measured by having a Form 1099-MISC or 1099-NEC) and find similar patterns during the pandemic as in earlier years.

[8] The Current Population Survey shows lower wage growth through 2021 than does either the IRS data or the National Income and Product Accounts. In the CPS, real wages fell by 0.2 percent from 2019 through 2021. A comparison of the CPS and IRS distributional estimates are provided in online appendix Table A4.

[9] Note that our panel focuses on employees and therefore excludes relief going to non-employees, such as stimulus payments to retirees. Among workers in our data, fiscal relief was about $170 billion in 2001–2003, $440 billion in 2008–2010, and $1,220 billion in 2020–2022 (in 2022 dollars: $270 billion, $580 billion, and $1,340 billion).

[10] Much smaller advance payments of child tax credit expansions sent in mid-2003 are not included as relief.

relief. Importantly, our panel approach differs from evaluating trends using repeated cross-sections because individuals are always classified into quintiles or percentiles based on their pre-recession earnings, thereby allowing us to focus on individual-level earnings mobility.

Relative to prior recessions, market earnings changes in the Covid recession were more regressive, but both the policy response and the Covid recovery have been more progressive. This is seen with each of our three measures: (a) the share of workers whose earnings increased; (b) median earnings changes within earnings groups; and (c) the share of workers with large (10 percent or more) changes in earnings. Finally, we show how specific fiscal relief programs, especially unemployment insurance and stimulus payments, offset earnings declines in the Covid recession and recovery.

4.1. Frequency of Earnings Increases and Declines During the Covid Recession

Across the overall population, market earnings for most workers were resilient through the Covid recession, as 51 percent had real market earnings increases in 2020. With rising inflation, the share with real earnings above pre-recession levels ticked down slightly in 2021 and 2022, but just over half still had higher earnings than in 2019. In the Great Recession a smaller share of workers, 47 percent, had market earnings above their pre-recession levels in both 2008 and 2009, and 45 percent had market earnings above pre-recession levels in 2010.

Yet market earnings trends differ through the distribution. When considering market earnings by quintile of pre-recession earnings in Fig. 1 (dashed lines), low-earning workers were typically making less in 2021 and 2022 than they were in 2019 before the recession. Of these bottom-quintile workers, 49 percent had higher real market earnings in 2022 than three years earlier. This is an improvement from 2020, when many low-income workers lost earnings (in some cases because their jobs could not be done remotely) and just 41 percent of bottom-quintile workers had increases in real market earnings. But the Covid recession was also historically short, and the share of bottom-quintile workers with real market earnings above their pre-recession level increased slightly in 2021 (to 45 percent) and increased further in 2022. In contrast, during the Great Recession, the share of bottom-quintile workers with market earnings above pre-recession levels fell in the second and third year after the start of the recession—past the official end date of the recession. Hence, relative to pre-recession levels, a larger share of low-earning workers made more two years after the Covid recession than was the case following the 2001 recession or Great Recession.

The time pattern was reversed for top-quintile workers: contrast the bottom-quintile results in panel A with those for the top quintile in panel C, still focusing on the dashed lines (results for all quintiles are in the online data). In 2020, a majority (57 percent) of those who started in the top quintile had market earnings gains despite the economic downturn. In 2021 and 2022, the share with real market earnings gains among this group fell. Consequently, by 2022 a smaller share of top-quintile workers made more than they did before the recession than is seen in the bottom quintile. Meanwhile, among middle-quintile workers (panel B) a majority earned more in real terms than before the recession.

Once incorporating fiscal relief (solid bars), however, the distributional patterns are quite different. Comparing the solid and dashed lines in Fig. 1 highlights the progressive effect of relief in offsetting earnings losses during the first two years after the Covid recession. Among workers who were in the bottom quintile before the Covid recession, relief increased the share with earnings increases in 2020 by 31 percentage points—from 41 percent to 72 percent. For the middle quintile and the top quintile, this increase is only 20 and 5 percentage points, respectively—an indication of progressive fiscal relief.

In 2021, the total amount of direct fiscal relief fell by about one-third relative to 2020. Nevertheless, most low-earning workers had higher earnings with relief than before the recession. From 2019 to 2021, earnings with relief increased for 69 percent of the bottom quintile. In 2022, however, the earnings picture after relief for the bottom quintile shifts dramatically. Reflecting the end of enhanced unemployment insurance benefits, the lack of additional stimulus payments, and the expiration of the advance child tax credit, Covid-era fiscal relief no longer provided additional support (although some people had additional savings because of these measures). Consequently, post-relief earnings fell substantially and the 49 percent making more than before the pandemic was about the same with or without relief. This provides a first indication of how the withdrawal of fiscal relief in 2022 was more impactful for low-earning workers.

