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Where Are the Missing Workers? Anticipated and Unanticipated Labor Supply Changes in the Pandemic's Aftermath

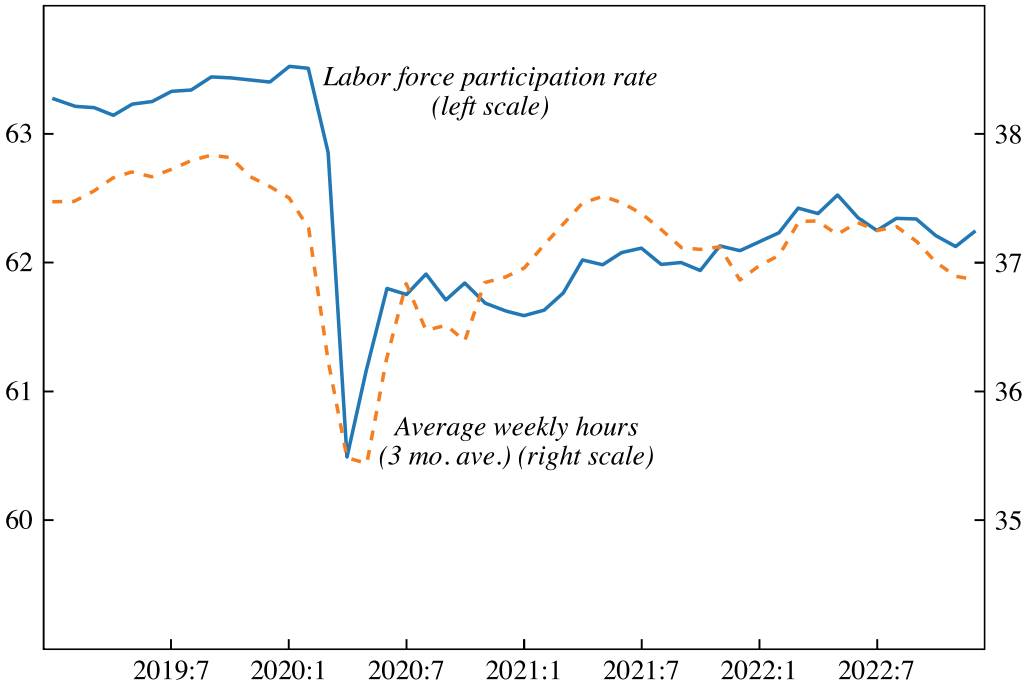
ABSTRACT Labor force participation and average hours of work both fell sharply at the beginning of the COVID-19 pandemic. Neither had fully recovered by the end of 2022. The drop in participation between December 2019 and December 2022 implies a loss of 3 million people from the labor force; the decline in average hours over the same period translates to the equivalent of 2.6 million fewer workers. Demographic and other trend factors that predated the pandemic explain most of the participation shortfall. Taken together, COVID-19-related health effects and the persistent (though shrinking) effects of the fear of contracting COVID-19 more than explain the rest. In contrast, pre-pandemic factors account for little of the shortfall in hours. COVID-19-related health effects account for perhaps 40 percent of that decline, but we are unable to explain the majority of the hours shortfall. We speculate that the lower level of hours in the post-pandemic period may reflect a shift in the desired balance between work and other aspects of workers' lives.

The US labor force participation rate has been trending downward since the beginning of the 21st century (Abraham and Kearney 2020), falling on average about 0.2 percentage point per year. At the start of the pandemic, however, participation plummeted, dropping more than 3 percentage points on a seasonally adjusted basis over just two months. As can

Conflict of Interest Disclosure: The authors did not receive financial support from any firm or person for this paper or from any firm or person with a financial or political interest in this paper. The authors are not currently an officer, director, or board member of any organization with a financial or political interest in this paper.

Brookings Papers on Economic Activity, Spring 2023: 1–48

Figure 1. Labor Force Participation (Monthly) and Average Weekly Hours (Three-Month Moving Average), Seasonally Adjusted, January 2019 to December 2022



Sources: Authors' tabulations of Current Population Survey data.

Note: Series constructed using monthly data downloaded from the IPUMS data set (Flood and others 2022) and reweighted to wedge effects of new population controls introduced in January 2022 and January 2023 backward. Individuals with a job but not at work were assigned zero hours. Monthly estimates seasonally adjusted using X-12 seasonal adjustment command in Eviews, applying multiplicative X-11 method and auto X-12 seasonal and trend filter.

be seen in figure 1, about half of that initial drop was quickly reversed, but as of December 2022, the seasonally adjusted participation rate was still more than a percentage point below its December 2019 level. Average weekly hours of work as measured in the Current Population Survey (CPS) also fell sharply at the onset of the pandemic and, as of late 2022, had not fully recovered. Seasonally adjusted average weekly hours for the three months centered on December 2022 were about 0.7 hour below their level for the three months centered on December 2019.[1]

1. We count people who had a job but did not work during the survey reference week as having zero hours. Even after seasonal adjustment, the weekly hours series is noisy. To make the trends in the data more easily visible, figure 1 plots a centered three-month average rather than the monthly numbers. As explained later in the paper, all of our analysis makes use of data adjusted to wedge the effects of the new population controls introduced in the CPS in January 2022 and January 2023 back over an appropriate prior period rather than treating them as changes that occurred in a single month. This means that our estimates do not exactly match published CPS estimates.

In this paper, we explore more systematically what happened to the labor force participation rate and average weekly hours of work over the three years ending in December 2022.[2] Ongoing declines in participation due to the aging of the baby boomers have long been anticipated. Although rising educational attainment has partially offset the effects of population aging, taken together these demographic changes accounted for a bit more than a 0.5 percentage point decline in participation between December 2019 and December 2022, leaving an unexplained decline of about 0.6 percentage point. Even prior to the pandemic, moreover, participation among younger and prime-age adults generally had been trending downward. Although increasing participation among older adults has partially offset these declines, extrapolating the pre-pandemic within-group trends in addition to accounting for changes in demographic mix can explain an additional 0.3 percentage point decline in the participation rate from December 2019 through December 2022. This leaves a decline of just 0.3 percentage point that is not explained by preexisting factors.

The post-pandemic decline in average hours per week reduced total hours worked almost as much as the decline in participation. In contrast to the decline in participation, however, demographic changes and pre-pandemic trends explain almost none of this drop. Our paper highlights the importance of hours for understanding how labor supply changed over the post-pandemic period.

Measured relative to changes projected based on a continuation of pre-existing within-group trends, the post-pandemic shortfalls in participation and hours were not uniform across age and education groups. Participation among adults age 25–54 dropped more than anticipated for those without a college degree but changed little among the college-educated. Among adults age 65 and older, in contrast, there were *larger* unanticipated participation rate declines among the college-educated than among those with less education, though in this case both groups' participation rates fell significantly relative to their previous trends. Participation net of demographic and trend influences fell for white non-Hispanic individuals, but changed little for Black non-Hispanic and Hispanic

2. Although excess mortality and reductions in immigration associated with the pandemic also have affected the size of the labor force through their effects on the size of the population (Powell 2022; Hobijn and Şahin 2022), we focus here on what has happened to the willingness of the resident population to supply their labor to the market.

individuals. The unanticipated declines in participation were a bit larger for women than for men, but the reverse is true for the unanticipated declines in hours.

Various hypotheses have been offered for why, as late as December 2022, participation and hours had not yet fully rebounded to the levels that would have been predicted prior to the pandemic. We explore (and in some cases extend) available evidence related to several widely cited explanations: that improvements in households' balance sheets attributable to federal safety net spending or to the rising stock market and increases in house prices had a dampening effect on labor supply; that COVID-19 itself led to lower participation and shortened hours of work; and that fear of COVID-19 slowed the return of workers to the labor market.

We conclude that, although they contributed to improvements in household balance sheets, neither federal transfers to households during the pandemic nor rising asset prices contributed in any substantial way to lower overall labor supply. Rising house prices, however, could have made it possible for older homeowners adversely affected by other shocks to retire earlier than they otherwise might have done.

Available data suggest that missed work time due to COVID-19 infections explains a portion of the shortfall in hours we document. Some prior studies have estimated very large effects of long COVID—lingering health problems consequent to a COVID-19 infection—on labor supply. Although we do not find the largest previously estimated effects to be plausible, we conclude that long COVID explains much if not all of the modest shortfall in participation relative to what one might have anticipated prior to the pandemic and a portion of the shortfall in hours. By the end of 2022, fear of COVID-19 had become less important as a reason for nonparticipation but continued to play a role. Insofar as working even a shortened in-person work schedule would have involved potential COVID-19 exposure, however, fear of COVID-19 seems unlikely to have contributed significantly to the shortfall in hours.

Taken together, demographic changes, preexisting trends, COVID-19 health effects, and continuing fear of COVID-19 (more than) explain the post-pandemic shortfall in participation we document. Even after considering all of these factors, however, much of the unanticipated decline in average weekly hours remains unexplained. This leads us to speculate that a reevaluation of the balance between work and other activities may be a part of the explanation for the reduction in hours we document. Whether this change will be permanent remains to be seen.

I. How Did Labor Supply Change in the Post-Pandemic Labor Market?

The central question we seek to answer is why, despite the strength in the labor market, neither participation nor weekly hours of work had fully recovered to pre-pandemic levels nearly three years later. We look first at the raw changes in participation and hours between December 2019 and December 2022, then examine series from which we net out the effects of demographic changes and, for a second counterfactual, also net out the effects of preexisting trends. These estimates imply that much of the shortfall in participation compared to pre-pandemic levels should have been anticipated based on demographic and other trend factors. In contrast, almost none of the shortfall in weekly hours of work can be explained by demographic changes or pre-pandemic group-specific trends.

I.A. Developing a Benchmark for Assessing Post-Pandemic Participation and Hours

Prior to the start of the pandemic, the labor market had been experiencing a long-running cyclical recovery, with unemployment having reached lows not seen since the late 1960s. Had the labor market been less strong at the end of 2022 than in late 2019 or early 2020, an explanation for the post-pandemic shortfalls in participation and hours might have been that they were due to weaker labor demand conditions. In fact, however, available data suggest that the labor market was at least as tight at the end of 2022 as it had been three years earlier. The seasonally adjusted unemployment rate stood at 3.6 percent in December 2019 and was 3.5 percent in December 2022. If anything, the elevated levels of both job vacancies and quits prevailing at the end of 2022 suggest a tighter labor market than implied by the unemployment rate (Domash and Summers 2022). This leads us to interpret the shortfalls we observe as a product of changes in labor supply, not labor demand. In the remainder of the paper, we compare participation and hours as of December 2022 to their levels in December 2019. One caution about the interpretation of our results is that labor supply typically responds to tightening labor markets with a lag. Although this process had been largely completed by the end of 2022 (Hobijn and Şahin 2022), data from the months following the endpoint for our analysis suggest it had not fully played itself out.

Even absent the pandemic, changing population demographics over the past three years, most especially the aging of the population and ongoing

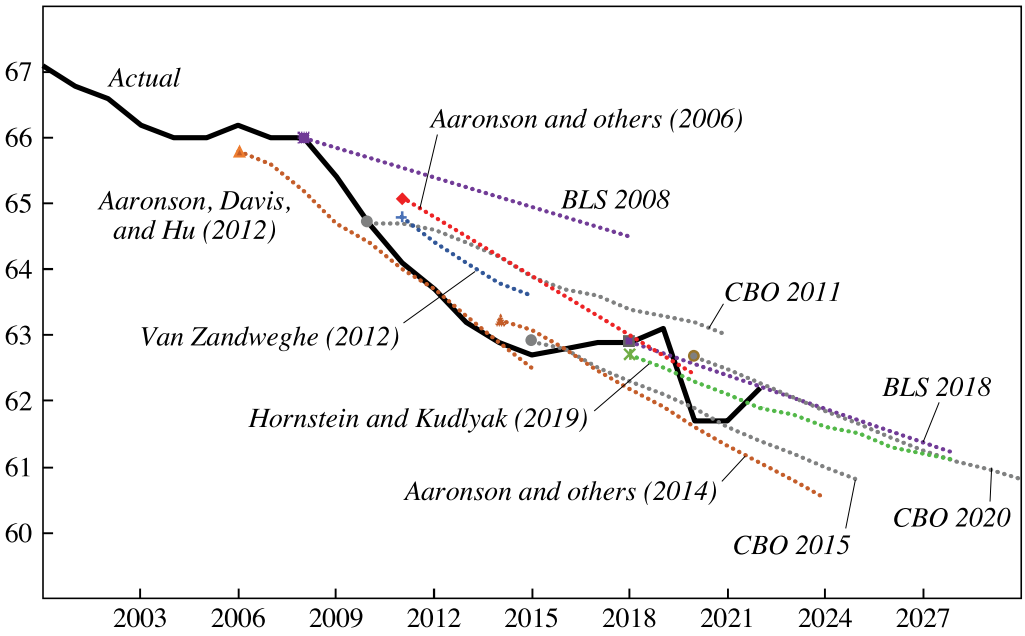
increases in educational attainment at given ages, would have affected participation and possibly hours. Because participation drops off significantly at older ages, it has long been anticipated that the aging of the baby boomers would put downward pressure on the overall participation rate. Rising education levels have worked in the opposite direction, as once their schooling is completed more-educated individuals have higher participation rates than those with lower levels of education, but have only partially offset the effects of aging. The net effect of these demographic changes on participation has been negative (Aaronson, Davis, and Hu 2012; Aaronson and others 2006; Aaronson and others 2014; Montes 2018; Hornstein and Kudlyak 2019). Average weekly hours vary less with age and education than participation, but also should be adjusted for these same demographic factors.

Some discussions of post-pandemic labor force participation implicitly have set a benchmark that incorporates a continuation of subgroup participation trends during the years immediately preceding the pandemic. As unemployment fell and the labor market tightened during this period, within-group participation rates generally were rising. Extrapolating those short-term trends generates a benchmark against which the number of "missing workers" is very large. Given the significant cyclical upswing in participation that already had occurred by the beginning of 2020, however, continuation of the immediate pre-pandemic participation trends is an unrealistic counterfactual.[3]

Although it would not be appropriate to extrapolate the short-term pre-pandemic trends and treat that as the benchmark for recent experience, there have been notable longer-term trends in participation that might well have been expected to continue. Participation among young adults (16–24 years old) and prime-age adults (25–54 years old) generally has fallen since about 2000; in contrast, participation among older adults (55 years old and older) generally has risen (Abraham and Kearney 2020). Analysts have modeled these trends in different ways. The ten-year labor force projections developed by the Bureau of Labor Statistics, for example, essentially extrapolate preexisting participation trends for specific subgroups (US Bureau of Labor Statistics 2022b). Others have directly estimated participation rate models for demographic subgroups that contain cyclical, structural, and cohort variables, though different analysts have made differing choices about exactly what variables to include in the model,

3. Hobijn and Şahin (2022) make a similar point.

Figure 2. Actual and Projected Cyclically Neutral Labor Force Participation Rates, 2000–2028



Source: Hobijn and Şahin (2022), adapted with authors' permission.

Note: Actual figures are published CPS estimates; BLS projections available at https://www.bls.gov/emp/; and CBO forecasts available at https://www.cbo.gov/data/budget-economic-data. Other estimates from Aaronson, Davis, and Hu (2012); Aaronson and others (2006); Aaronson and others (2014); Hornstein and Kudlyak (2019); and Van Zandweghe (2012). Markers show vintage of projection or forecast.

how the cohort effects are specified, and other model features (Aaronson, Davis, and Hu 2012; Aaronson and others 2006; Aaronson and others 2014; Montes 2018; Hornstein and Kudlyak 2019). Despite the differences in approach—and some notable differences in what the models imply about the level of the cyclically neutral labor force participation rate—there is broad agreement about the combined effects of demographic changes and other factors on the overall trend in labor force participation.

This can be seen in figure 2, adapted from a recent paper by Hobijn and Şahin (2022).[4] Both across models and across different vintages of the same model, there are significant differences in the level of the cyclically neutral participation rate. In every case, however, the models imply that the overall participation rate has been trending downward by between

4. We thank Bart Hobijn and Ayşegül Şahin for sharing the data underlying their chart with us. Our chart includes a slightly different set of previous projections than were included in their chart but otherwise is similar to theirs.

0.2 and 0.3 percentage point per year. The adjustments we make to account for changes in demographic mix and, in some calculations, preexisting within-group trends, described below, are consistent with these projections.

I.B. Adjusting Participation and Hours for Demographics and Preexisting Group-Specific Trends

We measure participation and hours using data from the CPS; the underlying microdata were downloaded from the IPUMS database (Flood and others 2022). As in the series displayed in figure 1, our average hours calculations assign zero hours to people who had a job but did not work during the survey reference week. One complication in working with these data is that the population controls used to determine the weighting for CPS estimates are updated each January but the weights and associated estimates for previous months are not adjusted to reflect this updated information. The January 2021 changes to the population controls had a negligible effect on key estimates (US Bureau of Labor Statistics 2021), but both the January 2022 and the January 2023 changes raised the estimated labor force participation rate. The new controls introduced in January 2022 reflected information from the 2020 Census showing that the population was younger than had previously been believed. Because younger adults are more likely than older adults to be working or seeking work, using the new controls would have raised the December 2021 labor force participation rate by 0.3 percentage point (Montes, Smith, and Dajon 2022; US Bureau of Labor Statistics 2022a). This discrepancy should be thought of as having accumulated over the period since population controls incorporating information from the 2010 Census were introduced rather than occurring all at once. An implication is that the participation rate just prior to the start of the pandemic was a bit higher and the size of the post-pandemic decline in participation through December 2021 a bit larger than suggested by published statistics.[5] The new controls introduced in January 2023 produced smaller changes, but their use would have raised the December 2022 labor force participation rate by 0.1 percentage point (US Bureau of Labor Statistics 2023). Incorporating the January 2023 controls thus has the effect of shrinking the post-pandemic decline in participation, partially reversing the effects of incorporating the January 2022 controls.

5. Montes, Smith, and Dajon (2022) make a similar point in the context of discussing the growth in retirees as a share of the population through October 2022, which they argue would have been understated had they not taken the January 2022 change in population controls into account.

To measure the changes in participation and hours more accurately, we use weight adjustment factors developed by Bauer and others (2023) that wedge the changes captured by the new population controls introduced in January 2022 and January 2023 backward to the beginning of the period over which each of them is likely to have accumulated.

Given estimates of the declines in participation and hours between December 2019 and December 2022 incorporating the weight adjustments just described, we first would like to know how much of the changes we see can be attributed to factors whose effects were anticipatable prior to the onset of the pandemic. Subtracting the influence of those anticipatable factors should tell us how much remains to be explained by factors related to the pandemic and its aftermath. We begin by removing the effects of changes in demographic mix from the data and then, additionally, adjust for the potential effects of preexisting within-group participation rate trends.

Disaggregating across any mutually exclusive set of population subgroups, the change in the labor force participation rate between any two periods can be written as:

$$\Delta\left(LFPR\right)_{t_0,t_1} = \sum_i s_{i,t_0}\Delta\left(LFPR\right)_{i,t_0,t_1} + \sum_i \left(LFPR\right)_{i,t_0}\Delta s_{i,t_0,t_1} + \sum_i \Delta s_{i,t_0,t_1}\Delta\left(LFPR\right)_{i,t_0,t_1} \tag{1}$$

where *LFPR* is the estimated labor force participation rate, *s* is a specific group's share of the overall population, *i* indexes the different mutually exclusive groups, and t_0 and t_1 are the start and end of the time period over which the change is measured. We can express the change in average hours similarly, but with employment shares in place of population shares. The first term in these equations captures the effects of within-group changes in participation or hours, holding population or employment shares fixed. A series constructed based on that term tells us how much participation or hours has changed net of the effects of changes in demographic mix. The second term captures the effect of changes in group shares, holding each group's initial participation rate or average hours constant. The third term summarizes any potential interaction effects. Although these can matter in some contexts, they are consistently negligible for the decompositions we report.