4.2. Magnitudes of Earnings Changes

Fig. 2 goes beyond the share with earnings increases to also consider the magnitude of earnings changes. It displays the percentage change in median real earnings of workers in each quintile relative to the year before each recession.[11] Once again, the dotted bars only include market earnings, and the solid bars add fiscal relief.

The Covid recession stands out for its severe effects on market earnings of low-earning workers as well as its progressive recovery. For workers starting in the bottom-quintile, their 2019 real median market earnings fell 26 percent by 2021 and 2 percent by 2022 (see dashed lines). This reflected a decline of nearly one-third in 2020 followed by a small increase in 2021 and a far larger increase in 2022. Among those who started in the second and middle quintile, real median market earnings increased by 7 and 2 percent through 2022. Among the top quintile, real median market earnings fell to 2 percent below pre-recession levels by 2022. Hence, the combined effect on market earnings of the Covid recession was regressive in 2020, although this was offset by a progressive recovery in 2021 and 2022.

Low-wage workers also benefited greatly from progressive policy responses in the Covid recession and recovery—especially from stimulus checks and expanded enhanced unemployment benefits that had replacement rates over 100 percent for low-income workers (Ganong et al., 2020). When including fiscal relief, as shown in the solid bars in Fig. 2, bottom-quintile workers saw their real median earnings with relief increase by 66 percent in 2020 and then remain up 64 percent in 2021 as market earnings gains largely offset the withdrawal of fiscal relief. These increases were remarkably large and far exceeded that seen even during recent non-recessionary periods, highlighting the magnitude of the progressive policy response. Since 1999, the increase in bottom-quintile real median earnings (after relief) over a two-year period never exceeded 11 percent prior to the Covid recession. Frequently, the median two-year change for this group was slightly negative.[12] It was only in 2022, when relief measures were withdrawn, that the median earnings with relief for this group fell substantially. Consequently, it appears the withdrawal of Covid-era relief measures contributed more to the decline in resources for bottom-quintile workers in 2022 than the increase in inflation.

Middle-quintile real median earnings with relief increased by 9 percent in 2020 and remained 8 percent above 2019 levels in 2021 (note the change in scale in Fig. 2 for the middle and top quintiles). The

[11] To complement the results shown here for each recessionary period, estimates for every year are available in online appendix Fig. A6.

[12] As is standard in panel-based studies, average earnings growth was larger for low-wage workers than their median earnings growth (see online appendix Fig. A1). This is in part because the panel includes people who are just starting in the workforce and because there is mean reversion among those with temporary earnings declines. This earnings growth, however, is offset somewhat by workers aged 60 or older with large declines (online data Table B1). When removing initial-year workers with earnings below $5,000, bottom-quintile median earnings decreases were less common and smaller (online data Tables B4 and B5).