The decomposition just described treats each group's participation rate or hours in the initial period as the relevant benchmark for evaluating subsequent within-group changes. Since persistent trends reflect factors that

might have a continuing influence, it also may be appropriate to net out the effects of any preexisting within-group trends. We can modify equation (1) to do this:

$$\Delta\left(LFPR\right)_{t_0,t_1} = \sum_i s_{i,t_0}\left[\Delta\left(LFPR\right)_{i,t_0,t_1} - TREND_{i,t_0,t_1}\right] + \sum_i\left[\left(LFPR\right)_{i,t_0}\Delta s_{i,t_0,t_1} + s_{i,t_0}TREND_{i,t_0,t_1}\right] + \sum_i \Delta s_{i,t_0,t_1}\Delta\left(LFPR\right)_{i,t_0,t_1} \tag{2}$$

In equation (2), *TREND* is the estimated preexisting long-term within-group trend for a group extrapolated over the time period of interest. The first term in the equation is now the unanticipated change in participation after netting out the effects of both demographic changes and preexisting within-group trends. The second term is the change that should have been anticipated based on the combination of those factors. The third term is unchanged and, as before, represents potential interaction effects. A similar decomposition can be carried out for the change in hours using employment shares rather than population shares.

We begin by constructing series that fix the age by education composition of the population or employment, as appropriate, but allow within-age-and-education-group participation and hours to change as they did. For these series, we hold constant the shares in each of thirteen detailed age groups (16–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, and 75 and older). Because those age 16–24 are still in the process of completing their education and the decision whether to remain in school is itself an endogenous outcome, we do not hold educational attainment constant within the 16–19 or 20–24 age groups. For those age 25 and older, we fix the shares within each detailed age group in each of the following four educational attainment categories—less than a high school education, high school or the equivalent, some college, or a bachelor's degree or higher.[6]

6. Among those age 16–24, participation rates and hours of work are markedly higher for those who are out of school than for those who are still enrolled. Because the shares of 16- to 19-year-olds and 20- to 24-year-olds who are out of school has risen, holding constant the shares who are in versus out of school would leave slightly more of the change in participation to be explained by within-group changes as opposed to changes in population demographics.

Starting with the age-by-education-adjusted series, we also construct series that additionally net out the effects of within-group trends from the first term of equation (2) or its hours analogue. For this purpose, the preexisting trend in each of the detailed age groups (for those under age 25) or age by education groups (for those age 25 and older) is estimated using annual data for the period from 2000 through 2019.

Figure 3 shows the result of netting out the effects of demographic changes and preexisting group-specific trends. For participation, the figure displays seasonally adjusted monthly numbers. The hours series shown in the figure are three-month moving averages.

As shown in figure 3, panel A, the seasonally adjusted labor force participation rate we estimate fell by 1.2 percentage points between December 2019 and December 2022. On an age-and-education-adjusted basis, participation was about 0.6 percentage point lower in December 2022 than it had been in December 2019. Allowing for preexisting within-age-and-education-group trends, participation was about 0.3 percentage point lower in December 2022. This second calculation suggests that most of the post-pandemic decline in participation may be attributable to factors that predated the pandemic, though there was still a modest shortfall as of December 2022.

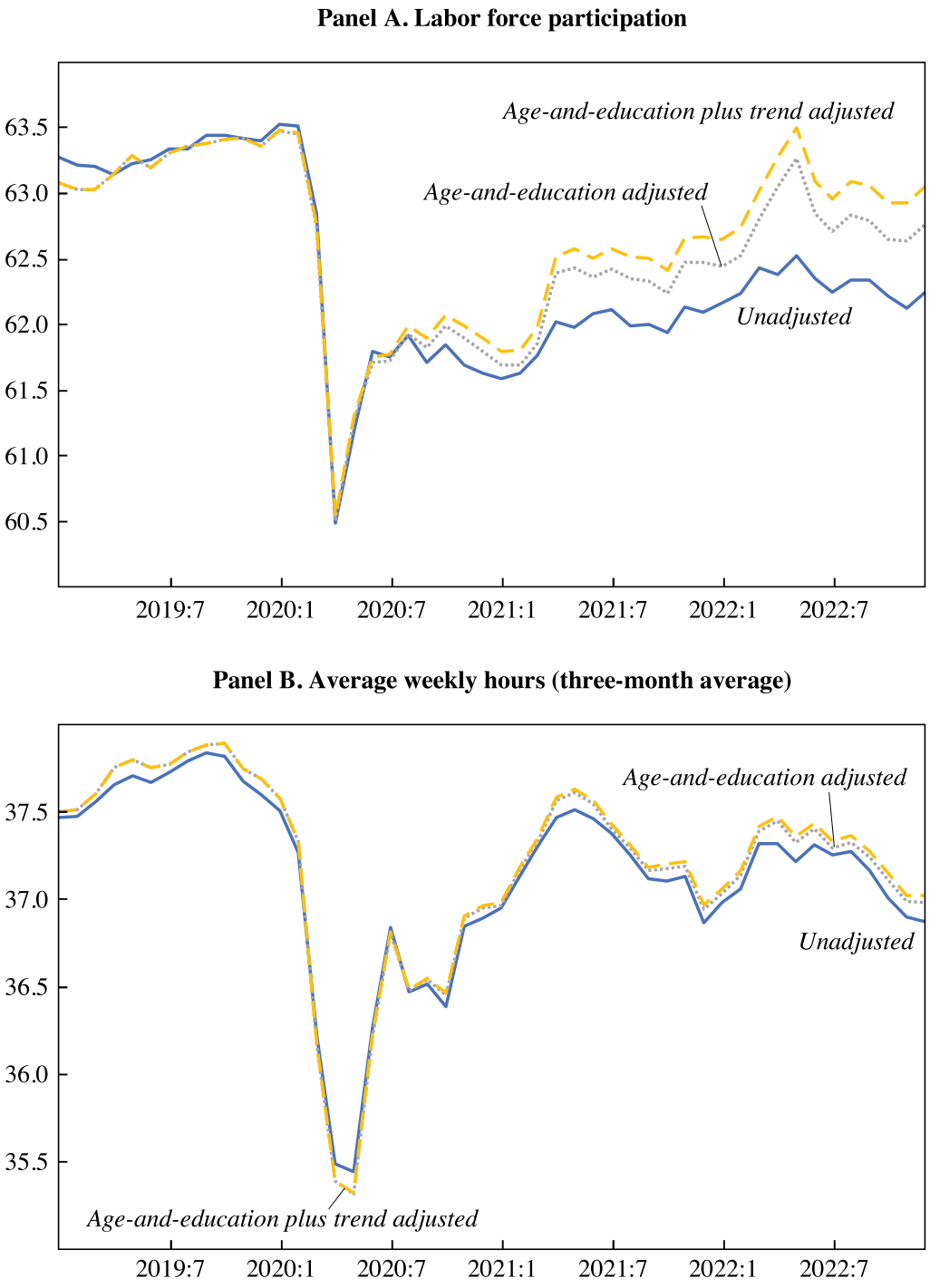
Panel B shows corresponding series for hours of work. Average weekly seasonally adjusted hours measured as a three-month moving average were 36.9 hours in December 2022 compared to 37.6 hours in December 2019 or 0.7 hour lower. Although there are differences in average weekly hours across some of the employment subgroups, adjusting for the age-by-education composition of employment does not greatly affect the measured overall net change in average hours. Removing the effects of long-term preexisting within-group trends in average hours also has little effect on the measured overall net change.

To be slightly more formal about the relative importance of changes along different margins to the change in the aggregate supply of hours, consider the following identity:

$$\frac{TOTHRS_t}{POP_t} = \frac{LF_t}{POP_t} * \frac{EMP_t}{LF_t} * AVEHRS_t \tag{3}$$

where *TOTHRS* is aggregate hours worked per week; *POP* is the population age 16 and older; *LF* is the number of people age 16 and older in the labor force; *EMP* is the number of employed people age 16 and older; and *AVEHRS* is the average weekly hours worked by those who are employed.

Figure 3. Unadjusted and Adjusted Labor Force Participation and Average Weekly Hours, January 2019 to December 2022



Sources: Authors' tabulations of Current Population Survey data.

Note: Series constructed using monthly data downloaded from the IPUMS data set (Flood and others 2022) and reweighted to wedge effects of new population controls introduced in January 2022 and January 2023 backward. Individuals with a job but not at work were assigned zero hours. Monthly estimates seasonally adjusted using X-12 seasonal adjustment command in Eviews, applying multiplicative X-11 method and auto X-12 seasonal and trend filter. For adjusted series, component series seasonally adjusted and then summed.

In this identity, $\frac{LF}{POP}$ is just the labor force participation rate ($LFPR$) and $\frac{EMP}{LF}$ can be expressed as one minus the unemployment rate ($1 - UR$). Substituting into equation (3), taking the natural log and then differencing gives us:

$$(4) \qquad \Delta \ln\left(TOTHRS\right) - \Delta \ln\left(POP\right) = \Delta \ln\left(LFPR\right) + \Delta \ln\left(1 - UR\right) + \Delta \ln\left(AVEHRS\right)$$

This expression decomposes the change in aggregate weekly hours per adult member of the population into pieces attributable to changes in the labor force participation rate, the employment rate (one minus the unemployment rate), and average weekly hours among the employed. Carrying out the equation (4) decomposition for December 2022 compared to December 2019 (and using monthly data that are not seasonally adjusted for all of the terms), the natural logarithm of aggregate hours per person age 16 and older fell by 0.0328, roughly a 3.2 percent decline. Of this decline, about 55 percent was due to declining labor force participation (which fell about 1.8 percent) and about 48 percent to the decline in average weekly hours (which fell about 1.6 percent), with a small offsetting positive residual attributable to the 0.1 percentage point decrease in the unemployment rate between the two endpoints.[7]

A simple way to put these numbers into perspective is to ask how many missing labor force participants the changes along each of the three margins represent. The approximately 1.8 percent decline in labor force participation we observe between December 2019 and December 2022 reduced the size of the labor force by about 3.0 million in December 2022. Based on our separate decomposition of the factors that have contributed to the participation decline, roughly 1.5 million of this shortfall remains after allowing for changes in the age-education composition of the population and a bit under 0.8 million remains after allowing, in addition, for the continuation of preexisting within-group participation trends. The approximately

7. Lee, Park, and Shin (2023) report results from a similar analysis that decomposes the change in aggregate hours from 2019 through 2022 into a piece attributable to changes in the employment to population ratio and changes in average weekly hours. They find that changes in average hours have been roughly as important as changes in the employment to population ratio in explaining the post-pandemic aggregate hours shortfall.

1.6 percent decline in average weekly hours translates into the equivalent of a 2.6 million reduction in the size of the labor force. In contrast to the participation figures, very little of this is attributable to demographic changes or preexisting trends. Holding everything else constant, the change in the unemployment rate would have *added* a small amount to the available workforce (about 0.1 million people).

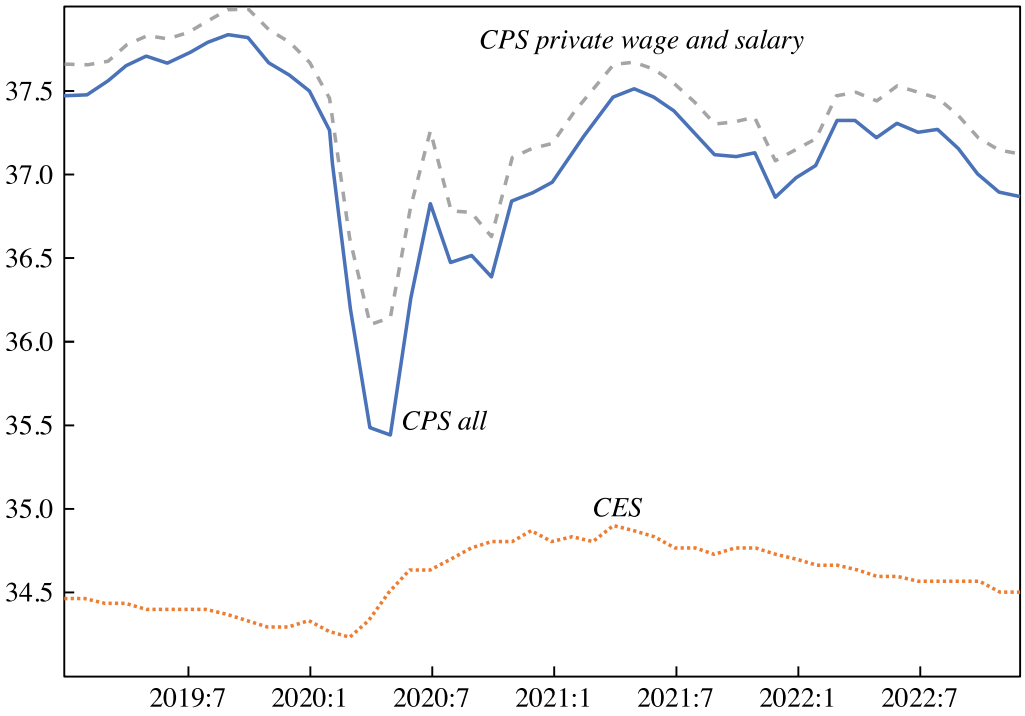
I.C. An Aside on the Measurement of Hours

In these decompositions, net of the effects of demographic changes and preexisting within-group trends, the shortfall in average weekly hours is a more important part of the post-pandemic labor supply shortfall than the corresponding shortfall in labor force participation. Hours as estimated in the Current Employment Statistics (CES) survey (the monthly payroll survey), however, give a very different sense of how hours moved during the post-pandemic period. Figure 4 shows three-month moving averages of seasonally adjusted estimates for both CPS and payroll survey hours for the period from January 2019 through December 2022. As already discussed, weekly hours of work per employed person as measured in the CPS fell sharply at the start of the pandemic and had not fully recovered by the end of 2022. Weekly CPS hours for people whose main job is a private sector wage and salary job—a group that aligns more closely with the payroll survey universe—behaved similarly to overall weekly CPS hours. On a seasonally adjusted basis, the private sector wage and salary series declined from about 37.7 hours in December 2019 to about 37.1 hours in December 2022. In contrast, seasonally adjusted weekly paid hours per private sector job as measured in the payroll survey *rose* following the onset of the pandemic, increasing from 34.3 hours in December 2019 to 35.0 hours in January 2021 before eventually falling back to 34.4 hours as of December 2022, 0.1 hour above their starting level.

Although we cannot fully reconcile the different movements in the CPS and payroll survey hours, we can identify two factors that likely have been at work. First, the CPS measures hours *worked*, whereas the payroll survey measures hours *paid*. Second, whereas the CPS is a measure of hours per *person*, the CES survey is a measure of hours per *job*. Both help to explain why the two hours series behaved differently over the post-pandemic period.

The gap between hours worked and hours paid is especially important for salaried workers. Although salaried workers' actual weekly hours may vary considerably, they are paid for a fixed number of hours per week. We

Figure 4. Average Weekly Hours, Current Population Survey and Current Employment Statistics Survey, January 2019 to December 2022



Sources: Authors' tabulations of Current Population Survey data and Bureau of Labor Statistics.

Note: CPS hours data downloaded from the IPUMS data set (Flood and others 2022) and reweighted to wedge effects of new population controls introduced in January 2022 and January 2023 backward. In CPS data, individuals with a job but not at work were assigned zero hours. Monthly estimates seasonally adjusted using X-12 seasonal adjustment command in Eviews, applying multiplicative X-11 method and auto X-12 seasonal and trend filter. CES survey hours data seasonally adjusted series as published by Bureau of Labor Statistics. All series centered three-month moving averages.

are able to distinguish salaried workers from hourly workers in the quarter of the CPS sample that belongs to the outgoing rotation groups (those in the survey sample for either the fourth or the eighth of eight interviews). Seasonally adjusted average weekly hours worked for private sector wage and salary workers in this outgoing rotation group sample were about 0.9 hour lower in the three months centered on December 2022 than in the three months centered on December 2019. To gauge what this decline might have looked like had hours paid rather than hours worked been recorded for the salaried workforce, we recalculated the numbers with the hours of full-time salaried workers fixed at 40 hours per week and those of part-time salaried workers fixed at 20 hours per week. The resulting series, which should more closely approximate an hours paid series, exhibits a net decline of just over half as much as the original series.

This back-of-the-envelope calculation does not fully capture how converting the measurement from hours worked to hours paid would affect the post-pandemic CPS estimates, as it does not account for the potential effects of changes in paid time off among the hourly workforce. During the pandemic, reflecting the impact of COVID-19, there were increases both in the share of workers absent from work for health-related reasons and in the share working part-time rather than full-time for health-related reasons.[8] The increases in these shares have been larger among private sector hourly workers than for the wage and salary workforce as a whole. Suppose that affected hourly workers otherwise would have worked the same hours as in the previous month, provided they were working rather than absent (for the first group) or working full-time rather than part-time (for the second group). Under these assumptions, the extra work time missed by hourly workers due to absences or cutting back to part-time in the three months centered on December 2022 compared to the three months centered on a typical December would have reduced overall average weekly hours worked by about 0.2 hour. To the extent that these workers had access to paid sick leave, hours paid would not reflect this reduction in hours.[9]

The other major conceptual difference between the CPS and payroll hours series is that the former measures hours per person while the latter measures hours per job. This difference means that changes over time in the prevalence of multiple job holding may cause the series to diverge. Data from the CPS indicate that the seasonally adjusted multiple job holding rate among workers whose primary job was as a private sector employee fell from 4.7 percent in December 2019 to a low of 3.8 percent in April 2020, stayed low through the end of 2020, and then recovered, slowly and unevenly, to 4.7 percent in December 2022. All else the same, the initial decline in multiple job holding would have led hours per employee as measured in the CPS to fall. In addition, because second jobs generally involve fewer hours per week than the average job, a decline in multiple job holding can be expected to have caused average hours per job, the concept measured in the payroll survey, to rise. Back-of-the-envelope calculations using CPS data suggest that, holding average hours per week

8. Goda and Soltas (2023) show that absences for health-related reasons among the workforce as a whole have been correlated with local area COVID-19 case counts and have grown more for workers in occupations that are more likely to require physical presence on the job, corroboration for the view that the increase can be attributed to COVID-19.

9. We use three-month averages for the calculations just described because information to distinguish salaried from hourly workers is available only for the outgoing rotation groups and the sample sizes are correspondingly smaller.

on the primary and secondary jobs held by employees whose primary job was in the private sector at their December 2019 level, the reduction in the multiple job holding rate through April 2020 would have reduced average weekly hours per private sector employee by about 0.1 hour. It also would have raised average weekly hours per job they held by about 0.2 hour.[10] Multiple job holding thus helps to explain why, at the pandemic's start, CPS hours and payroll survey hours initially moved in opposite directions.

In sum, the differences between measuring hours worked versus hours paid and hours per person versus hours per job appear to explain much if not all of the divergence in the behavior of CPS and payroll survey hours since the pandemic's start. Our interest lies with understanding changes in labor supply over this period and, for that purpose, the CPS numbers are the conceptually more appropriate measure. In what follows, we make use of hours worked as measured in the CPS.

I.D. Whose Labor Supply Fell?

The estimates we have presented thus far suggest that there were notable changes in aggregate labor supply during the post-pandemic period relative to the changes that should have been expected based on shifts in population demographics or the combination of shifts in population demographics and preexisting trends. This naturally raises the question of which groups in the population were responsible for these changes. Table 1 summarizes the results of an accounting exercise that decomposes the overall change in the participation rate between December 2019 and December 2022 into the components shown in either equation (1) or equation (2). These calculations make use of non-seasonally adjusted data reweighted as discussed above to more appropriately distribute the effects of the new population controls introduced in January 2022 and January 2023. The mutually exclusive groups used for the calculations are defined using detailed age groups and, for those age 25 and older, completed education. The decomposition shown in panel A accounts only for changes in age and education mix; panel B additionally incorporates the projected effects of a continuation of within-group trends. In each case, we are interested primarily in the row in the table that shows the decline in participation in

10. A limitation of this calculation is that some of the second jobs held by people whose main job is as a private sector employee are in self-employment. It also does not count second jobs as employees held by people who are primarily self-employed. Abraham and others (2023) report that, in the CPS, about 75 percent of second jobs held by people who are employees on their main job are also employee jobs, as are about 40 percent of second jobs held by the much smaller share of people who are self-employed on their main job.

Table 1. Decomposition of Percentage Point Change in Labor Force Participation Rate, without and with Trend Adjustments, December 2019 to December 2022

	Contribution to overall change in LFPR					
	Overall	*Men*	*Women*	*White non-Hispanic*	*Black non-Hispanic*	*Hispanic*
Total change	−1.13	−1.06	−1.25	−1.51	−0.54	−0.71
Panel A: Decomposition without accounting for within-group trends						
Within-age-and-education group participation changes	−0.59	−0.59	−0.62	−0.78	−0.31	−0.30
16–24, all	0.05	0.04	0.05	0.10	−0.15	0.01
25–54, less than college	−0.39	−0.41	−0.37	−0.41	−0.06	−0.54
25–54, college plus	−0.01	−0.02	−0.04	−0.03	−0.17	0.18
55–64, less than college	0.03	−0.02	0.09	0.01	−0.05	0.11
55–64, college plus	0.00	0.02	−0.03	−0.06	0.27	−0.01
65 and older, less than college	−0.11	−0.12	−0.12	−0.14	−0.15	−0.14
65 and older, college plus	−0.16	−0.10	−0.20	−0.25	0.00	0.08
Age-and-education share changes	−0.55	−0.46	−0.64	−0.74	−0.15	−0.47
Interactions	0.01	−0.01	0.01	0.02	−0.07	0.06
Panel B: Decomposition accounting for within-group trends						
Within-age-and-education group participation changes less trend effects	−0.30	−0.19	−0.43	−0.58	0.11	−0.09
16–24, all	0.31	0.37	0.26	0.34	−0.02	0.33
25–54, less than college	−0.18	−0.18	−0.13	−0.20	0.20	−0.43
25–54, college plus	0.02	0.03	−0.07	−0.03	−0.09	0.16
55–64, less than college	−0.01	−0.05	0.05	−0.03	0.00	0.01
55–64, college plus	−0.04	−0.02	−0.08	−0.11	0.24	−0.03
65 and older, less than college	−0.18	−0.18	−0.19	−0.22	−0.20	−0.19
65 and older, college plus	−0.22	−0.16	−0.27	−0.33	−0.03	0.07
Age-and-education share changes plus trend effects	−0.84	−0.86	−0.83	−0.95	−0.57	−0.69
Interactions	0.01	−0.01	0.01	0.02	−0.07	0.06

Panel C: Change in participation rate (average across detailed component groups)						
16–24, all	0.32	0.29	0.35	0.80	–0.90	0.07
25–54, less than college	–1.32	–1.28	–1.37	–1.67	–0.17	–1.19
25–54, college plus	–0.04	–0.09	–0.18	–0.17	–1.02	1.48
55–64, less than college	0.22	–0.18	0.62	0.29	0.80	–0.73
55–64, college plus	0.00	0.37	–0.59	–0.88	7.54	–0.56
65 and older, less than college	–0.82	–0.98	–0.80	–0.87	–1.25	–1.62
65 and older, college plus	–2.49	–1.43	–3.20	–3.02	0.10	4.58
Panel D: Change in participation rate relative to preexisting trend (average across detailed component groups)						
16–24, all	2.12	2.41	1.83	2.73	–0.15	1.62
25–54, less than college	–0.60	–0.57	–0.49	–0.81	0.56	–0.95
25–54, college plus	0.08	0.18	–0.34	–0.16	–0.54	1.35
55–64, less than college	–0.13	–0.49	0.32	–0.06	0.88	–1.42
55–64, college plus	–0.69	–0.44	–1.55	–1.63	6.89	–1.23
65 and older, less than college	–1.32	–1.47	–1.26	–1.36	–1.68	–2.20
65 and older, college plus	–3.40	–2.33	–4.33	–3.91	–0.76	3.80

Sources: Authors' analysis of Current Population Survey data.

Note: Data adjusted to smooth changes in estimates due to introduction of new population controls in January 2022 and January 2023. Preexisting within-group trends estimated over 2000–2019 period. Detailed age groups are 16–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, and 75 plus. Detailed education categories for those age 25 and older are less than high school, high school, some college, and bachelor's degree or higher (labeled as college plus). Race and ethnicity categories are mutually exclusive. Race and ethnicity breakouts exclude non-Hispanic individuals who identify as Asian; American Indian, Aleut, or Eskimo; Hawaiian or Pacific Islander; or more than one race. People in these excluded groups represent less than 10 percent of the population.

excess of what we would have anticipated based on these factors. Estimates for the whole population are reported in the table's first column; the remaining columns show results by gender and by race and ethnicity. The table also shows the contribution of different broad age by education groups to the overall decline in participation relative to expectations and, for reference, the average change in the labor force participation rate within each of these same broad groups, again measured relative to expectations. The top row in table 1 shows that, not seasonally adjusted, the overall participation rate declined by about 1.1 percentage points between December 2019 and December 2022, but also that there were some differences across groups.[11] Participation declined noticeably more for white non-Hispanic individuals than for either Black non-Hispanic individuals (a 1.0 percentage point difference) or Hispanic individuals (a 0.8 percentage point difference). Women's participation rate declined slightly more than men's.

Given previously expected demographic changes and preexisting within-group participation rate trends, much of the overall change in participation could have been anticipated prior to the pandemic. After adjusting for changes in demographic mix, overall participation was roughly 0.6 percentage point lower than expected as of December 2022; also allowing for the effects of preexisting trends, it was only about 0.3 percentage point lower.

Focusing on the estimates that account for preexisting trends, overall participation declined most sharply for adults age 65 and older, and especially so for those with a college degree. The declines in participation for adults age 55–64, while less pronounced, also were larger for those with a college degree than for those with less education. These patterns are consistent with the finding by Montes, Smith, and Dajon (2022) that excess retirements increased more during the pandemic for those with a college education than for those without a college degree. Among adults age 25–54, in contrast, only the participation of those with less than a college degree fell relative to the pre-pandemic trend. These declines were partially offset by unanticipated within-group participation *increases* (relative to trend) among those age 16–24.

There are also differences in the patterns by gender and by race and ethnicity, though because of smaller sample sizes for some of the subgroups used in the decompositions, these results should be interpreted with

11. The declines in seasonally adjusted participation and hours plotted in figure 1 and figure 3 differ slightly from the non-seasonally adjusted declines reported in table 1 and table 2. Because the large and unusual movements in these series at the start of the pandemic make it more difficult to identify the appropriate seasonal factors, we chose to use non-seasonally adjusted data for the decompositions.

caution. The declines in participation for college-educated adult women age 55–64 and age 65 and older were larger relative to what would have been projected prior to the pandemic than those for men. Among college-educated adults age 65 and older, where the adjusted overall participation rate dropped substantially, the decline relative to trend was much smaller for Black non-Hispanic individuals, and participation relative to trend actually rose for highly educated older Hispanic individuals. The overall average decline in participation net of previous trends among everyone age 65 and older (not shown) was larger for white non-Hispanic individuals (2.2 percentage points) than for either Black non-Hispanic (1.5 percentage points) or Hispanic individuals (1.2 percentage points). Consistent with these findings, Montes, Smith, and Dajon (2022) report that excess retirements increased more during the pandemic for older white adults than for older Black or Hispanic adults.

For completeness, we include a similar decomposition of the post-pandemic change in average weekly hours. As can be seen in table 2, changes in the age by education composition of the employed population do not account for any appreciable share of the overall change in average weekly hours in the post-pandemic period—essentially all the decline reflects within-group hours reductions—nor do preexisting within-group trends in hours explain much of the observed change. Men's average weekly hours fell more than women's. Hours fell slightly less for Hispanic workers than for white non-Hispanic workers and actually increased slightly for Black non-Hispanic workers.

II. How Did the Pandemic Affect Participation and Hours?

There are several channels through which the pandemic—and the public policy response to the pandemic—could have contributed to the post-pandemic shortfall in participation and hours just documented. One potential explanation is that improvements in household balance sheets due to federal financial assistance during the pandemic may have slowed the return to work (Ferguson 2023). A related explanation is that increasing household wealth, the rising stock market, and especially, growing house prices associated with the pandemic-induced increase in the demand for housing in many locations could have led some people to exit the labor market (Coile 2022; Favilukis and Li 2023). Contracting COVID-19 leads directly to missed work hours. In addition, long COVID symptoms may have forced some affected individuals to withdraw from the labor force or cut back more permanently on the time they spend at work (Bach 2022a,

Table 2. Decomposition of Change in Average Weekly Hours, without and with Trend Adjustments, December 2019 to December 2022

	Contribution to overall change in average weekly hours					
	Overall	*Men*	*Women*	*White non-Hispanic*	*Black non-Hispanic*	*Hispanic*
Total change	–0.59	–0.88	–0.29	–0.73	0.14	–0.78
Panel A: Decomposition without accounting for within-group trends						
Within-age-and-education group hours changes	–0.58	–0.89	–0.27	–0.68	0.06	–0.79
16–24, all	–0.04	–0.07	0.00	–0.08	0.16	0.05
25–54, less than college	–0.35	–0.46	–0.24	–0.36	–0.08	–0.69
25–54, college plus	–0.10	–0.20	–0.01	–0.10	–0.09	–0.09
55–64, less than college	–0.06	–0.10	0.00	–0.08	–0.08	0.00
55–64, college plus	–0.01	–0.02	–0.01	–0.01	0.13	–0.04
65 and older, less than college	0.00	–0.01	0.01	–0.01	0.02	0.01
65 and older, college plus	–0.03	–0.03	–0.03	–0.03	0.00	–0.04
Age-education share changes	–0.03	–0.01	–0.04	–0.07	–0.03	0.00
Interactions	0.02	0.02	0.02	0.02	0.11	0.01
Panel B: Decomposition accounting for within-group trends						
Within-age-and-education group hours changes less trend effects	–0.54	–0.74	–0.37	–0.70	0.10	–0.59
16–24, all	0.00	–0.03	0.02	–0.06	0.19	0.14
25–54, less than college	–0.33	–0.39	–0.24	–0.36	–0.04	–0.62
25–54, college plus	–0.06	–0.12	–0.05	–0.07	–0.07	–0.05
55–64, less than college	–0.08	–0.11	–0.02	–0.11	–0.10	0.00
55–64, college plus	–0.02	–0.03	–0.03	–0.02	0.12	–0.03
65 and older, less than college	–0.02	–0.03	–0.01	–0.03	0.00	0.01
65 and older, college plus	–0.04	–0.04	–0.04	–0.05	–0.01	–0.04
Age-and-education share changes plus trend effects	–0.07	–0.16	0.06	–0.05	–0.08	–0.20
Interactions	0.02	0.02	0.02	0.02	0.11	0.01

Panel C: Change in average weekly hours (average across detailed component groups)						
16–24, all	–0.30	–0.60	–0.03	–0.75	1.21	0.33
25–54, less than college	–0.96	–1.18	–0.71	–1.16	–0.17	–1.29
25–54, college plus	–0.35	–0.80	–0.02	–0.35	–0.37	–0.54
55–64, less than college	–0.19	–0.27	–0.02	–0.41	–0.03	–0.03
55–64, college plus	–0.22	–0.37	–0.17	–0.17	3.34	–1.35
65 and older, less than college	0.13	–0.16	0.39	–0.20	0.72	0.49
65 and older, college plus	–0.87	–0.79	–1.04	–0.89	–0.20	–5.28
Panel D: Change in average weekly hours relative to preexisting trend (average across detailed component groups)						
16–24, all	–0.01	–0.29	0.20	–0.52	1.47	0.89
25–54, less than college	–0.90	–0.99	–0.72	–1.15	–0.08	–1.16
25–54, college plus	–0.22	–0.48	–0.17	–0.24	–0.31	–0.32
55–64, less than college	–0.33	–0.34	–0.18	–0.58	–0.13	–0.07
55–64, college plus	–0.25	–0.41	–0.41	–0.24	3.15	–1.06
65 and older, less than college	–0.45	–0.70	–0.18	–0.78	0.11	0.47
65 and older, college plus	–1.28	–1.26	–1.51	–1.30	–0.61	–5.43

Source: Authors' analysis of Current Population Survey data.

Note: Data adjusted to smooth changes in estimates due to introduction of new population controls in January 2022 and January 2023. Preexisting within-group trends estimated over 2000–2019 period. Detailed age groups are 16–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, and 75 plus. Detailed education categories for those age 25 and older are less than high school, high school, some college, and bachelor's degree or higher (labeled as college plus). Race and ethnicity categories are mutually exclusive. Race and ethnicity breakouts exclude non-Hispanic individuals who identify as Asian; American Indian, Aleut, or Eskimo; Hawaiian or Pacific Islander; or more than one race. People in these excluded groups represent less than 10 percent of the population.

2022b; Goda and Soltas 2023; Sheiner and Salwati 2022). Finally, continued fear of contracting COVID-19 could have kept people out of the labor force (Barrero, Bloom, and Davis 2022, 2023). We consider the evidence pertaining to these various explanations and then summarize the conclusions we draw from the available evidence.

II.A. Social Safety Net Expansions during 2020 and 2021

A common explanation for shortfalls in labor supply early in the pandemic was that relatively generous social safety net supports were discouraging people from looking for work (Morath and Chen 2020; Mitchell, Weber, and Cambon 2021). By the beginning of 2022, these added supports had come to an end, though household balance sheets remained healthier through the end of 2022 than might otherwise have been predicted, partially as a result of the earlier supports (Barnes and others 2022). The question is whether improvements in households' financial situations plausibly can explain the persistence of the shortfall in labor supply relative to prepandemic levels. To estimate how much the federal dollars that flowed to households during the pandemic might have affected labor supply, we first ask how large an increase in household wealth these payments represented. Then, we appeal to the literature that has estimated the elasticity of labor supply with respect to a pure increase in wealth to translate the increase in household wealth into a labor supply effect.

Estimating how much federal pandemic spending contributed to household wealth is tricky. Absent the pandemic, unemployment would not have spiked as it did and, for many households, unemployment benefits only partially replaced lost earnings. As a very generous upper bound estimate, we count as infusions to household balance sheets all of the approximately $441 billion the federal government spent on Federal Pandemic Unemployment Compensation, which added first $600 per week and later $300 per week to recipients' normal unemployment insurance (UI) payments; the approximately $85 billion spent on Pandemic Emergency Unemployment Compensation, which extended benefit durations; and the approximately $130 billion spent on Pandemic Unemployment Assistance, which made benefits available to the self-employed and others who ordinarily would not have qualified.[12] When the American Rescue Plan Act was passed in

12. These estimates come from United States Department of Labor, "Unemployment Insurance: Families First Coronavirus Response Act and Coronavirus Aid, Relief, and Economic Security (CARES) Act Funding to States," https://oui.doleta.gov/unemploy/docs/cares_act_funding_state.html, and include spending through October 8, 2022. We have subtracted spending that flowed to Puerto Rico and the Virgin Islands.

March 2021, the Congressional Budget Office estimated that the act's changes to the child tax credit would add about $85 billion to federal outlays during fiscal years 2021 and 2022 (CBO 2021). Spending on the three rounds of economic impact payments totaled about $850 billion (Parker and others 2022). Pandemic spending directed to households thus totaled roughly $1.6 trillion. As of the beginning of 2021, according to Census Bureau figures, there were about 250 million people age 18 and older living in the United States. On a per adult basis, federal pandemic spending directed to households thus amounted to an average of about $6,400.

In contrast to the voluminous literature on the effects of wages on labor supply, the literature on the labor supply effects of an increase in wealth is limited. A challenge is that increases in household wealth are seldom exogenous with respect to labor supply decisions. The best evidence we are aware of comes from studies of how lottery winnings affect the winners' subsequent labor supply. If people are myopic, the effects of an unexpected financial windfall such as winning a lottery could be larger in the short run than over time; if households are forward-looking, however, one would expect the effects to be smaller but more persistent. Consistent with the idea that households are forward-looking, Cesarini and others (2017) find that lottery winners spend their money slowly and that the labor supply effects of a lottery win are relatively stable for at least five years after the win. According to their elasticity estimates, winning a lottery valued at about $140,000 in 2010 dollars, equivalent to about $175,000 as of the middle of 2021, reduced winners' labor force participation rate by about 2 percentage points and their weekly hours by about 1.3 hours. Although one might expect these effects to be larger for older adults, they do not vary significantly by age group, at least not through age 65. Winning a lottery also affects a spouse's labor supply but only by about half as much as it affects the winner's. Using the elasticity estimates reported by Cesarini and others (2017), a wealth increase on the order of $6,400 would lower labor force participation by less than 0.1 percent and hours by less than 0.1 hour per week even after allowing for effects on spouses' labor supply. Given that much of the money the federal government directed toward households during the pandemic offset lost earnings rather than representing a net addition to household balance sheets, our assessment is that any negative effects of this spending on labor supply most likely were negligible.

II.B. Other Influences on Household Balance Sheets

Although discussions of how strong household balance sheets might be affecting labor supply often emphasize the role of federal payments during

the pandemic, these payments have not been the only or even the most important influence on households' financial well-being (Barnes and others 2022). While a significant number of households suffered serious economic harm due to pandemic shutdowns, others benefited initially from a rising stock market and rising home prices, the latter arguably a result of changes in the demand for housing induced by the pandemic. Stock prices later dropped and the housing market also cooled, though house prices remained significantly elevated. The group of people one might expect to be most affected by a run-up in asset prices are those close to retirement, for whom an increase in household wealth could make earlier retirement possible.

Previous research generally has concluded that short-term fluctuations in the stock market do not significantly affect the timing of retirement (Coile and Levine 2011; Goda, Shoven, and Slavov 2011). Research on the effects of short-term house price movements largely has come to a similar conclusion. Bosworth and Burtless (2010), for example, find no evidence in CPS data that trailing three-year house price increases in a respondent's state have a significant effect on the labor force participation of individuals age 55 to 74. Coile and Levine (2011) obtain similar results. Using data from the Health and Retirement Study, Farnham and Sevak (2016) find that year-over-year changes in housing prices do not have a significant effect on retirement rates.

Much of this research has been based on data for periods when the most significant variation in house prices was the large drop experienced in many markets during the Great Recession. The experience with rising house prices during the pandemic could have been different. Coile (2022), however, finds no evidence that state-level housing price changes during the pandemic were associated with increased labor market exits among those age 55–74. In contrast, in a recent paper, Favilukis and Li (2023), using American Community Survey (ACS) household data and Freddie Mac housing returns data, find that metropolitan area house price increases from 2016 through the middle of 2021 were associated with significantly lower labor force participation among older homeowners. For older renters and younger adults, however, house price increases were associated with *higher* participation; middle-aged adults' participation did not vary with house prices. Taken at face value, these results imply a negligible effect of the run-up in house prices on overall participation, but Favilukis and Li (2023) view it as explaining much if not all of the decline in participation among adults age 65 and older.