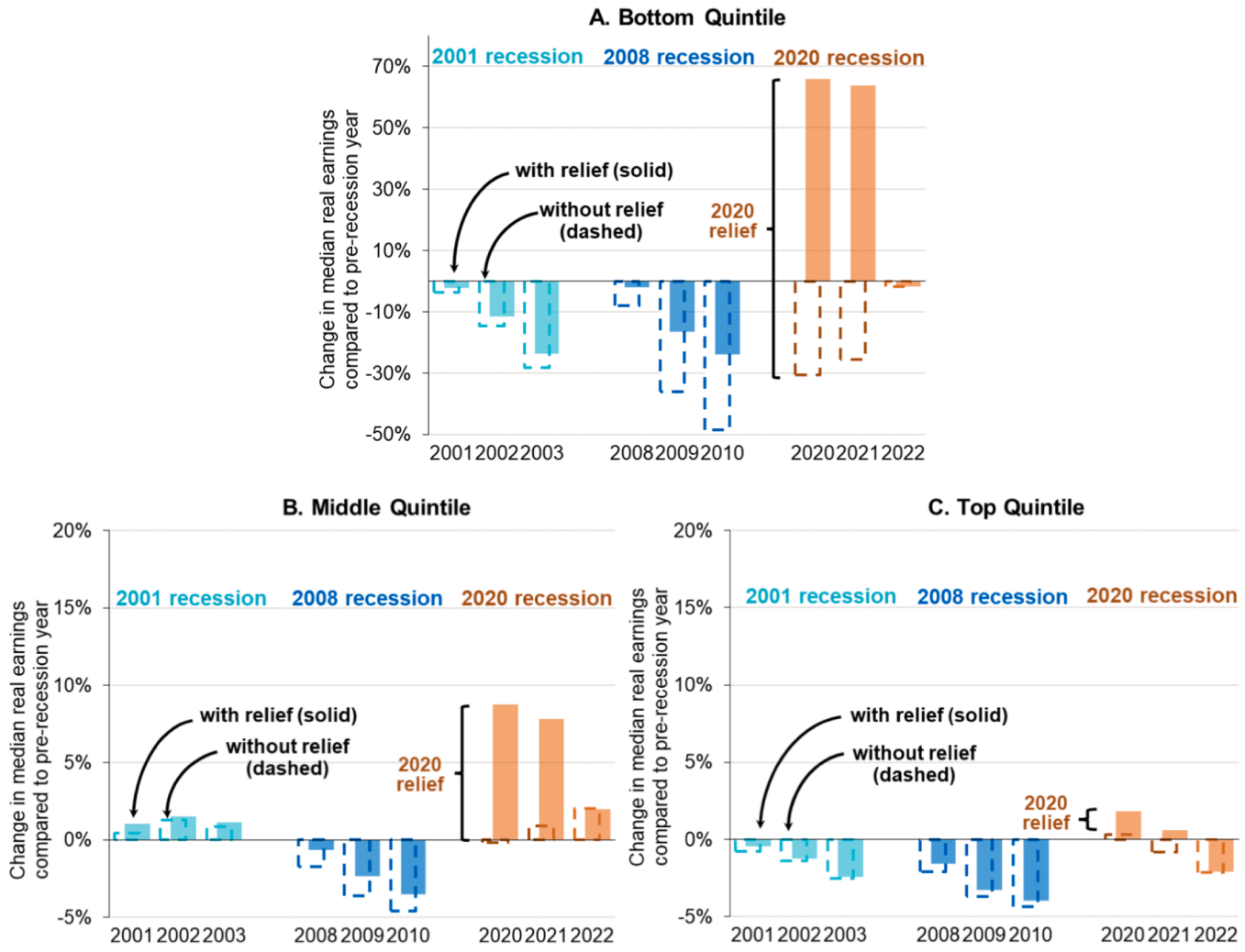

Fig. 2. Median real earnings relative to pre-recession year, by earnings quintile. *Note*: Among workers aged 24 to 99 with earnings or unemployment benefits in the pre-recession year and alive at end of specific year. Earnings are indexed with the chained CPI-U. Quintiles (with and without relief) are based on wages in pre-recession years (2000, 2007, and 2019). Median real earnings without relief (2022 dollars) for pre-recession years (2000, 2007, and 2019)—bottom quintile: $6,240, $6,360, $8,140; middle quintile: $41,310, $42,500, $46,040; top quintile: $108,010, $114,990, $129,640. Relief increases median real earnings in 2021 by $7,690 for the bottom quintile, $3,390 for the middle quintile, and $1,950 for the top quintile. *Source*: Authors' calculations using tax data.

withdrawal of relief in 2022 was also impactful for middle-income families, as their 2022 median earnings with relief fell back to only 2 percent above pre-recession levels.

Top-quintile median earnings with relief increased by 2 percent in 2020, and then returned to near-2019 levels in 2021. Yet in 2022, earnings for the top quintile fell more substantially. In contrast to the bottom and middle quintiles, where the withdrawal of fiscal relief was the most important 2022 development, inflation outpacing nominal wage growth explains the decline in real post-relief earnings for the top quintile.

4.3. *Frequency of Large Earnings Changes during Covid*

For some workers, increases or decreases in earnings may be small. To consider the more dramatic effects of recessions and recoveries on workers, we also consider the share of workers with large real annual earnings changes, excluding small changes. This extends the analysis of large annual earning changes in 2020 conducted by Larrimore et al. (2022a) to subsequent years while also looking at multi-year changes. Large changes are defined as 10 percent or more, where large declines include those exiting the workforce (*i.e.*, going from positive to no earnings). Consistent with the earlier discussion, those entering the workforce are excluded—although when considering multi-year periods, re-entries are included. Over the last two decades, an average of 28 percent of workers had large earnings increases and 28 percent had large declines each year. Other estimates using administrative tax data find similarly high shares of workers with large short-term earnings changes (Congressional Budget Office, 2008).