It is unclear, however, exactly what to make of these findings. The participation rate models estimated by Favilukis and Li (2023) include a variety of individual and metropolitan area controls in addition to their main house price change variable, but other factors still could explain the associations they find between house price increases and participation. For example, purchases by retirees of homes in smaller cities during the pandemic could have pushed up house prices in those areas while mechanically being associated with a lower participation rate for older adults. Further, Favilukis and Li are interested mainly in the role of rising house prices during the pandemic as a driver of lower participation among older homeowners, but their baseline model measures house price changes over a longer period. They do not obtain statistically significant results for house price increases that occurred after the start of 2020 while also controlling for pre-pandemic house price run-ups. Even setting these issues aside, there is a question about how any changes in older homeowners' participation behavior in areas where house prices were rising should be interpreted. Rather than house price changes driving declines in participation among older homeowners, it could be that something else—long COVID, fear of COVID-19, or simply the loss of a job—pushed older homeowners out of work. For those that had benefited from rising house prices, the fact that they had more home equity then made it possible for them not to return. Regardless, given that more-educated adults also are more likely to be homeowners, these findings are qualitatively consistent with the fact that, as documented earlier, the unanticipated declines in participation among college graduates age 65 and older have been larger than those for less-educated older adults.

II.C. COVID-19 Infections

Individuals who become infected with COVID-19 typically must take time off from work. Although active COVID-19 infections are unlikely to have an immediate effect on employment, they can be expected to reduce hours worked during the infection period. To estimate these effects, we use information from the CPS on the percentage of workers who were absent from work during the survey reference week for health-related reasons and on the percentage who worked part-time instead of their usual full-time for the same reasons. Both of these were higher in the post-COVID-19 period than they were on average from 2010 through 2019. We estimate lost hours for workers absent from their job for health-related reasons based on hours in the prior month for workers in this group who were working in the previous month. Similarly, we estimate lost hours for those

working part-time rather than full-time for health-related reasons by comparing current hours to hours in the prior month for workers in this group who were working full-time in the previous month. Our estimates suggest that, if the share of workers absent for health-related reasons and the share of workers who are normally full-time but temporarily part-time for health-related reasons had been equal in December 2022 to their pre-pandemic average for the month of December, average weekly hours for the workforce as a whole would have been between 0.1 and 0.2 hour higher. Our point estimate of the reduction in hours translates into the equivalent of roughly 710,000 workers.

II.D. Long COVID

Even after their initial recovery, a significant share of COVID-19 sufferers continue to experience debilitating symptoms that may include difficulty thinking or concentrating ("brain fog"), headaches, sleep problems, and depression or anxiety, among other symptoms (Aiyegbusi and others 2021). It would not be surprising if some of those suffering from long COVID have chosen to withdraw from the labor force or cut back on their hours.

A number of researchers have investigated the effects of long COVID on labor supply. One general approach to estimating the effect of long COVID on participation is to combine estimates of the number of people experiencing long COVID symptoms with estimates of the effect of experiencing long COVID on work activity. This is a sensible strategy, but unless the long COVID population is defined in the same way for estimating the number of long COVID sufferers as for estimating long COVID's labor supply impact, these estimates could be misleading. More specifically, a problem arises if the size of the long COVID population is defined in an inclusive fashion but the share of workers with long COVID symptoms who have withdrawn from the labor force or reduced their work hours is estimated based on a group with especially severe symptoms. Such a calculation will overstate the impact of long COVID on the size of the labor force.[13]

One study of how long COVID has affected labor supply that generated headlines when it was released is by Katie Bach (2022b). She concludes that, as of June 2022, long COVID may have reduced labor supply by the equivalent of 2 to 4 million full-time workers, even ignoring any effects on people older than 65.[14] To arrive at her estimates, Bach first cites

13. Sheiner and Salwati (2022) also make this point.

14. This study updates an earlier estimate reported in Bach (2022a) that, as of December 2021, long COVID reduced labor supply by the equivalent of 1.6 million full-time-equivalent workers.

an estimate from the Household Pulse Survey that, as of June 2022, about 16 million Americans age 16–65 were experiencing long COVID symptoms, a number that seems roughly in line with other available estimates. She assumes that, absent long COVID, the labor force participation rate for these people would have been the same as the average for the 16–65 age group (about 75 percent). This also seems reasonable. Bach's final step is to apply alternative estimates of the share of workers with long COVID who leave the labor force and the share who reduce their hours, together with a rough estimate of how large the reduction in hours might have been. This is where the difficulties arise.

Two of the three studies of how long COVID affects labor supply that Bach (2022b) cites seem especially questionable as sources of estimates to be applied to the full long COVID population. Her largest estimate of the long COVID effect is that the equivalent of 4 million people age 16 to 65 were not working because of long COVID. This estimate draws on employment and hours impacts reported by respondents to an online non-probability survey for which people with suspected and confirmed COVID-19 were recruited through COVID-19 support groups and social media (Davis and others 2021). The employment and hours impacts underlying her midrange estimate—that long COVID reduced labor supply by the equivalent of 3 million workers—come from an online non-probability survey conducted by the United Kingdom's Trades Union Congress. The methodology statement for this survey states: "The survey was open between 3 April and 27 May 2021 and was promoted on social media, through affiliated unions and long COVID support groups" (Trades Union Congress 2021). Given the way in which participants were recruited, both surveys seem likely to overrepresent people for whom long COVID was an especially severe problem. Bach's lowest estimate—that COVID-19 reduced labor supply among those age 16–65 by the equivalent of 2 million full-time workers—is based on data collected in the June 2021 wave of the Understanding America Survey (UAS) COVID-19 panel (Ham 2022). Although it is difficult to be certain how representative the respondents to the UAS COVID-19 panel are and the sample in any case included only 193 long COVID sufferers, this is the most plausible of Bach's estimates.[15]

15. While this estimate is more plausible than the others, it is not clear to us how Bach (2022b) translated the UAS estimates into impacts on employment and hours. Ham (2022) reports that, in the UAS data, 25.9 percent of people with long COVID say their work has been "impacted," meaning that they either left work or were working fewer hours, but the survey did not ask separately about effects on the extensive versus the intensive margin of labor supply.

Obtaining accurate estimates of long COVID prevalence and its effects on labor supply admittedly is difficult. Goda and Soltas (2023) produce an estimate using an approach that does not rely on directly identifying long COVID sufferers. They infer long COVID's effects on participation using data on the prevalence of health-related work absences and the relationship of these absences to later labor force withdrawal. This approach assumes, as seems supported by available evidence, that the significant increases in health-related absences from work following the start of the pandemic can be attributed to COVID-19 infections. Another key assumption is that, as also seems to be supported by the data, health-related absences affect labor force withdrawals and reductions in hours similarly whether they are due to COVID-19 or something else.

In their analysis, Goda and Soltas (2023) begin by identifying CPS respondents who missed an entire week of work for health-related reasons. Using the longitudinal structure of the CPS to link these records to other interviews with the same people, Goda and Soltas ask how absences from work affect the probability that a person is working at later points in time. Their baseline estimate is that labor force participation falls by about 7 percentage points following a health-related absence. They also find that, following the health-related absence, those who remain employed reduce their hours and are more likely to shift into part-time jobs.

Goda and Soltas (2023) translate their estimate of how a health-related absence affects subsequent participation into an estimate of the overall effect of COVID-19 on the size of the labor force by combining it with estimates of the number of excess health-related absences during the COVID-19 period. A limitation of the analysis is that people are observed for no more than 14 months after their health-related absence. Goda and Soltas's baseline estimate assumes that the effect on participation in later months continues to decay at the same rate as from months 1 to 14. The more extreme cases that bound this estimate assume either instantaneous complete decay (no effect on participation beginning in month 15) or no further decay (effects on participation that persist at the same level as in month 14). Overall, these calculations imply that, as of June 2022, COVID-19 had reduced the size of the labor force by between 340,000 and 590,000 people, with a baseline estimate of 500,000 people.

As Goda and Soltas (2023) explain, there are at least two reasons why these estimates might be too low. First, the estimates include only people who experienced COVID-19 while employed. Assuming that the likelihood of experiencing a serious bout of COVID-19 is the same for nonworkers as for workers and that COVID-19 reduces the likelihood of a

nonworker entering the labor force by the same percentage as it increases the likelihood of a worker leaving the labor force, accounting for this adds about 50,000 people to Goda and Soltas's baseline participation estimate. Second, some workers could have experienced COVID-19-related absences outside the CPS reference week. Using information on the rate of month-to-month persistence in being absent for health-related reasons to estimate the rate of escape, they estimate that the typical absence lasts a little over three weeks. This implies an adjustment to their baseline participation estimates of about 110,000 people. Together, these adjustments raise Goda and Soltas's baseline estimate of the participation effect by 32 percent to 660,000 people out of the labor force in June 2022 due to earlier having contracted COVID-19, with an implied range of about 450,000 to 780,000 people.[16]

We have built on the analysis by Goda and Soltas (2023) in several ways. First, to assess whether the estimated effect of long COVID has been growing, we extended the time period for the analysis through December 2022. We find somewhat larger long COVID effects as of December 2022 than as of June 2022, though given the nature of these estimates we would be cautious about placing too much weight on the differences. Our baseline estimate for December 2022 is that 620,000 people were out of work as a result of previous excess health-related work absences, with a range from 370,000 to 730,000 people. This is up from a baseline estimate of 560,000 people and a range of 350,000 to 610,000 people for June 2022.[17] Inflating the December numbers to account for absences from work that did not occur during the CPS reference week and for people who were not working at the time of their health-related episode, our baseline estimate for December 2022 is 820,000 people, with a range of 480,000 to 960,000 people.

Second, after replicating Goda and Soltas's (2023) event study estimates of the effects of absences from work on hours in subsequent months, we convert those hours effects into an estimate of worker equivalents lost

16. Goda and Soltas (2023) report estimates of how making the two adjustments just described affects their baseline estimates; we have used those numbers to approximate the corresponding figures for their low and high estimates.

17. Our June 2022 estimates are slightly higher than the original estimates in Goda and Soltas (2023). One reason is that rather than attempting to estimate the decay rate from the data, which proved to be problematic for subgroup analysis, we assume for our baseline estimates that the effects of health-related absences on participation and hours fade out over the three years following the last observation at 14 months after the absence. Another difference in our calculations is that we used weights adjusted for the effect of the CPS population controls introduced in January 2022 and January 2023.

by dividing the implied total loss in hours by average weekly hours as of December 2019. Our estimate assumes that the incidence of weeklong COVID-19 spells is the same for nonworking as for working individuals and that having experienced a weeklong COVID-19 spell affects the later hours of nonworking individuals who become employed in the same way as it affects the later hours of individuals who were employed at the time of their illness. By the same reasoning that Goda and Soltas apply to their labor force effect estimates, we also adjust the figures to account for absences that occurred outside the CPS reference week. Under the same alternative assumptions as used to estimate the participation effects about the decay rate for long COVID effects following the end of the period we are able to observe, our baseline estimate is an hours effect of about 480,000 worker equivalents, with range of 260,000 to 580,000 people.[18] An important caveat, however, is that there is a pre-trend in the event study estimates for hours that the controls included in the model do not eliminate, something that Goda and Soltas also note. The true effect of long COVID on hours thus likely is lower than suggested by these estimates.

Our final extension to the analysis in Goda and Soltas (2023) is to build on their results to investigate how the decline in labor supply attributable to long COVID was distributed across people with different demographic characteristics. We do not find any notable differences by sex or by race and ethnicity. We were especially interested in whether there were differences between people under age 65 and people age 65 and older, as we thought differential long COVID effects might explain the differing pattern of labor force changes between older and younger adults. More specifically, our objective was to determine whether long COVID might help to explain why participation fell more for older adults. Results reported by Goda and Soltas (2023) show (and we confirm) that the effects of a health-related work absence lasting a week or more on subsequent labor force participation are larger for adults age 65 and older than for younger adults. The excess rate of weeklong absences for health reasons during the pandemic period also was larger for older workers. Despite this, reflecting the lower pre-COVID-19 participation rate among those over age 65, the *percentage point* participation rate effect was *smaller* for this older group than for adults age 16–64.

Taking a different approach, Sheiner and Salwati (2022) develop estimates that make use of CPS information on disability status. As was true

18. To translate hours into worker equivalents we assume they work the December 2019 average weekly hours.

of the prevalence of health-related absences from work, the share of people reporting a disability rose noticeably following the start of the pandemic, both absolutely and relative to trend. Using the different labor force participation rates they observe for people with and without a disability both before and after the COVID-19 period, Sheiner and Salwati tease out estimates of the impact of long COVID on overall labor force participation among those age 16–64.

To produce these estimates, Sheiner and Salwati (2022) estimate the number of people disabled due to long COVID as the difference between the number reporting a disability and the number that would have been expected based on the 2017–2019 trend in the disability rate. They assume that, had they not gotten sick, those with long COVID would have had the same participation rate as nondisabled adults of the same age and sex. An assumption also is needed about the evolution of the participation rate for people with an existing non-COVID-19 disability during the COVID-19 period. The simplest assumption is that it would have been the same as in 2019, but Sheiner and Salwati also consider an alternative with a continuation of the rising trend in participation for those with a disability estimated over the 2017–2019 period. Based on these assumptions, they estimate that long COVID reduced the size of the labor force by an average of between 281,000 and 562,000 people over the January–September 2022 period, where the larger number assumes that the participation rates of previously disabled adults continued on their rising trend. An additional complication is that the growing availability of remote work since the pandemic could have allowed more of the existing population with disabilities to enter the labor force. If this has occurred and increased the participation of disabled adults age 45–64 by 5 percent, the total estimated labor force shortfall among those age 16–64 attributable to COVID-19 is larger, in the range of roughly 400,000 to 683,000 people. Sheiner and Salwati also produce an estimate of the effect of long COVID on hours worked by those who remain employed of roughly 20,000 to 39,000 full-time equivalents. This contrasts with the considerably larger effect on hours we obtain based on the approach used by Goda and Soltas (2023), though as noted there is reason to suspect that the latter estimate is biased upward.

Sheiner and Salwati (2022) chose to focus their analysis on adults age 16–64, but the labor market decisions of older adults also may have been affected by long COVID, and we have replicated their calculations including adults age 65 and older. Our calculations make use of 2022 data for the full calendar year rather than for January–September as in Sheiner and Salwati (2022). Adding participation shortfalls among those age 65 and

older raises the estimated long COVID effects; we estimate a range of 324,000 to 858,000 people out of work due to long COVID, where the former assumes the same participation rates for the existing disabled as in 2019 and the latter assumes a continuation of the prior upward trend in participation for that group together with an additional increase in their participation due to growth in the opportunity for remote work.[19]

We also have replicated Sheiner and Salwati's (2022) hours analysis. For consistency with calculations reported elsewhere in the paper, we translate the total implied hours lost into worker equivalents by dividing by average weekly hours as of December 2019. Our original intention had been to include people age 65 and older in these calculations, but we could not obtain sensible results for that group and abandoned the effort. Our estimates are nonetheless somewhat larger than Sheiner and Salwati's estimates, both because our hours denominator is slightly smaller than the 40 hours per week they assume and because, using the same denominator, the hours shortfall in 2022 compared to the pre-pandemic period looks larger when considering data for the full calendar year as opposed to just January–September. Hours are more seasonal than participation and are relatively high during the summer months, which means that comparing estimates for January–September 2022 to estimates for the full 2019 calendar year leads to an understatement in how much hours changed. Even so, the worker equivalent effect of reductions in hours due to long COVID that we estimate remains small compared to the effect of long COVID on participation, just 42,000 to 62,000 workers.

Based on all the available evidence as just described, our best guess is that long COVID may have reduced the size of the labor force as of the end of 2022 by perhaps 710,000 people, a participation rate decline of a bit less than 0.3 percentage point. As already discussed, the presence of a pre-trend in the event study coefficients for the hours estimates leads us to suspect that estimates of the hours effect based on the approach taken by Goda and Soltas (2023) are too large. On the other hand, we are concerned that the estimates of the hours effect based on the approach taken by Sheiner

19. In addition to the modifications mentioned in the text, we also use CPS weights adjusted for the introduction of new population controls in January 2022 and January 2023 rather than the unadjusted weight used in the original calculations in Sheiner and Salwati (2022). The calculations for our high-end estimate implied that, for the 65 and older age group, the number of individuals who left the labor force due to COVID-19 was larger than the number of people in that group who would have been working had they not contracted COVID-19. We use the latter as our high-end estimate of the estimated COVID-19 effect.

and Salwati (2022) are sensitive to noise in the data. We split the difference between the two and place the effect of long COVID on hours at the equivalent of about 270,000 workers.[20]

II.E. Fear of COVID-19

Another explanation offered for the persistent post-pandemic shortfalls in labor supply is that fear of contracting COVID-19 or spreading COVID-19 to a family member kept potential workers on the sidelines. To some extent, this may overlap with the effects of long COVID, in that those suffering from long COVID may have been more fearful of contracting COVID-19 again. We know of two ongoing surveys that have asked questions relevant to understanding how fear of COVID-19 has affected participation—the Survey of Working Arrangements and Attitudes (SWAA) and the Census Bureau's Household Pulse Survey (HPS). The SWAA is an online non-probability survey administered monthly since May 2020 to Americans age 20–64 (Barrero, Bloom, and Davis 2022, 2023). The SWAA sample initially was restricted to individuals with significant prior year work attachment; this restriction was dropped beginning in June 2022.[21] The survey has included direct questions about fear of COVID-19 and other infectious diseases as a reason for nonparticipation since February 2022.[22] The HPS is an experimental probability-based survey first fielded by the Census Bureau at the end of April 2020. The sample for the HPS is drawn from households on the Census Bureau's Master Address File (MAF) that could be matched to a phone number (available for 88 percent of addresses) and/or email address (available for 80 percent of addresses). Data were collected for adults age 18 and older using an online platform (Fields and others 2020). A question on reasons for nonparticipation was included in each of the forty-seven waves of the HPS from June 2020 through December 2022.

20. The 710,000 and 270,000 numbers are the averages of our baseline estimates based on the approach used by Goda and Soltas (2023) and the midpoints of the ranges we obtain using the approach used by Sheiner and Salwati (2022).

21. More specifically, from May 2020 to March 2021, the requirement for inclusion in the SWAA sample was earnings of at least $20,000 in 2019. From April to September 2021, the earnings threshold transitioned to $10,000 in 2019, and from January to May 2022, it transitioned to $10,000 during the prior year, before being dropped in June 2022.

22. The SWAA includes a separate question about plans to continue social distancing, also analyzed by Barrero, Bloom, and Davis (2022, 2023). They find that people who plan to continue social distancing also are more likely not to be working, but that finding is more difficult to interpret than the findings based on answers to questions about fear of COVID-19 as a factor in the decision to participate.

Jose Maria Barrero, Nicholas Bloom, and Steven J. Davis are the research team that has looked most directly at the effect of COVID-19 fears on labor force participation. In an October 2022 working paper (Barrero, Bloom, and Davis 2022), they reported estimates based on responses from SWAA sample members with significant prior year earnings who were not currently working or looking for work to the question: "Are worries about catching COVID or other infectious diseases a factor in your decision not to seek work at this time?" The three response options were: "Yes, the main reason"; "Yes, a secondary reason"; and "No." Their estimates assume that all of those who said their main reason for not working or seeking work was fear of COVID-19 and that half of those who said it was a secondary reason otherwise would have been in the labor force. Under these assumptions, they estimate that COVID-19 fears reduced labor force participation in their sample from February through July 2022 by 2.0 percentage points.[23]

One limitation of the initial estimates in Barrero, Bloom, and Davis (2022) is that the SWAA sample on which they are based is restricted to people with significant prior year work attachment. Beginning in June 2022, the SWAA sample was expanded to include all adults age 20–64. Barrero, Bloom, and Davis kindly shared with us estimates for the June–December 2022 period based on the survey question just described, both for the set of people satisfying the original SWAA sample selection criteria and for the expanded sample. Assuming that half of those citing COVID-19 fears as a secondary reason for nonparticipation otherwise would have been in the labor force, the estimated impact of COVID-19 fears for December 2022 in the restricted sample was 1.2 percentage points, down from 2.0 percentage points earlier in the year. For the more inclusive sample, it was 1.9 percentage points in December 2022.