Expansions often coincide with more workers having large increases. In the 2012–2019 expansion, the share with large earnings increases before relief exceeded the share with large declines by an average of 3 percentage points. In 2021 and 2022, the first full year of the Covid recovery, the share with large increases also averaged 3 percentage points above the share with large declines. However, one-year improvements include mean reversion of prior-year losses, which is why we also consider two-year changes. Over the two-year period from 2019 to 2021, large earnings increases before fiscal relief were 1 percentage point less common than large earnings declines (34 percent vs. 35 percent). For comparison, in the pre-Covid expansion years from 2017 to 2019, large increases were 7 percentage points more frequent than large decreases.

The distribution of large earnings changes is considered next. Fig. 3 displays the share of workers, by earnings percentile in the base year, with a real earnings change of at least 10 percent. Panel A displays the

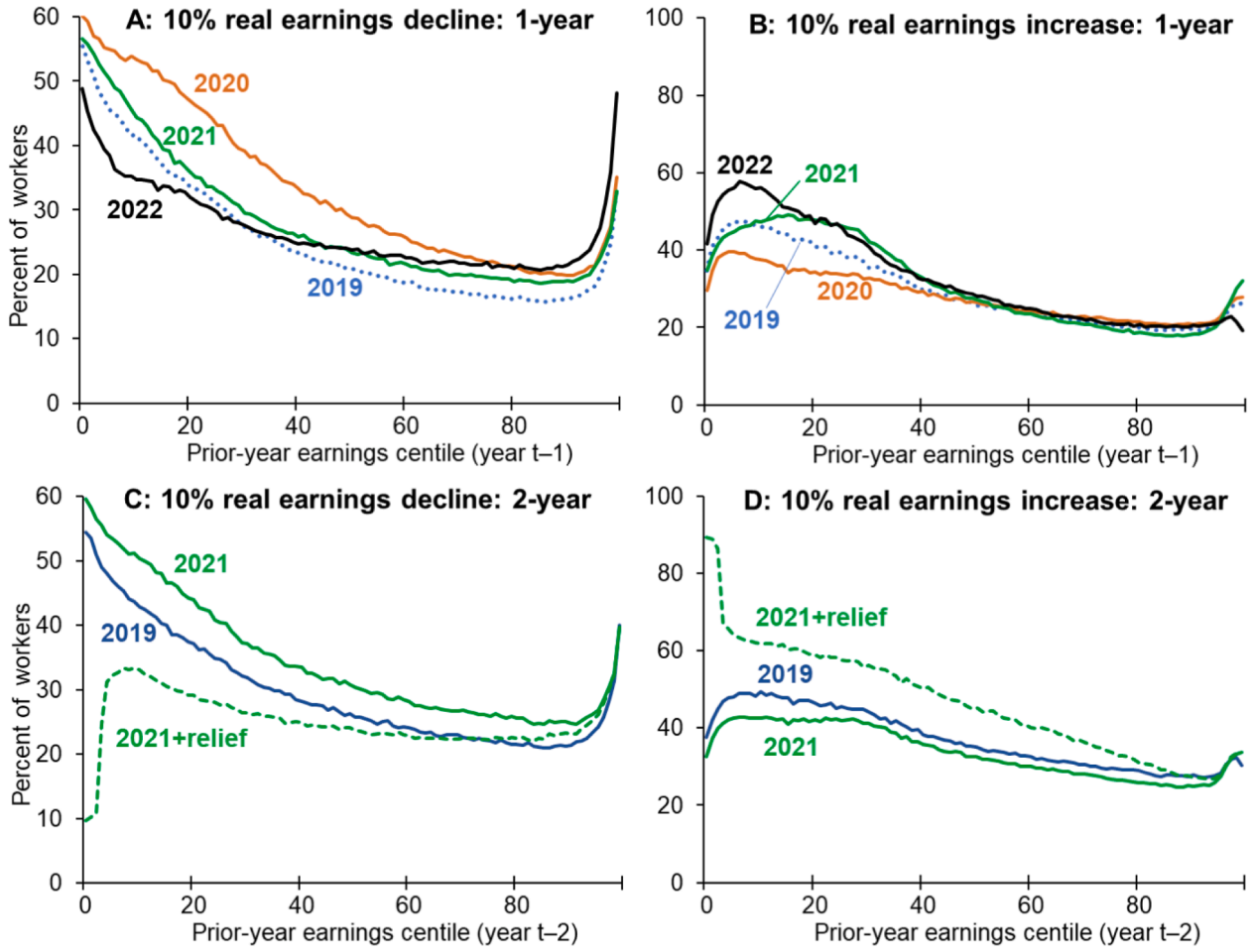

Fig. 3. Share of workers with large real market earnings decline or increase. *Note*: Among workers aged 24 to 99 with earnings or unemployment income in the initial year (t–1 or t–2) and alive at end of final year. Percentiles are based on wages in initial years. Earnings are indexed with the chained CPI-U. *Source*: Authors' calculations using tax data.

share with large annual *decreases* for 2019 before the Covid recession, and for 2020, 2021, and 2022.[13] As previously illustrated by Larrimore et al. (2022a), the share with large market earnings declines during the 2020 recession was elevated throughout the distribution relative to 2019, but especially so among the bottom half of the distribution. In the 2021 recovery, the share of workers with large earnings declines is slightly above the 2019 expansion's analog for each earnings percentile, although the shape is similar. In the 2022 recovery, bottom-quintile workers were less likely to have large earnings declines than in 2019 while top-quintile workers were far more likely to experience large declines.

Panel B shows the share of workers with large earnings *increases*. For the top half of the distribution, the share with large increases was similar across recent expansion, recession, and recovery years. For the bottom half, however, the share experiencing a large earnings increase fell dramatically between the 2019 expansion and the 2020 onset of the recession. In 2021, there was a surge in earnings increases for those with earnings between the 10th and 40th percentiles. In 2022, the distribution of large earnings increases shifted even further towards the lower-income tail—additional evidence of a progressive earnings recovery.

Shifting to two-year changes again shows the regressive nature of the recession. Panel C shows that between 2019 and 2021 the share of bottom-quintile workers with a large earnings decline was 7 percentage points higher than the prior expansion (51 percent vs. 44 percent), but for top-quintile workers it was only 3 percentage points higher (27 percent vs. 24 percent). Symmetric changes for large increases also suggest regressive effects. In Panel D, the share of bottom-quintile workers with a large increase was 6 percentage points lower than the prior expansion, but for top-quintile workers it was only 2 percentage points lower.

However, despite being smaller than in 2020, fiscal relief continued to be extremely progressive into 2021. Once incorporating fiscal relief, large earnings declines were far less common among the bottom half of the distribution from 2019 through 2021 than during the most recent expansion, and large income gains were far more common for everyone outside of the top decile.[14] Among the bottom quintile, relief decreased the share with large declines from 51 percent to 28 percent and increased the share with large increases from 41 percent to 66 percent.

4.4. *Which Direct Fiscal Relief Measures Mattered Most?*

Table 1 shows how Covid public policies reduced the share of workers with large income declines across different years (annual and

[13] For the one, two, and three-year large earnings declines by starting percentile for all years since 1999, see online Appendix Fig. A7.

[14] Note that the progressivity of relief in 2020 is not contributing to this observed progressivity in 2021, since it only compares calendar years 2019 and 2021.

Table 1
Share of workers with at least a 10 percent real earnings decline.

	All working-age adults	Among the bottom quintile	Among the top quintile	All working-age adults	Among the bottom quintile	Among the top quintile
	A: 2019–2020 (1-year)			**B: 2019–2021 (2-year)**		
Earnings	33.5	53.3	21.9	34.6	50.9	26.7
+ Unemployment Ins.	24.2	38.4	20.8	30.7	41.3	26.4
+ Stimulus checks	19.3	25.3	19.7	26.0	29.4	25.5
+ Advanced CTC (earnings + relief)	19.3	25.3	19.7	25.2	28.0	25.1
	C: 2019–2021 (2-year): No dependents			**D: 2019–2021 (2-year): With dependents**		
Earnings	36.7	52.1	29.9	29.6	45.2	21.8
+ Unemployment Ins.	33.2	44.0	29.6	25.7	34.1	21.5
+ Stimulus checks	28.9	32.9	28.9	19.8	20.2	20.0
+ Advanced CTC (earnings + relief)	28.8	32.6	28.9	17.8	16.2	19.2