To put this number in context, the overall labor force participation rate for adults age 20–64 was just 0.2 percentage point lower in December 2022 than it had been in December 2019 (77.4 percent compared to 77.6 percent). The 1.9 percentage point estimate thus implies that, absent the fear of COVID-19, participation among adults age 20–64 would have been 1.7 percentage points *higher* in December 2022 than it had been in December 2019. Given the similarity of overall labor market conditions in those

23. Although the SWAA question is worded more generally to encompass "worries about catching COVID or other infectious diseases," during this period it seems reasonable to think that the infectious disease most people have in mind is COVID-19. For consistency with the data for other months, Barrero, Bloom, and Davis (2022) dropped June 2022 and July 2022 respondents who did not satisfy the prior earnings requirement in place from February 2022 through May 2022 from the estimation sample.

months and that participation generally has been trending downward, we do not find this plausible.

A number of questions can be raised about the estimates reported by Barrero, Bloom, and Davis (2022), most of which the authors themselves have investigated and, where possible, addressed. One obvious question is whether participants in the pre-recruited online panels used for the SWAA are representative of the target population. Barrero, Bloom, and Davis report that, in a sample that imposed a prior earnings requirement and using answers to a different question about the main reason a person is not working, the SWAA estimate of the share of people saying they were not working because of COVID-19 fears was about 0.6 percentage point higher than when the same question was asked in the HPS.[24] Because of the relatively small SWAA sample size, this difference is not statistically significant, but it may suggest issues with the representativeness of the SWAA sample.

In addition, the way the original SWAA question was structured seems likely to have inflated the estimated effect of COVID-19 fears in the initial analysis by Barrero, Bloom, and Davis (2022). The original SWAA question asks directly whether COVID-19 fears are a factor in not working or looking for work. This construction of the question is potentially subject to acquiescence bias—the tendency of survey respondents to agree with a survey statement whether or not it reflects their true opinion. The share of people who said fear of COVID-19 was the main reason they were out of the labor force was considerably larger than the share who chose fear of COVID-19 as their main reason for not working when responding to the HPS question that offers respondents a menu of possible reasons for nonparticipation (Barrero, Bloom, and Davis 2022).[25]

Beginning in October 2022, the SWAA has included new questions that address this concern. These questions ask in turn for the main reason and the second most important reason a person is not working or looking for work. Respondents are given a menu of possible responses to each of these questions, one of which is: "I worry about catching COVID or other infectious diseases." As reported by Barrero, Bloom, and Davis (2023), an update to Barrero, Bloom, and Davis (2022), when the answers to these questions are translated into participation effects, assuming a 50 percent impact for people saying COVID-19 fears were a secondary factor, the estimates are considerably smaller. For the sample with no prior earnings

24. The difference between the two estimates rises to 0.8 percentage point when the SWAA sample is restricted to respondents who gave an acceptable answer to included "attention check" questions.

restrictions, the new question yields an estimated effect of COVID-19 fears on participation for December 2022 of 1.0 percentage point, compared to 1.9 percentage points based on the original question.

A final comment about the estimates by Barrero, Bloom, and Davis (2022, 2023) concerns the translation of the responses to the fear of COVID-19 question into participation impacts. The assumption underlying all of the featured estimates is that half of those who cite COVID-19 fears as a secondary reason for nonparticipation otherwise would have been working or looking for work. One might doubt whether the marginal effect on participation of concerns about COVID-19 among people who have already said their main reason for not working is something else is this large. If the true effect for this group is smaller, the overall impact on participation would, of course, also be smaller. As an illustration, the numbers reported in table 6 of Barrero, Bloom, and Davis (2023) imply that, if it were assumed that 10 percent rather than 50 percent of those who give COVID-19 fears as a secondary reason for nonparticipation otherwise would have been in the labor force, the estimated effect of COVID-19 fears on the December 2022 participation rate would have been 0.4 percentage point rather than 1.0 percentage point.

The HPS is a second source of information on how COVID-19 fears have affected participation. Although the HPS also may suffer from representation problems—its response rate has averaged under 10 percent—it is a probability-based sample and low survey response rates do not necessarily imply bias in survey estimates (Groves and Peytcheva 2008). Some research has found that probability samples tend to produce more accurate estimates than nonprobability samples even when the response rates to the former are low (Yeager and others 2011), though the low HPS response rate nonetheless suggests caution in interpreting the estimates.

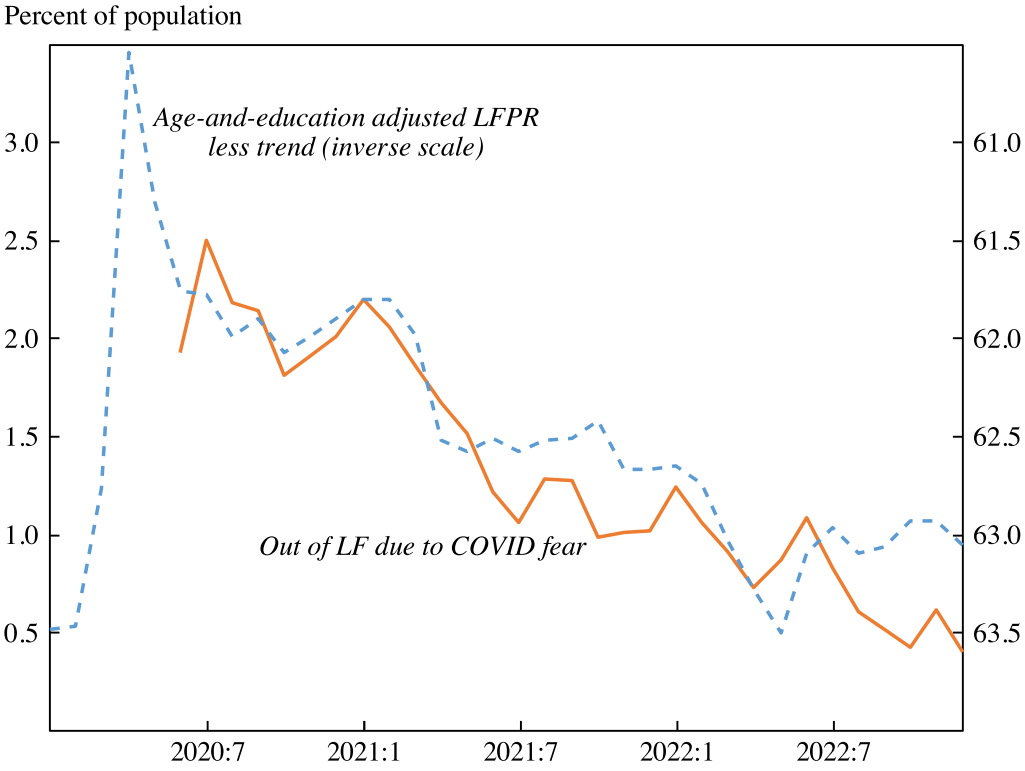
The HPS question about nonparticipation asks adults age 18 and older who were not working during the survey reference week the main reason they were not employed.[26] "I was concerned about getting or spreading the coronavirus" is one of roughly a dozen response options.[27] Figure 5 shows

25. As mentioned above, the SWAA question is also worded more generally to encompass "worries about catching COVID or other infectious diseases," but the mention of other infectious diseases seems unlikely to account for the much higher number of "yes" responses.

26. The question is asked of everyone who is not working rather than only of those who are out of the labor force, but if someone gives fear of COVID-19 as the reason they are not employed, it is likely this fear would also prevent them from actively seeking work.

27. The exact list of response options has varied slightly over time, but the option related to fear of getting or spreading the coronavirus has been included on the list in every wave in which the question was asked.

Figure 5. Labor Force Participation Rate Adjusted for Age, Education, and Trend and Percentage of Population out of Labor Force Due to COVID-19 Fears, January 2020 to December 2022



Sources: Authors' tabulations of Current Population Survey and Household Pulse Survey data.

Note: Labor force participation series constructed using monthly CPS data downloaded from the IPUMS data set (Flood and others 2022) and reweighted to wedge effects of new population controls introduced in January 2022 and January 2023 backward. Monthly participation estimates seasonally adjusted using X-12 seasonal adjustment command in Eviews, applying multiplicative X-11 method and auto X-12 seasonal and trend filter. Participation rate is for persons age 16 and older; share not working due to fear of COVID is for persons age 18 and older.

the HPS estimate of the share of the population age 18 and older who said that fear of COVID-19 was their main reason for not working and (on an inverse scale) the overall labor force participation rate adjusted for changes in demographic mix and pre-pandemic within-group trends. The HPS estimates are for the survey wave closest in time to each month's CPS reference week or, in a few cases, are interpolations based on the values for adjacent months. According to the HPS estimates, the share of people 18 and older who said they were not working because of COVID-19 fears peaked at 2.5 percent in July 2020. By February 2022, it had fallen to 1.1 percent, and by December 2022 to 0.4 percent. The changes in this series and in the labor force participation rate are of similar magnitude, and they have moved remarkably closely together over time (the Pearson

correlation between them is −0.91). This is consistent both with COVID-19 fears having been a more significant part of the explanation for the shortfall in participation earlier in the pandemic and also with their having become much less important over time.

While the overall relationship between the percentage of people saying they are not working because of COVID-19 fears and the adjusted participation rate is very strong, it breaks down when the data are disaggregated by demographic group. As discussed in the first section of the paper, the age group with the largest unanticipated declines in participation since the start of the pandemic has been adults age 65 and older, but this is also the age group least likely to say they are out of the labor force due to COVID-19 fears. We initially found this somewhat counterintuitive, since COVID-19 risks are well known to be more serious for older adults. The responses regarding fear of COVID-19 may be less meaningful for older adults because they are more likely to choose retirement as the main reason they are out of the labor force even if COVID-19 fears contributed to their choosing not to work. In the data by race and ethnicity, as documented earlier, after adjusting for age, education, and trend effects, overall participation has been below expectations for non-Hispanic white adults but not for non-Hispanic Black adults and only very slightly so for Hispanic adults. The share of Hispanic adults and non-Hispanic Black adults citing fear of COVID-19 as a reason for being out of the labor force, however, has been significantly higher than the share of white non-Hispanic adults. The fear of COVID-19 information in the HPS is, of course, collected only from those who are not working. To the extent that COVID-19 concerns are in fact generally greater among groups where a larger percentage of people are out of the labor force because of them, however, it may be that the necessity of working—and the opportunity to do so in a very tight labor market—has pushed people in some groups that on average have more limited resources back into the labor market despite real health concerns.

There are, of course, reasons to be cautious in interpreting these numbers. Given the survey's very low response rate, one might wonder about the representativeness of the HPS sample. Because the HPS question asks only about respondents' main reason for not working, it may miss some people for whom fear of COVID-19 is a contributing factor, though it is somewhat unclear how important this might be. On the other hand, the responses to the question about why people are not working may be affected by social desirability bias. Some people may feel it puts them in a better light to say the reason they are not working is fear of COVID-19

rather than, for example, that they did not want to be working at this time, leading the estimated effect of COVID-19 fears on labor force participation to be exaggerated. In addition, fear of COVID-19 also may overlap to some extent with having experienced long COVID. Although this is necessarily a guess—albeit a guess informed by our assessment of available data—if forced to assign a number, we would peg the effect of COVID-19 fears on labor force participation as of December 2022 at perhaps 0.3 percentage point or about 800,000 people.

III. Conclusion

The labor market changed significantly over the three years following the start of the pandemic. As of December 2022, the labor force participation rate was about 1.1 percentage points below its December 2019 level. This is a shortfall of about 3 million workers. The 0.6 hour reduction in average weekly hours over the same period contributed an additional labor supply shortfall that is the equivalent of about another 2.6 million workers. Our goal in this paper has been to better understand what explains these changes.

Table 3 summarizes our assessment of the changes in participation and average weekly hours between December 2019 and December 2022, together with the factors we believe contributed to those changes. Panel A of the table reports estimates for the decline in the labor force participation rate; panel B translates those declines into thousands of people; and panel C presents estimates for the decline in average weekly hours in terms of their equivalent in thousands of people. As we hope is clear from the discussion earlier in the paper of the evidence on which these estimates are based, the numbers in the table are very much in the nature of guesstimates. Although we do not attach great confidence to the exact magnitudes reported, we are more confident in our general conclusions regarding the orders of magnitude of the various effects.

As shown in the table, much of the decline in labor force participation over the three years ending in December 2022 should have been anticipated even absent the pandemic. Exactly how much change should have been anticipated depends on what one believes to be the relevant counterfactual. If the labor force participation rate would have evolved after December 2019 based solely on demographic factors—specifically, changes in the age and education composition of the population—participation at the end of December 2022 was a little less than 0.6 percentage point or about

Table 3. Explaining the Post-pandemic Declines in Labor Force Participation and Worker-Equivalent Average Hours, December 2019 to December 2022

	Counterfactual: Demographic adjustment only	*Counterfactual: Demographic and trend adjustment*
Panel A: Total labor force participation rate decline through December 2022	1.13	1.13
Anticipated decline based on chosen counterfactual	0.55	0.84
Unanticipated decline based on chosen counterfactual	0.58	0.29
Selected pandemic-related factors		
Healthier household balance sheets	0.00	0.00
Active COVID-19 infections	0.00	0.00
Long COVID	0.27	0.27
Fear of COVID-19	0.30	0.30
Residual unexplained decline	0.01	–0.28
Panel B: Total labor force decline through December 2022 (thousands)	3,000	3,000
Anticipated decline based on chosen counterfactual	1,460	2,230
Unanticipated decline based on chosen counterfactual	1,540	770
Selected pandemic-related factors		
Healthier household balance sheets	0	0
Active COVID-19 infections	0	0
Long COVID	710	710
Fear of COVID-19	800	800
Residual unexplained decline	30	–740
Panel C: Total worker-equivalent hours decline through December 2022 (thousands)	2,610	2,610
Anticipated decline based on chosen counterfactual	120	300
Unanticipated decline based on chosen counterfactual	2,490	2,310
Selected pandemic-related factors		
Healthier household balance sheets	0	0
Active COVID-19 infections	710	710
Long COVID	270	270
Fear of COVID-19	0	0
Residual unexplained decline	1,510	1,330

Source: Authors' estimates.
Note: Basis for rough effect size estimates described in text. Person counts rounded to nearest ten thousand.

1.5 million people below where we would have expected it to be. If the evolution of the participation rate also would have reflected the continuation of preexisting within-group trends, the unexplained shortfall is somewhat less than 0.3 percentage point or about 0.8 million people.

In addition to these anticipatable factors, we believe that both long COVID and the fear of COVID-19 put downward pressure on the post-pandemic participation rate, though in both cases we estimate the magnitude

of the effect to be considerably smaller than some previous analyses have suggested. The demographic factors incorporated in our first counterfactual together with long COVID and fear of COVID-19 fully explain the decline in the participation rate from December 2019 through December 2022; those factors plus the preexisting within-group trends incorporated in the second counterfactual more than fully explain it. Put somewhat differently, under the second counterfactual, had the labor market been as strong as it was in December 2022 and had the pandemic not occurred, the labor force participation rate would have been almost 0.3 percentage point higher than it was in December 2019. Although the unemployment rate was comparable in December 2022 to what it had been in December 2019, as discussed earlier in the paper, other indicators including the job vacancy rate provide reason to suspect the December 2022 labor market was even tighter. This makes it plausible that, absent the pandemic and with the tightness of the labor market as it was in December 2022, demographic- and trend-adjusted participation in December 2022 could have been a bit above its December 2019 level.

We have been less successful in explaining why the changes in labor force participation have differed across demographic groups. The largest reductions in participation relative to expectations occurred among older adults and especially the most-educated older adults. The unanticipated shortfall in participation was greater among white non-Hispanic adults than among Hispanic adults, and participation among Black non-Hispanic adults actually rose slightly. We have not found direct evidence that allows us to account for the differences we observe. Many older adults would have been exiting the labor force shortly regardless, and those with means likely have had more flexibility about exactly when that transition occurred. Even if they did not contract COVID-19 and were not driven by fear of COVID-19, living through the pandemic may have led some to reevaluate how long they wanted to continue working. The finding reported by Favilukis and Li (2023) that participation declined more among older homeowners who benefited from rising house prices is consistent with the speculation that some older adults rethought their priorities. White non-Hispanic adults as a group have greater accumulated wealth than Black non-Hispanic or Hispanic adults and the decision not to work could have been more financially feasible for them.

Panel C of table 3 tells a rather different story about average weekly hours. Neither demographic changes nor preexisting trends can account for much of the drop in average weekly hours we observe between December 2019 and December 2022. Time missed due to acute COVID-19 infections and

reductions in hours resulting from long COVID both have been a factor, but in our estimation these account for less than 40 percent of the hours decline. In contrast to our conclusion with regard to participation, we do not believe that fear of COVID-19 helps to explain the decline in hours. More of the decline in hours thus remains to be explained.

Average weekly hours as measured in the CPS are quite cyclical, and it is possible that, given time, they will recover to pre-pandemic levels. It also is possible, however, that the lower level of hours reflects a more permanent reevaluation regarding the balance people wish to strike between their work and personal lives. The media are full of stories about "quiet quitting" (Telford 2022; Rosalsky and Selyukh 2022) and professionals who are opting to step back from demanding working schedules (Krueger 2022). Consistent with this narrative, Faberman, Mueller, and Şahin (2022) provide evidence that desired hours of work fell during the pandemic. To the extent this accounts for the reduction in hours we observe, it could be much longer lasting.

ACKNOWLEDGMENTS We thank Stephanie Aaronson, Steven Davis, Jan Eberly, Yongseok Shin, James Stock, participants in a seminar at the Harris School of Public Policy, and participants in the *BPEA* meeting for helpful comments on earlier drafts of this paper. We are grateful to Ayşegül Şahin, Bart Hobijn, Gopi Shah Goda, Evan Soltas, Louise Sheiner, Nasiha Salwati, Jose Maria Barrero, Nicholas Bloom, and Steven Davis for sharing data and code with us.

References

Aaronson, Daniel, Jonathan Davis, and Luojia Hu. 2012. "Explaining the Decline in the U.S. Labor Force Participation Rate." Chicago Fed Letter 296.

Aaronson, Stephanie, Tomaz Cajner, Bruce Fallick, Felix Galbis-Reig, Christopher Smith, and William L. Wascher. 2014. "Labor Force Participation: Recent Developments and Future Prospects." *Brookings Papers on Economic Activity*, Fall, 197–255.

Aaronson, Stephanie, Bruce Fallick, Andrew Figura, Jonathan F. Pingle, and William L. Wascher. 2006. "The Recent Decline in the Labor Force Participation Rate and Its Implications for Potential Labor Supply." *Brookings Papers on Economic Activity,* no. 1: 69–154.

Abraham, Katharine G., Brad Hershbein, Susan N. Houseman, and Beth Truesdale. 2023. "The Independent Contractor Workforce: New Evidence on Its Size and Composition and Ways to Improve Its Measurement in Household Surveys." Working Paper 30997. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w30997.

Abraham, Katharine G., and Melissa S. Kearney. 2020. "Explaining the Decline in the US Employment-to-Population Ratio: A Review of the Evidence." *Journal of Economic Literature* 58, no. 3: 585–643.

Aiyegbusi, Olalekan Lee, Sarah E. Hughes, Grace Turner, Samantha Cruz Rivera, Christel McMullan, Joht Singh Chandan, and others. 2021. "Symptoms, Complications and Management of Long COVID: A Review." *Journal of the Royal Society of Medicine* 114, no. 9: 428–42.

Bach, Katie. 2022a. *Is 'Long Covid' Worsening the Labor Shortage?* Washington: Brookings Institution. https://www.brookings.edu/research/is-long-covid-worsening-the-labor-shortage/.

Bach, Katie. 2022b. *New Data Shows Long Covid Is Keeping as Many as 4 Million People Out of Work*. Washington: Brookings Institution. https://www.brookings.edu/research/new-data-shows-long-covid-is-keeping-as-many-as-4-million-people-out-of-work/.

Barnes, Mitchell, Wendy Edelberg, Sara Estep, and Moriah Macklin. 2022. *Bolstered Balance Sheets: Assessing Household Finances since 2019*. Washington: Hamilton Project, Brookings Institution. https://www.brookings.edu/research/bolstered-balance-sheets-assessing-household-finances-since-2019/.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2022. "Long Social Distancing." Working Paper 30568. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w30568.

Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis. 2023. "Long Social Distancing." Working Paper. Chicago: Becker Friedman Institute, University of Chicago. https://bfi.uchicago.edu/working-paper/long-social-distancing/.

Bauer, Lauren, Wendy Edelberg, Sara Estep, and Brad Hershbein. 2023. "Who's Missing from the Post-Pandemic Labor Force?" Washington: Brookings Institution. https://www.brookings.edu/2023/04/04/whos-missing-from-the-post-pandemic-labor-force/.

Bosworth, Barry P., and Gary Burtless. 2010. *Recessions, Wealth Destruction, and the Timing of Retirement*. Washington: Brookings Institution. https://www.brookings.edu/research/recessions-wealth-destruction-and-the-timing-of-retirement/.

Cesarini, David, Erik Lindqvist, Matthew J. Notowidigdo, and Robert Ostling. 2017. "The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries." *American Economic Review* 107, no. 12: 3917–46.

Coile, Courtney C. 2022. "Retirement during the COVID-19 Pandemic." Paper presented at the Federal Reserve Bank of Boston 66th Economic Conference, November 18–19. https://www.bostonfed.org/-/media/Documents/events/2022/labor-markets/papers/retirement-during-the-covid19-pandemic-coile.pdf.

Coile, Courtney C., and Phillip B. Levine. 2011. "The Market Crash and Mass Layoffs: How the Current Economic Crisis May Affect Retirement." *B.E. Journal of Economic Analysis and Policy* 11, no. 1: 1–42.

CBO (Congressional Budget Office). 2021. "Estimated Budgetary Effects of H.R. 1319, American Rescue Plan Act of 2021." Washington. https://www.cbo.gov/publication/57056.

Davis, Hannah E., Gina S. Assaf, Lisa McCorkell, Hannah Wei, Ryan J. Low, Yochai Re'em, Signe Redfield, Jared P. Austin, and Athena Akrami. 2021. "Characterizing Long COVID in an International Cohort: 7 Months of Symptoms and Their Impact." *eClinicalMedicine* 38:101019.

Domash, Alex, and Lawrence H. Summers. 2022. "How Tight Are U.S. Labor Markets?" Working Paper 29739. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w29739.

Faberman, R. Jason, Andreas I. Mueller, and Ayşegül Şahin. 2022. "Has the Willingness to Work Fallen during the Covid Pandemic?" Working Paper 29784. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w29784.

Farnham, Martin, and Purvi Sevak. 2016. "Housing Wealth and Retirement Timing." *CESifo Economic Studies* 62, no. 1: 26–46.

Favilukis, Jack, and Gen Li. 2023. "The Great Resignation Was Caused by the COVID-19 Housing Boom." Social Science Research Network, January 25. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4335860.

Ferguson, Stephanie. 2023. "Understanding America's Labor Shortage." US Chamber of Commerce, July 13. https://www.uschamber.com/workforce/understanding-americas-labor-shortage.

Fields, J. F., J. Hunter-Childs, A. Tersine, J. Sisson, E. Parker, V. Velkoff, C. Logan, and H. Shin. 2020. "2020 Household Pulse Survey: Interagency Federal Statistical Rapid Response Survey to Measure Effects of the Coronavirus (COVID-19) Pandemic on the United States Household Population." Working Paper. Washington: US Census Bureau. https://www2.census.gov/programs-surveys/demo/technical-documentation/hhp/2020_HPS_Background.pdf.

Flood, Sarah, Miriam King, Renae Rodgers, Steven Ruggles, J. Robert Warren, and Michael Westberry. 2022. *Integrated Public Use Microdata Series, Current*

Population Survey: Version 10.0 [dataset]. Minneapolis: University of Minnesota. https://doi.org/10.18128/D030.V10.0.

Goda, Gopi Shah, John B. Shoven, and Sita Nataraj Slavov. 2011. "What Explains Changes in Retirement Plans during the Great Recession?" *American Economic Review* 101, no. 3: 29–34.

Goda, Gopi Shah, and Evan J. Soltas. 2023. "The Impacts of Covid-19 Absences on Workers." *Journal of Public Economics* 222:104889.

Groves, Robert M., and Emilia Peytcheva. 2008. "The Impact of Nonresponse Rates on Nonresponse Bias: A Meta-Analysis." *Public Opinion Quarterly* 72, no. 2: 167–89.

Ham, Dasom I. 2022. "Long-Haulers and Labor Market Outcomes." Working Paper 60. Federal Reserve Bank of Minneapolis, Opportunity and Inclusive Growth Institute. https://www.minneapolisfed.org/research/institute-working-papers/long-haulers-and-labor-market-outcomes.

Hobijn, Bart, and Ayşegül Şahin. 2022. "'Missing' Workers and 'Missing' Jobs since the Pandemic." Paper prepared for the Federal Reserve Bank of Boston Conference on Labor Markets during and after the Pandemic. https://www.bostonfed.org/-/media/Documents/events/2022/labor-markets/papers/missing-workers-and-missing-jobs-since-the-pandemic-hobijn-sahin.pdf.

Hornstein, Andreas, and Marianna Kudlyak. 2019. "Aggregate Labor Force Participation and Unemployment and Demographic Trends." Working Paper 19-08. Federal Reserve Bank of Richmond. https://www.richmondfed.org/publications/research/working_papers/2019/wp_19-08.

Krueger, Alyson. 2022. "Endless Summer Fridays." *New York Times*, April 1. https://www.nytimes.com/2022/04/01/style/four-day-workweek-friday.html.

Lee, Dain, Jinhyeok Park, and Yongseok Shin. 2023. "Where Are the Workers? From Great Resignation to Quiet Quitting." Working Paper 30833. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w30833.

Mitchell, Josh, Lauren Weber, and Sarah Chaney Cambon. 2021. "4.3 Million Workers Are Missing. Where Did They Go?" *Wall Street Journal*, October 14. https://www.wsj.com/articles/labor-shortage-missing-workers-jobs-pay-raises-economy-11634224519.

Montes, Joshua. 2018. "CBO's Projection of Labor Force Participation Rates." Working Paper 2018-04. Washington: Congressional Budget Office. https://www.cbo.gov/publication/53616.

Montes, Joshua, Christopher Smith, and Juliana Dajon. 2022. "'The Great Retirement Boom': The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation." Finance and Economics Discussion Series 2022-081. Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/FEDS.2022.081.

Morath, Eric, and Te-Ping Chen. 2020. "As $600-a-Week Jobless Aid Nears End, Congress Faces a Quandary." *Wall Street Journal*, July 21. https://www.wsj.com/articles/as-600-a-week-jobless-aid-nears-end-congress-faces-a-quandary-11595151000.

Parker, Jonathan A., Jake Schild, Laura Erhard, and David S. Johnson. 2022. "Economic Impact Payments and Household Spending during the Pandemic." *Brookings Papers on Economic Activity*, Fall, 81–130.

Powell, Jerome H. 2022. "Inflation and the Labor Market." Speech delivered at the Hutchins Center on Fiscal and Monetary Policy, Brookings Institution, November 30. Washington: Board of Governors of the Federal Reserve System. https://www.federalreserve.gov/newsevents/speech/powell20221130a.htm.

Rosalsky, Greg, and Alina Selyukh. 2022. "The Economics behind 'Quiet Quitting'—and What We Should Call It Instead." *Planet Money*, NPR, September 13. https://www.npr.org/sections/money/2022/09/13/1122059402/the-economics-behind-quiet-quitting-and-what-we-should-call-it-instead.

Sheiner, Louise, and Nasiha Salwati. 2022. "How Much Is Long COVID Reducing Labor Force Participation? Not Much (So Far)." Working Paper 80. Washington: Hutchins Center on Fiscal and Monetary Policy, Brookings Institution. https://www.brookings.edu/research/how-much-is-long-covid-reducing-labor-force-participation-not-much-so-far/.

Telford, Taylor. 2022. "'Quiet Quitting' Isn't Really about Quitting. Here Are the Signs." *Washington Post*, August 21. https://www.washingtonpost.com/business/2022/08/21/quiet-quitting-what-to-know/.

Trades Union Congress. 2021. *Workers' Experiences of Long Covid: A TUC Report.* London. https://www.tuc.org.uk/sites/default/files/2021-06/Formatted%20version%20of%20Long%20Covid%20report%20-%20v1.3.pdf.

US Bureau of Labor Statistics. 2021. "Adjustments to Household Survey Population Estimates in January 2021." https://www.bls.gov/cps/population-control-adjustments-2021.pdf.

US Bureau of Labor Statistics. 2022a. "Adjustments to Household Survey Population Estimates in January 2022." https://www.bls.gov/cps/population-control-adjustments-2022.pdf.

US Bureau of Labor Statistics. 2022b. "Employment Projections: Calculation." In *Handbook of Methods*. https://www.bls.gov/opub/hom/emp/calculation.htm.

US Bureau of Labor Statistics. 2023. "Adjustments to Household Survey Population Estimates in January 2023." https://www.bls.gov/web/empsit/cps-pop-control-adjustments.pdf.

Van Zandweghe, Willem. 2012. "Interpreting the Recent Decline in Labor Force Participation." *Economic Review* 97, no. 1: 5–34.

Yeager, David S., Jon A. Krosnick, LinChiat Chang, Harold S. Javitz, Matthew S. Levendusky, Alberto Simpser, and Rui Wang. 2011. "Comparing the Accuracy of RDD Telephone Surveys and Internet Surveys Conducted with Probability and Non-probability Samples." *Public Opinion Quarterly* 75, no. 4: 709–47.

Comments and Discussion

COMMENT BY

STEPHANIE AARONSON I am very happy to have the opportunity to discuss this paper by Katharine Abraham and Lea Rendell. As the authors point out, the post-pandemic labor market has been characterized by an aggregate labor force participation rate (LFPR) that is well below pre-pandemic levels and declining hours of work for those with jobs. Understanding whether these phenomena are driven by temporary factors or whether they are likely to persist is critical both for monetary policymakers trying to estimate the cyclical position of the economy and for fiscal policymakers concerned with, among other issues, projecting tax collections and the future of the Social Security trust funds, which depend importantly on the size of the labor force and how much people are working.

In their paper, Abraham and Rendell attempt to answer this question by focusing primarily on the LFPR, although they also do some analysis of the workweek. They start by decomposing the changes in participation and the workweek into a component that can be explained by demographics and preexisting trends and an unexplained residual. Then they look for possible explanations for the unexplained component, focusing on factors that have arisen since the pandemic, including the large increase in the social safety net and household wealth, which improved household balance sheets, as well as the increased incidence of illness associated with COVID-19 itself. The extent to which the "missing workers" present a problem for policymakers depends on understanding whether current behavior represents a break from the past and whether it is likely to persist. My goal in this discussion, therefore, is to provide an alternative benchmark by which to

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judge the current behavior of the participation rate, to provide some additional evidence on the likely persistence of recent trends, and to identify some areas for future research.

For their decomposition, Abraham and Rendell use a shift-share analysis to decompose the changes in the participation rate and workweek from February 2020, just prior to the pandemic, to December 2022. Their explanatory variables include age and education, and in one specification, they also control for pre-pandemic trends within these age and education groups. They calculate the trends using annual data from 2000 to 2019. Since there are indeed long-standing trends within groups—particularly the half-century-long decline in the participation rate among prime-age men—this is my preferred specification, and it is the one that is closest in spirit to my own analysis.

In order to make the comparison, the authors also make an assumption about the cyclical position of the economy. For their analysis, they assume that, given that the unemployment rate is at about the same level as it was pre-pandemic, the cyclical position is also the same. On the one hand, there is reason to think the labor market may have been tighter in winter 2019: by the time of the pandemic, the unemployment rate had been at or below 5 percent for four years and at or below 4 percent for two years. As of the end of 2022, the unemployment rate has been below 5 percent for a bit over two years and below 4 percent for a year. Given the long lags with which the participation rate responds to the economy, participation could have been cyclically stronger prior to the pandemic. On the other hand, measures of labor market tightness other than the unemployment rate, including the high ratio of vacancies to unemployment and the rapid wage growth relative to the pre-pandemic period, suggest the possibility that the labor market is tighter now than it was in early 2020. So, without a clearer benchmark, it is difficult to know whether their assumption that the cyclical position of the economy is the same is a good one.

Altogether Abraham and Rendell find that the participation rate is 1.1 percentage points lower in December 2022 than in December 2019, and most of the decline can be explained. About half the decline is attributable to changing demographics, as the aging of the population imparts a downward trend that is only partially offset by rising educational attainment. On top of that, about 0.3 percentage point is attributable to preexisting trends within groups. This leaves about 0.3 percentage point unexplained.

To check the robustness of this result, I performed my own decomposition, based on the model of the LFPR that I developed with colleagues, then at the Federal Reserve Board, which we first presented at *BPEA* in 2006 and

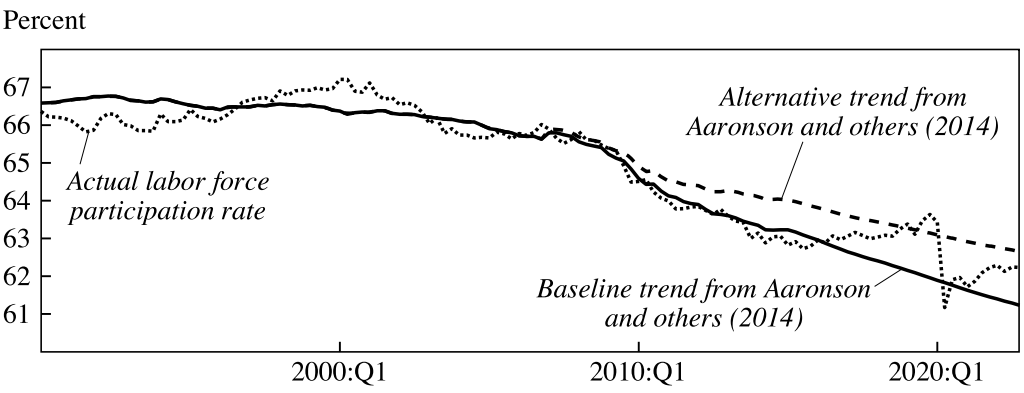
which we reexamined in a subsequent 2014 *BPEA* paper (Aaronson and others 2006, 2014). For this exercise, I did not reestimate the model, but I did crudely update the resulting trends. Similar to Abraham and Rendell, I recalculated the participation rate from the micro data using revised weights that account for the new population controls introduced in January 2022.[1] The data are at a quarterly frequency and were seasonally adjusted using factors from the Bureau of Labor Statistics (BLS). I also adjusted the 2014 model trends to account for the new population controls. I made this adjustment on the basis that if the model had known the population mix present in the new population controls, the level of the trend would have reflected it. To implement the adjustment, I assumed that the 0.3 percentage point increase to the level of the participation rate in January 2022 occurred linearly starting in April 2010. I estimated the cyclical component of the participation rate by regression, using as the measure of labor market slack the unemployment rate gap computed by subtracting the Congressional Budget Office (CBO)'s noncyclical unemployment rate from the aggregate unemployment rate.[2] Research done since we wrote the 2014 paper suggests that the participation rate reacts with very long lags to changes in business cycle conditions—up to four years—and for the analysis I use sixteen lags of the quarterly data.

Figure 1 shows the current participation rate (the dotted line) along with the baseline trend from the model (the solid line) and one of the model's alternative trends (the dashed line). The baseline trend appears to be too low. The level of the participation rate just prior to the pandemic is much higher above trend than can be explained even by the strong labor market that existed at that time. In addition, as I will show later in the discussion, it appears that we were mistaken in our assumption that the downward trend in participation among more recent cohorts would continue.

1. To adjust the micro data using the new population controls I used weights provided by John Coglianese and Christopher Nekarda, which were calculated using the IPUMS CPS and data from the US Census Bureau. The population controls were also updated in February 2023, and, unusually, the Census Bureau will be revising the data back to April 2010. However, at the time of this writing, the data necessary to revise the micro data have not been made publicly available, and since the revision to the level is relatively small (about 0.1 percentage point), I ignore the revision for this analysis. Abraham and Rendell adjust for both revisions to the population controls and the results are similar.

2. For a discussion of using the unemployment rate gap as a measure of slack in participation rate equations, see Aaronson and others (2014, 236–37). The CBO estimate of the noncyclical rate of unemployment does not account for any short-term movements in the natural rate due to dislocation from the pandemic, as, for instance, suggested by the dramatic rise in the ratio of the vacancies to unemployment.

Figure 1. Labor Force Participation Rate and Selected Trends, 1990–2022



Sources: Author's calculations using data from the Current Population Survey, the US Census Bureau, the Bureau of Labor Statistics, and Aaronson and others (2014).

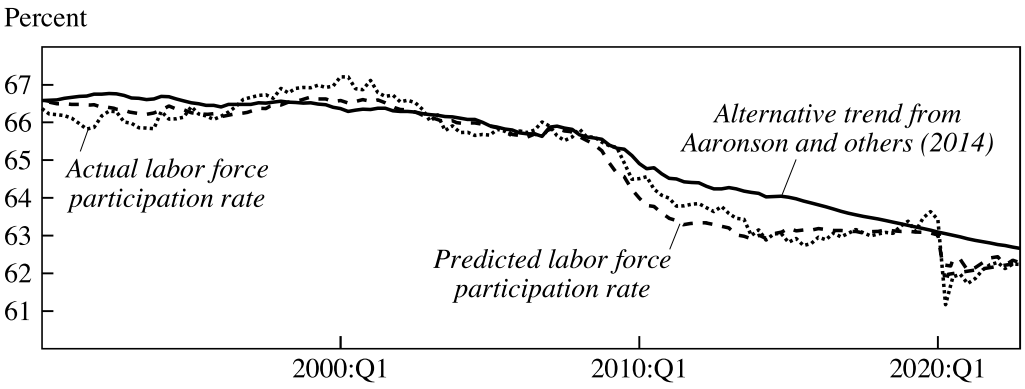
Note: The labor force participation rate is calculated from the Current Population Survey using weights, provided by John Coglianese and Christopher Nekarda, that reflect the US Census Bureau's Vintage 2021 population estimates. The data were seasonally adjusted using factors from the Bureau of Labor Statistics (actual labor force participation rate). The trends have also been adjusted to account for the Vintage 2021 population estimates.

The alternative trend appears to fit the data better. This trend roughly extrapolates forward the level of participation of the last fifteen cohorts, rather than extrapolating forward the downward trend. As I will show, this better matches the flattening out of participation among young people. In addition, this trend lines up well with the cyclical behavior of the participation rate.

Figure 2 shows the participation rate (again the dotted line) against this alternative trend (the solid line) and a predicted value for participation rate based on the trend and its estimated cyclical behavior (the dashed line). As of 2022:Q4, the actual participation rate was in line with the predicted value—in other words, participation was just where you would expect relative to trend, given the cyclical position of the economy. By this measure, there is no unexplained shortfall in the participation rate. That said, given the confidence intervals around the estimates of the trend participation rate, the predicted natural rate, and the unemployment rate gap, this result is not meaningfully different from that of Abraham and Rendell. It is also worth pointing out that, by this measure, there is room for the participation rate to continue to move up should the labor market continue to improve, in line with normal cyclical behavior.

As an alternative, we could do an exercise more similar to the one that Abraham and Rendell did, where we compute the change in the participation rate and subtract out the part we can explain—the change in the predicted

Figure 2. Labor Force Participation Rate: Actual, Trend, and Predicted, 1990–2022



Sources: Author's calculations using data from the Current Population Survey, the US Census Bureau, the Bureau of Labor Statistics, the Congressional Budget Office, and Aaronson and others (2014).