Note: Among workers ages 24 to 99 with wages or unemployment insurance in the initial year (t–1 or t–2) and alive at end of final year. Quintiles are based on wages in the initial year. Children include dependents younger than 17 years old claimed on tax returns. Earnings are indexed with the chained CPI-U.
Source: Authors' calculations using tax data.

two-year changes) and between those with and without dependents. Panel A considers annual earnings declines in the 2020 recession. Relief reduced the share with large (10 percent or more) annual declines by 14 percentage points, from 33 percent for earnings without relief to 19 percent with relief. Unemployment insurance benefits explain two-thirds of this distribution-wide stabilization effect and stimulus checks explain one-third. Among the bottom quintile, the share with large declines fell much more from fiscal relief—by 28 percentage points (from 53 to 25 percent)—where unemployment insurance and stimulus checks each explain half of the change.

Unemployment insurance was generally more progressive than stimulus payments in recessions. In both 2009 and 2020, the bottom quintile of adults received about one-third of unemployment benefits, while the middle received about one-fifth and the top quintile less than one-tenth (Larrimore et al., 2023). Stimulus payment amounts, in contrast, were about the same across the distribution except for a phase out for top income groups. Unemployment benefits also target workers with earnings declines, whereas stimulus payments are largely insensitive to earnings declines.

Panel B considers two-year earnings changes between 2019 and 2021 when substantial relief measures were still in effect. Relief reduced the share with large two-year declines by 9 percentage points, from 35 percent for earnings without relief to 25 percent with relief. Unemployment insurance benefits explain 41 percent, stimulus checks 50 percent, and advance child tax credits 8 percent of the stabilization effect.[15] Among the bottom quintile, the share with large declines fell by 23 percentage points due to fiscal relief (from 51 to 28 percent).

Fiscal relief disproportionately benefitted adults with dependents, especially in the bottom quintile. For those without dependents, relief reduced the share with large two-year declines by 8 percentage points (Panel C). For those with dependents, relief reduced it by 12 percentage points (Panel D). Among the bottom quintile, relief reduced the share with large decrease for those without and with dependents by 19 and 29 percentage points, respectively. This difference is largely because each tax unit usually received an additional $1,400 of stimulus checks for each dependent and at least $1,500 per child of advance child tax credits.

[15] When averaging these estimates with the reverse-order of adding types of relief (*i.e.*, unemployment insurance added last), unemployment insurance benefits explain a similar 39 percent, stimulus checks 49 percent, and advance child tax credits 12 percent of the stabilization effect.

5. Summary

With a panel of tax data, we follow individuals over recent business cycles. Reflecting the rapid pace of the economic recovery, since 2019 about half of workers had higher real earnings (after adjusting for inflation) in 2020, 2021, and 2022. Yet, this overall stability masks trends for low-income workers who experienced substantial earnings declines in 2020.

However, earnings gains have been progressive in the recovery, partially offsetting the regressive earnings losses in the 2020 downturn. Among workers in the bottom quintile before the Covid recession, real median market earnings fell 31 percent in 2020 and then increased slightly in 2021. In 2022, their real median market earnings recovered substantially to within 2 percent of pre-recession levels. The earnings increases in 2021 and 2022 for this lowest-earning group greatly exceeded that in higher earnings quintiles (including the top quintile whose real market earnings fell in 2022). The market earnings recovery of the bottom half of the distribution has been much faster than in the last two recoveries.

Progressive policy responses, especially from expanded unemployment benefits and stimulus checks, also offset initial market earnings losses. When including fiscal relief, bottom-quintile workers saw their earnings increase substantially in 2020 and then stabilize in 2021 as market earnings gains offset the withdrawal of fiscal relief. We contrast these findings with the 2001 and 2008 recessions. In these earlier recessions, earnings changes were more proportional over the distribution and fiscal relief only had modest effects. Consequently, the distributional impacts of the Covid recovery and policy response have been far more progressive than in prior recessions. In 2022, however, the fiscal relief measures were nearly completely withdrawn, which resulted in substantial declines in post-relief earnings for lower-earning workers. This reduction in fiscal relief also means that enhanced fiscal support measures likely cannot be counted on to equalize the distribution in subsequent years.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpubeco.2023.104983.

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