Note: The labor force participation rate is calculated from the Current Population Survey using weights, provided by John Coglianese and Christopher Nekarda, that reflect the US Census Bureau's Vintage 2021 population estimates. The data were seasonally adjusted using factors from the Bureau of Labor Statistics (actual and predicted labor force participation rate). The trends have also been adjusted to account for the Vintage 2021 population estimates.

value. In this case, the unexplained portion of the decline is about 0.5 percentage point.[3]

As noted above, the actual participation rate is in line with its predicted value, but the change in the actual participation rate relative to the change in the predicted value suggests that about 0.5 percentage point of the decline in the participation rate is unexplained. What explains the difference? The second calculation captures the fact that the participation rate was about 0.5 percentage point above the predicted value just prior to the pandemic.

Based on this accounting, what you expect to see happen to the participation rate going forward depends on why you think the participation rate was so far above the predicted value prior to the pandemic and whether it is likely to persist. For instance, if the high level of the participation rate was just noise, or if we underestimated the cyclical position of the economy at that time, there is no reason to think that the high level of participation from that time would persist going forward. If, however, the unusually high level reflected a higher pre-pandemic trend, then we might expect a larger recovery.

3. In comparison the most comparable estimate of the unexplained gap in Abraham and Rendell is 0.3 percentage point. Of this difference, 0.1 percentage point can be explained by the fact that I don't adjust for the 2022 Vintage population controls and 0.1 percentage point is accounted for by the fact that I am looking at quarterly data.

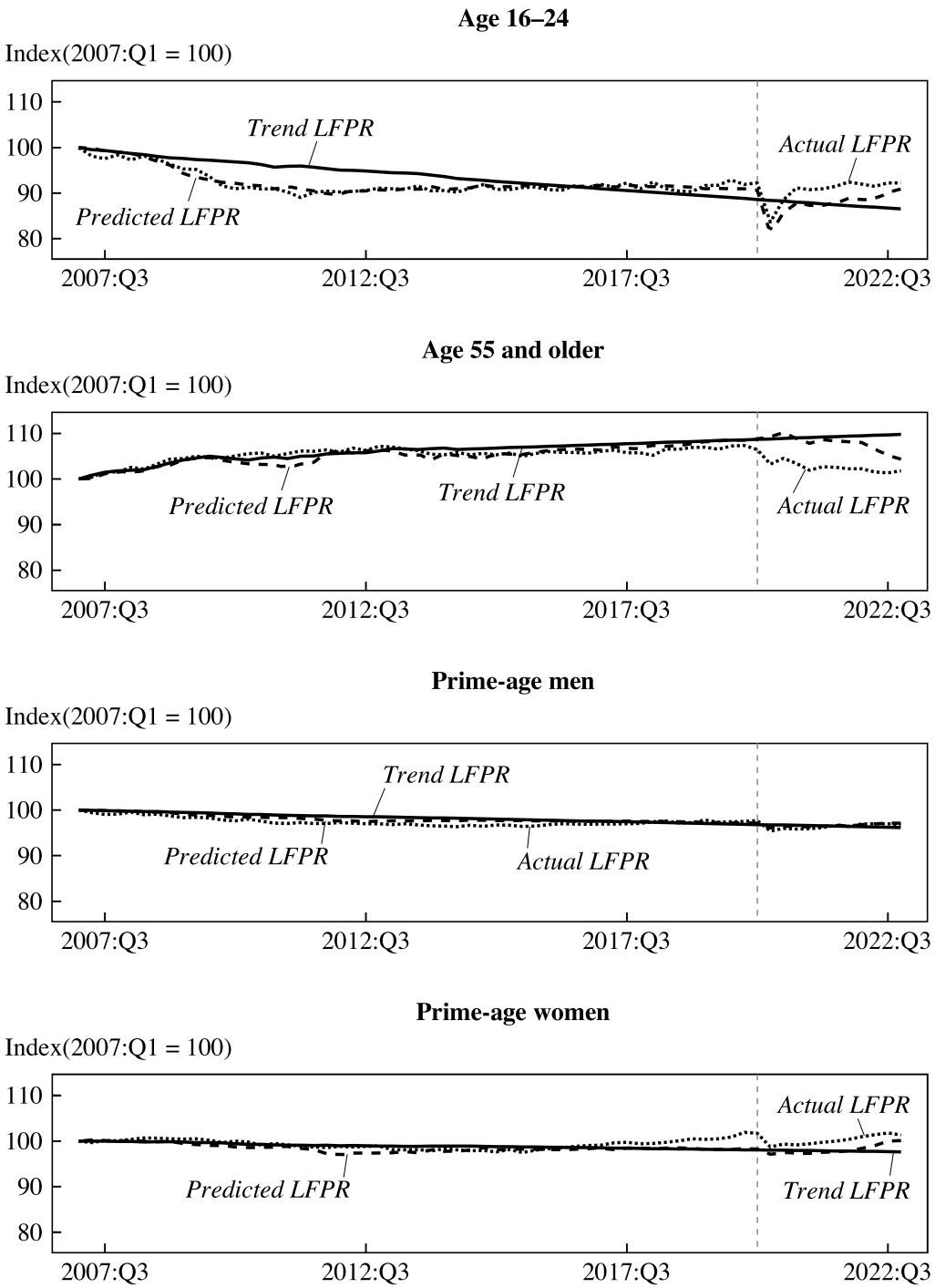
To elucidate whether there might be some signal for the trend in the relatively high pre-pandemic participation rate, figure 3 shows the participation rates of a few demographic groups along with their trends from the 2014 paper. The participation rates were calculated using the Current Population Survey (CPS) data and weights that account for the Vintage 2021 population controls. The data were seasonally adjusted using factors from the BLS. Note that I haven't adjusted the trends for the new population controls.[4] However, since the trends in the paper stopped in 2014, I drew out the trends using the growth rates over the 2009–2014 period. I also estimated the cyclical behavior of participation for each of the groups and plotted the predicted values. To put everything on the same scale, the data are indexed to 2007:Q1. A vertical dashed line marks the start of the pandemic.

These graphs show that for some groups there are differences in the evolution of their participation rates relative to their trends in recent years, which might have some information for thinking about the participation rate going forward. To start, the top graph shows the participation rate among those 16–24 years old. The participation rate for young people flattened out starting in 2012 and has largely moved sideways since then. The overall flattening is in line with what would be expected given the cyclical recovery in the economy over the time (comparing the actual participation rate (the dotted line) to the fitted value (the dashed line). That said, in the year just prior to the pandemic, and even more so now, the participation rate stands above what you would expect given the cyclical position of the economy. While our alternative trend captures this flattening better than the baseline (which is represented in this figure), nonetheless the relative strength in youth participation could suggest that the trend participation rate is higher than that embodied by even our alternative model.

Participation among prime-age women (the bottom graph) is also high relative to its trend and relative to what we would expect given the state of the business cycle. As with young people, this behavior started prior to the pandemic. The participation rate for prime-age women rose for much of the post–World War II era, up until about the year 2000, at which point it flattened out and even started to edge down. Since much of the weakness over the past two decades was among low-skilled women (Black, Schanzenbach, and Breitwieser 2017), it raised the question of whether their participation rate was being dragged down by the same demand factors

4. Because we divide the workers into broad age categories, this partially mitigates the fact that the trends are not adjusted for the new population controls.

Figure 3. Labor Force Participation Rates for Selected Age Groups



Sources: Author's calculations using data from the Current Population Survey, the US Census Bureau, the Bureau of Labor Statistics, the Congressional Budget Office, and Aaronson and others (2014).

Note: The labor force participation rate is calculated from the Current Population Survey using weights, provided by John Coglianese and Christopher Nekarda, that reflect the US Census Bureau's Vintage 2021 population estimates. The data were seasonally adjusted using factors from the Bureau of Labor Statistics (actual and predicted labor force participation rate). The trends have also been adjusted to account for the Vintage 2021 population estimates. Vertical dashed line indicates 2020:Q1.

dragging down the participation of low-skilled men. But in the years just prior to the pandemic and now during the recovery, the participation rate among prime-age women has started to edge up and now stands at about its historical peak. This may in part be due to the substantial increase in female educational attainment in recent years.[5] The more recent movements could also be due to changes in the labor market post-pandemic, including the persistence of remote work. While our model captures changes in educational attainment, it does so in a blunt way, and the model doesn't capture remote work at all. If these factors persist in boosting female labor force participation, then the actual trend participation rate is higher and flatter than that shown in figure 1.

In contrast, the participation rate of prime-age men appears to have continued to fall, roughly in line with the trend. It was perhaps a touch above trend prior to the pandemic and now, but it isn't clear that there has been a break relative to the model expectations.

The clearest break relative to model expectations seems to be among workers 55 and older, whose participation had been rising roughly in line with trend but fell off right as the pandemic hit. This makes the point clearly that, to the extent that there is a shortfall in participation, it is among retired workers (Montes, Smith, and Dajon 2022). The implications for labor force participation moving forward depend on whether the spate of early retirements was a onetime response to the pandemic. If so, the participation rate will return to its trend as these people pass the age at which they would have retired under normal circumstances. If, instead, COVID-19 changed workers' preferences about retirement—either because it has increased the health risks to working while older, or because it has affected the preference for work more generally, then this could represent a lower trend participation rate going forward, suggesting that the actual participation is even closer to its trend than the current model suggests.

To sum up this discussion of the LFPR, the evidence presented by Abraham and Rendell and in the alternative benchmarking provided by the model suggests that the LFPR is not particularly low. I would estimate the shortfall in the participation rate to be around zero, in line with the reading from the model. It is possible that the participation rate is further below its

5. Institute of Education Sciences National Center for Education Statistics, "Digest of Education Statistics 2021," Table 104.10 Rates of high school completion and bachelor's degree attainment among persons age 25 and over, by race/ethnicity and sex: Selected years, 1910 through 2021.

expected level, if the labor market is tighter than suggested by the unemployment rate gap, or if the trend is higher, for instance, because the trend in participation among women is higher than the model embodies. On the other hand, participation could actually be closer to the trend, if the change in retirement behavior during the pandemic is persistent, suggesting the trend is lower than that embodied in the model.

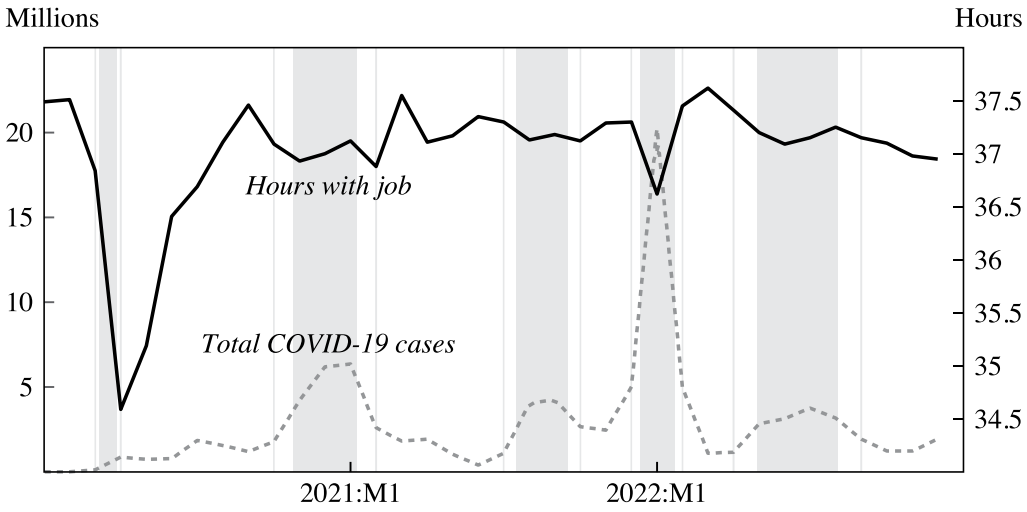
Up to now I have focused my discussion on the LFPR. However, the authors parse the decline in labor supply, as measured by total hours, between the participation rate and average weekly hours of work. By their calculation, when accounting for preexisting trends, the workweek accounts for perhaps three times the unexplained reduction in total hours as does the LFPR. Unfortunately, the authors have much less to say about the change in hours than they do participation. In part this is because the studies they review tended to focus on employment or participation and not hours. Given its importance to recent labor supply trends, the paper clearly identifies the workweek as an area requiring more attention by researchers. I will try to provide some guidance for future work on the topic.

The authors and a number of the studies they discuss (Goda and Soltas 2023; Sheiner and Salwati 2022) focus on the impact of COVID-19 on the level of hours. On aggregate, these studies and the additional work done by Abraham and Rendell find evidence that there has been an increased rate of illness since the pandemic, likely related to bouts of COVID-19 and especially long COVID, which has affected the level of hours worked. However, this work misses the fact that the pandemic has also ushered in a period of increased volatility in hours.

Figure 4 shows the Abraham and Rendell measure of hours along with periods of spikes in COVID-19 cases. As can be seen, the two are negatively correlated, with weekly hours of work falling when COVID-19 cases rise dramatically. More generally, I calculated the variance of hours before the pandemic and from fall 2021, when schools really reopened, through the end of 2022, and it is about 50 percent higher. The higher volatility could be due to any number of factors, including changes in hours due to sickness or to caregiving. And since higher volatility has its own cost associated with it—for instance, by reducing the ability of firms to plan their labor inputs and making it harder for individuals to balance work and family care—this is a phenomenon worth exploring.

Moving on from the COVID-19 effects, the authors put out the tantalizing possibility that perhaps people are changing their preferences around how many hours they work. This is an interesting idea, but I don't think that the measure of hours that the authors provide is particularly suggestive

Figure 4. Hours Worked Last Week and COVID-19 Cases



Sources: Author's calculations using data from the US Census Bureau, the Bureau of Labor Statistics, and the *New York Times*.

Note: Hours worked last week include zero for individuals who reported being with a job but not at work. Hours data were seasonally adjusted using the Census Bureau's X-13 method. Shading shows approximate dates of COVID-19 waves. COVID-19 case data retrieved from https://github.com/nytimes/covid-19-data using the variable cases_avg.

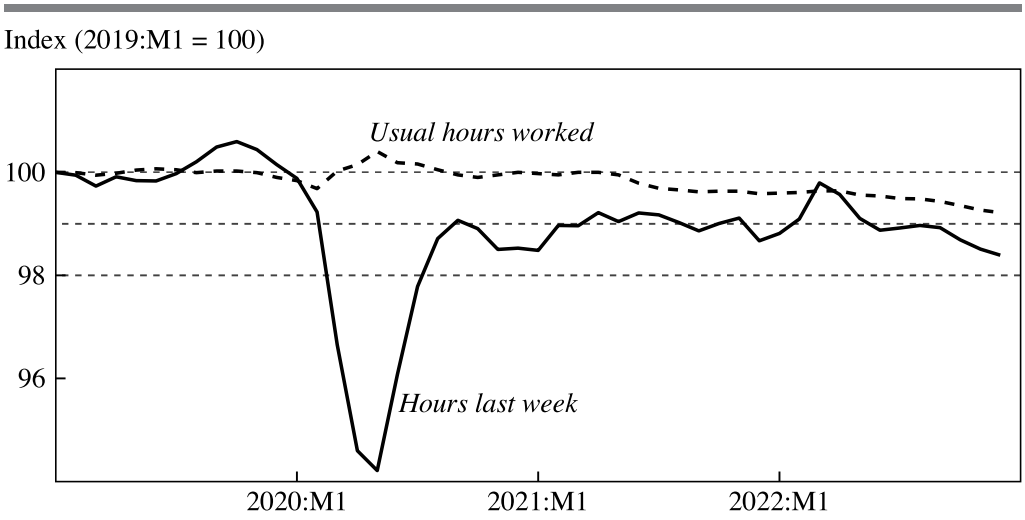
of this phenomenon, since it captures actual hours of work rather than desired hours of work. Actual hours of work can change when, as was just discussed, someone gets sick or if they have caregiving responsibilities. It can also vary due to weather, if employers adjust hours of work in response to changes in demand, and in response to other temporary changes in personal circumstances.

Luckily for us, the CPS also includes a measure of usual hours worked, which is closer conceptually to desired hours of work. Of course, there is a large literature suggesting people don't have complete choice when it comes to the hours they can work.[6] But at least the usual hours of work variable is free from the week-to-week shocks that move people away from their desired hours. In addition, my measure differs from the usual weekly hours measure published by the BLS because I eliminate from my sample people who are working part-time for economic reasons, since they are clearly off their supply curves.

Figure 5 compares the authors' measure of hours worked last week with my version of usual hours worked. To make the trend easier to see, I indexed

6. See Altonji and Paxson (1988) for a relatively early empirical exploration and Golden and Gebreselassie (2007) for a more recent example.

Figure 5. Alternative Hours Measures



Sources: Author's calculations using data from the US Census Bureau and the Bureau of Labor Statistics.

Note: Hours worked last week include zero for individuals who reported being with a job but not at work. Usual hours worked excludes those who worked part-time for economic reasons. Hours data were seasonally adjusted using the Census Bureau's X-13 method. Both series are centered three-month moving averages.

both series to be equal to 100 in 2019:M1. After falling dramatically during the pandemic, the authors' measure rebounded to a level about 1.25 percent below its pre-pandemic level and has moved about sideways since then. This timing is supportive of the authors' hypothesis that pandemic-related factors, such as fear of COVID-19 and increased illness, can explain the decline in actual hours worked. In contrast, usual hours worked was flat on balance, until the middle of 2021—suggesting that desired hours hadn't changed, even as actual hours declined. However, since mid-2021, around the time vaccines became more prevalent, usual hours of work has been trending down. I think that this provides some evidence that, as people have adjusted to post-pandemic life, desired hours may have fallen. If that is true, it would have long-term implications for potential output.

A final point I wish to make with respect to identifying missing workers is that by ignoring population, the authors miss out on an important part of the story for why the labor market has been so tight. Abraham and Rendell acknowledge in a footnote that they focus on people's willingness to supply their labor—through the LFPR and weekly hours—and ignore the population. But I think it is worth recalling just how dramatic the downshift in population growth was during the pandemic, and even prior to that. The growth rate of the working-age population fell from an average of about

1.25 percent between 1980 and 2007 to about 1 percent between 2007 and 2019. During the pandemic population growth slowed to about half that. Excess mortality during the pandemic alone accounted for about 500,000 fewer people in the working-age population (Federal Reserve System Board of Governors 2023). In addition, the shortfall in immigration between 2020 and 2022 amounts to an additional 750,000 people.[7] If immigrants had the same participation rates as the working-age population, this would have implied a shortfall of about 460,000 labor force participants in 2022:Q4. However, immigrants have much higher participation rates, so the number of missing participants due to immigration is probably closer to the upper bound. Altogether excess deaths and immigration probably account for between 1 and 1.25 million missing labor force participants. In comparison, our estimates suggest that the *unexpected* shortfall in the LFPR in the fourth quarter of 2022 was somewhere between zero and 0.5 percentage point. If we apply this miss to the working-age population in 2022:Q4, we find that the participation rate accounts for somewhere between zero and 1.3 million missing workers. By this accounting, reductions in the population account for somewhere between all of the missing workers and half of them.[8]

In terms of explaining the impact of the pandemic on labor supply, the authors left several areas underexplored, which point to areas for future research. Abraham and Rendell note that the COVID-19-related factors overexplain the decline in LFPR, depending on the exact calibration, but at the same time they cannot explain changes in labor supply for different demographic groups. As discussed here, in their paper, and elsewhere, the real shortfall in participation is among older people, and the work on long COVID cannot explain the magnitude of the change for that group. At the same time, if the aggregate estimates of the impact of COVID-19 are in the right ballpark, this suggests that there have been offsetting factors increasing participation among other groups. Determining which workers have increased their participation and why is important for understanding their implications for potential labor supply in the future.

7. In 2018 and 2019 immigration averaged about 950,000 people. In 2020–2022, immigration averaged about 700,000 people. If we assume that, in the absence of the pandemic, immigration would have remained at the 2018–2019 pace, then the shortfall in immigrants over the three years is about 750,000. For source data, see Knapp and Lu (2022).

8. These findings are similar to those by Bauer and others (2023), who put the labor force shortfall at 900,000, all of which they attribute to excess deaths and reduced immigration.

I also believe the authors were too dismissive of the possibility that the large expansion of the social safety net had an impact on labor supply. Perhaps due to space or time constraints, they did not delve into the details of the various income support programs. More generally, it is not enough to focus on the average benefit per workers—the distribution of benefits matters substantially for their likely impact on labor supply, since households with different levels of income face very different budget constraints. Moreover, it is not clear that the income and substitution effects estimated in a non-pandemic environment are useful for assessing likely behavior during a pandemic, when people are confronted with significant health risks and reductions in the availability of child and family care among other changes. While it is true that the social safety net programs have expired, they nonetheless may have had an impact on people's work habits that could be persistent.

While acknowledging that no paper can be comprehensive, I was a bit surprised that the authors didn't tackle the issue of remote work, the widespread use of which at the height of the pandemic transformed many jobs and people's expectations of their work and home life. This transformation could have important implications for both labor force participation and the workweek going forward. For instance, as described by Bick, Blandin, and Fuchs-Schündeln (2022), to the extent that remote work lowers the fixed costs of work, for instance, by reducing commute times and allowing for greater flexibility in location and family care, it could increase labor force participation and reduce hours of work. The extent to which remote work will continue to be broadly available to workers whose jobs can feasibly be done remotely will have important implications for the size and composition of the labor force going forward.

To conclude, the authors have provided a wide-ranging first look at the evolution of the labor market as we emerge from the pandemic. The work included an accounting of the role of the LFPR and the workweek in contributing to the shortfall as well as a careful appraisal of a number of pandemic-related factors that could be affecting labor supply. Their work also points to several important areas that require future research.

With respect to the implications for the economy, the research done by the authors and in this discussion suggest that most of the shortfall in labor force participation relative to its pre-pandemic level has largely been as expected. This implies that further expansion of labor supply will depend on continued cyclical improvement in the participation rate and the workweek and a rebound in immigration that is apparently already under way. Another potential source of labor supply would involve the reversal of some

persistent pandemic-induced patterns, including both early retirements and the low level of hours worked, or further positive structural changes, for instance, from remote work or changing demographics, such as higher educational attainment. Policymakers will certainly be paying attention.

REFERENCES FOR THE AARONSON COMMENT

Aaronson, Stephanie, Tomaz Cajner, Bruce Fallick, Felix Galbis-Reig, Christopher Smith, and William L. Wascher. 2014. "Labor Force Participation: Recent Developments and Future Prospects." *Brookings Papers on Economic Activity*, Fall, 197–255.

Aaronson, Stephanie, Bruce Fallick, Andrew Figura, Jonathan F. Pingle, and William L. Wascher. 2006. "The Recent Decline in the Labor Force Participation Rate and Its Implications for Potential Labor Supply." *Brookings Papers on Economic Activity*, no. 1: 69–154.

Altonji, Joseph G., and Christina H. Paxson. 1988. "Labor Supply Preferences, Hours Constraints, and Hours-Wage Trade-offs." *Journal of Labor Economics* 6, no. 2: 254–76.

Bauer, Lauren, Wendy Edelberg, Sara Estep, and Brad Hershbein. 2023. "Who's Missing from the Post-Pandemic Labor Force?" Washington: Brookings Institution. https://www.brookings.edu/2023/04/04/whos-missing-from-the-post-pandemic-labor-force/.

Bick, Alexander, Adam Blandin, and Nicola Fuchs-Schündeln. 2022. "Reassessing Economic Constraints: Maximum Employment or Maximum Hours?" In *Economic Policy Symposium Proceedings: Reassessing Constraints on the Economy and Policy*. Jackson Hole, Wyo.: Federal Reserve Bank of Kansas.

Black, Sandra E., Diane Whitmore Schanzenbach, and Audrey Breitwieser. 2017. "The Recent Decline in Women's Labor Force Participation." Washington: The Hamilton Project, Brookings Institution. https://www.brookings.edu/wp-content/uploads/2017/10/es_10192017_decline_womens_labor_force_participation_blackschanzenbach.pdf.

Federal Reserve System Board of Governors. 2023. *Monetary Policy Report—June 2023*. Washington: Author. https://www.federalreserve.gov/monetarypolicy/2023-06-mpr-summary.htm#:~:text=Monetary%20Policy%20Report%20submitted%20to,FOMC)%20objective%20of%202%20percent.

Goda, Gopi Shah, and Evan J. Soltas. 2023. "The Impacts of Covid-19 Absences on Workers." *Journal of Public Economics* 222:104889.

Golden, Lonnie, and Tesfayi Gebreselassie. 2007. "Overemployment Mismatches: The Preference for Fewer Work Hours." *Monthly Labor Review*, April, 18–37.

Knapp, Anthony, and Tiangeng Lu. 2022. "Net Migration between the United States and Abroad in 2022 Reaches Highest Level since 2017." US Census Bureau, December 22. https://www.census.gov/library/stories/2022/12/net-international-migration-returns-to-pre-pandemic-levels.html.

Montes, Joshua, Christopher Smith, and Juliana Dajon. 2022. "'The Great Retirement Boom': The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation." Finance and Economics Discussion Series 2022-081. Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/FEDS.2022.081.

Sheiner, Louise, and Nasiha Salwati. 2022. "How Much Is Long COVID Reducing Labor Force Participation? Not Much (So Far)."Working Paper 80. Washington: Hutchins Center on Fiscal and Monetary Policy, Brookings Institution. https://www.brookings.edu/research/how-much-is-long-covid-reducing-labor-force-participation-not-much-so-far/.

COMMENT BY

YONGSEOK SHIN Abraham and Rendell's superb article provides a thoughtful and thorough analysis of the trends in labor force participation and hours of work since the pandemic. Much has been written about the labor shortage during the post-pandemic recovery. Abraham and Rendell convincingly show that the lower participation rate is a continuation of a trend that existed even before the pandemic. In addition, the little shortfall that remains after adjusting for the trend can be attributed to people withdrawing from the labor force because of long COVID or fear of COVID-19, although the magnitude of these effects is smaller than what other researchers have posited. As for the decline in hours of work, Abraham and Rendell note that there was no preexisting trend, and that long COVID or fear of COVID-19 may not be the explanation, to the extent that these effects will predominantly operate at the extensive margin (working or not working) rather than at the intensive margin (hours of work, conditioning on working). The authors conjecture that the lower levels of hours reflect a reevaluation of the work-life balance people wish to strike.

I will first comment on the trend in labor force participation rates and offer some corroborating evidence on the role of fear of COVID-19. I will then discuss how the abrupt reallocation of economic activities during the pandemic is another reason for the tight labor market. Finally, I will point to the patterns in the declining hours of work across workers, which support the authors' conjecture on the cause of reduced hours of work.

TREND IN LABOR FORCE PARTICIPATION The labor force participation rate in the United States has been declining since 2000, as shown in figure 2 of the paper. This is partly due to demographic changes (population aging), but also due to downward trends within demographic groups. An alternative view of figure 2 is that it may not be one monotonic trend. For example, between 2004 and 2008, the participation rate stayed flat until hit

by the Great Recession. The downward trend was again arrested in 2014, with the participation rate increasing slightly through 2019 until hit by the pandemic lockdown. While the compositional effect of the demographic changes may well be predetermined and monotonic, the participation rates within demographic groups may have behaved differently had it not been for the Great Recession or the pandemic. In other words, we may not want to take all the preexisting downward trend in the participation rate as inexorably given.

The real question then is why the participation rates of some demographic groups are trending downward. As is well known, the labor force participation rate of young men without a four-year college degree has been falling since the Great Recession. Lee, Park, and Shin (2023) show that the participation rate of women over 30 without a four-year college degree has been falling as well. Considering the personal and social losses that young people's detachment from the labor force entails, it is imperative that researchers and policymakers delve into the cause of this phenomenon and come up with policy responses.

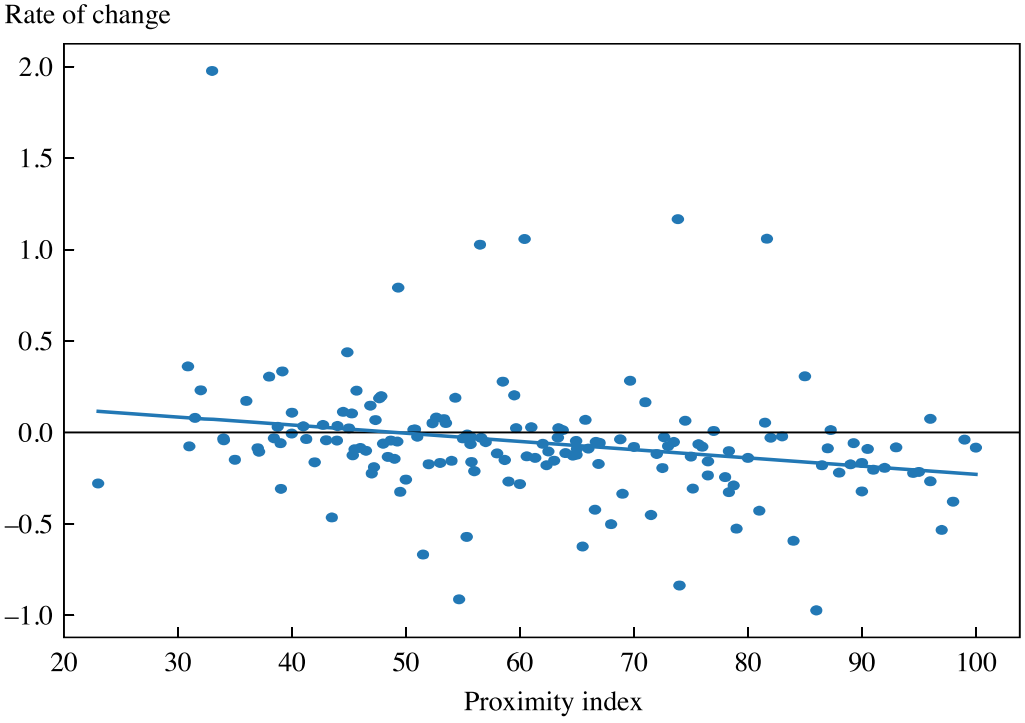
FEAR OF COVID-19 The discussion in the paper on the effect of fear of COVID-19 largely relied on direct survey evidence. I provide two pieces of corroborating evidence, building on my previous work on this topic.

First, I consider the impact of fear of COVID-19 on occupational employment. The idea is that occupations differ in terms of COVID-19 infection risks, and employment in riskier occupations would shrink more if fear of COVID-19 were an important factor.

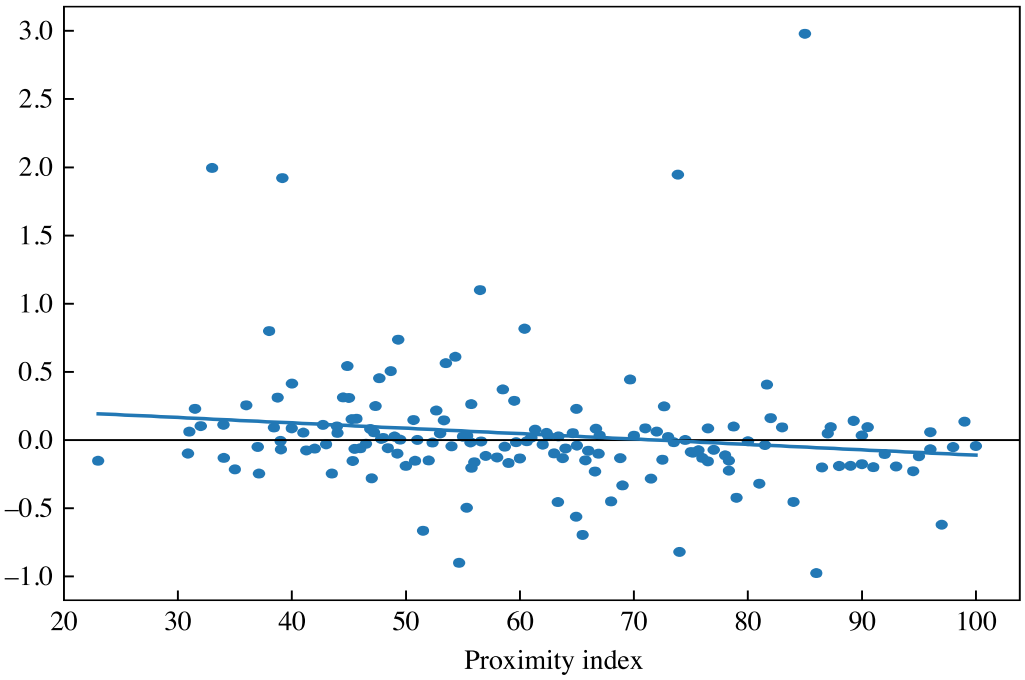
In figure 1, panel A plots the change in employment of occupations between 2019 and 2020 against each occupation's proximity index. The proximity index is a weighted index of job attributes measuring the extent to which the job requires workers to perform tasks in close physical proximity of other people (Aum, Lee, and Shin 2022). Given how COVID-19 gets transmitted, proximity at work is a good proxy for the risk of COVID-19 infection at work. We see that employment in occupations with high COVID-19 infection risks fell relative to those with low risks, suggesting that fear of COVID-19 had an impact on the labor market in 2020. Panel B shows the change in employment of occupations between 2019 and 2022. Although the pandemic had receded significantly by 2022, we still observe a significant negative relationship between the measure of COVID-19 infection risks at work and occupational employment. This is consistent with Abraham and Rendell's finding that fear of COVID-19 negatively affected people's labor market activities even in late 2022.

Figure 1. Occupational Proximity at Work and Employment Change

Panel A: Employment change rate across occupation, from 2019 to 2020



Panel B: Employment change rate across occupation, from 2019 to 2022



Sources: Author's calculations using the Current Population Survey and the occupational proximity index of Aum, Lee, and Shin (2022).

Table 1. Regressing Nonemployment Indicator on State-Level COVID-19 Cases

	Medium-risk state	*High-risk state*
Estimated coefficient	0.007	0.013
Standard error	0.001	0.001

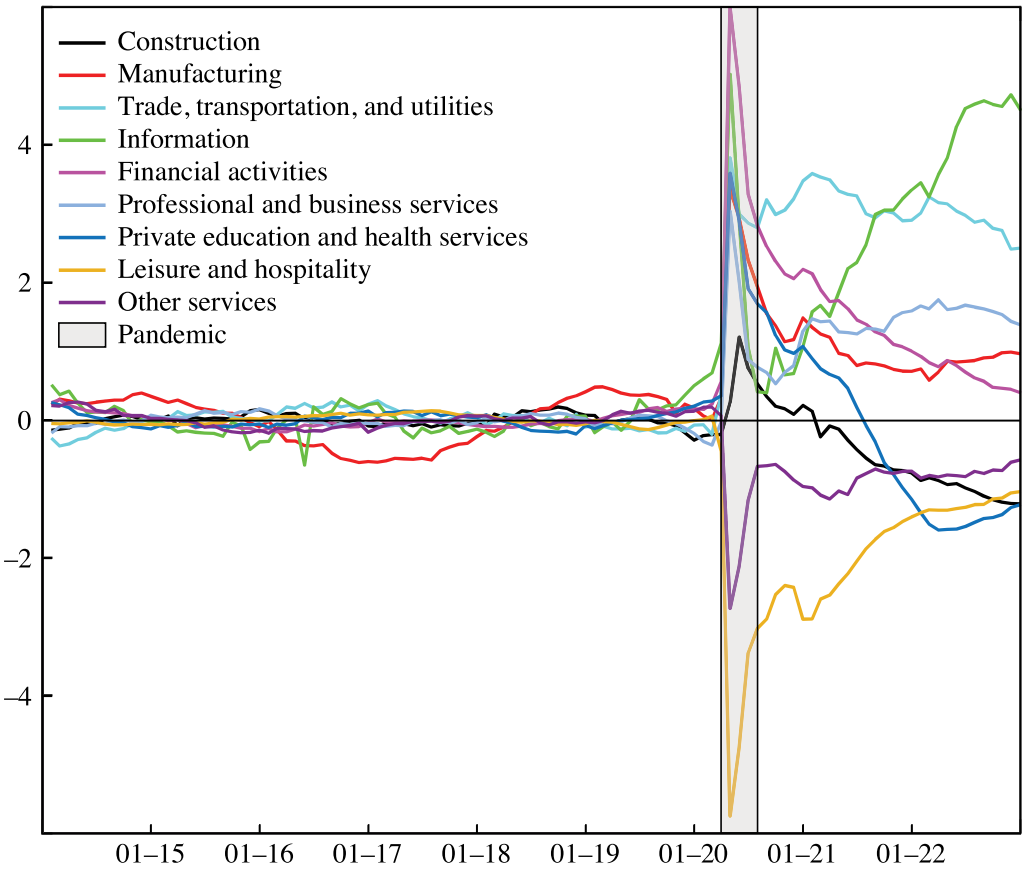
Sources: Author's calculations using the Current Population Survey and the Centers for Disease Control and Prevention, "COVID Data Tracker," https://covid.cdc.gov/covid-data-tracker/#datatracker-home.

Second, I explore whether concurrent COVID-19 cases have a negative effect on employment, with the idea that fear of COVID-19 will be heightened when and where the number of new COVID-19 cases is large. I extend the work of Lee, Park, and Shin (2021) and run an individual-level regression pooling the Current Population Survey (CPS) for all twelve months of 2022. The dependent variable is an indicator for nonemployment (nonparticipation and unemployment). The control variables include saturated dummy variables for individual characteristics such as gender, race or ethnicity, age, and education. In addition, I group US states into high, medium, and low risk in each month based on the number of new COVID-19 cases per 1,000 people during the four weeks that precede the week of the CPS interview (the week that contains the 19th of each month), using case counts from the Centers for Disease Control and Prevention.

In table 1, we see that residing in a state classified as medium COVID-19 risk at the time of the CPS interview is associated with a 0.7 percentage point increase in nonemployment rate, relative to the (excluded) low-risk states. People in states classified as high COVID-19 risk at the time of the CPS interview have a nonemployment rate that is 1.3 percentage points higher than those in low-risk states. As it is reasonable to think that a large number of recent COVID-19 cases will strengthen fear of COVID-19, the estimated coefficients corroborate Abraham and Rendell's finding that fear of COVID-19 continued to be a drag on labor force participation and employment through 2022.

PANDEMIC AS A REALLOCATION SHOCK The pandemic lockdown was not just a pause of the economy. It also reallocated economic activities across sectors, as emphasized by Buera and others (2021). In figure 2, I plot the employment shares of two-digit sectors of the US economy from January 2014 to January 2023. For each sector, I extrapolate a linear trend using the pre-pandemic data from 2014 and 2019 and then plot the deviation of the employment share from the trend, normalized by the standard deviation calculated from the pre-pandemic data.

Figure 2. Employment Share of Two-Digit Industries, Detrended and Standardized



Source: Author's calculations using the Current Employment Statistics survey.

Figure 2 shows that the pandemic had an unprecedentedly large effect on employment shares of sectors and that it affected sectors in a starkly asymmetrical fashion. What is remarkable is that the sectoral employment shares are still far away from the pre-pandemic trends a full three years after the initial shock. As worker skills are partly sector-specific, the pandemic as reallocation shock can generate a mismatch between available jobs and workers, which can explain both the exceptional tightness of the current labor market and the low labor force participation. Workers displaced from shrinking sectors cannot easily move to expanding ones because of skill mismatch, which may lead them to exit the labor market altogether. This is a channel that deserves more scrutiny.

DECLINE IN HOURS OF WORK The total work hours of an economy can fall because either the number of workers falls or workers work fewer hours.

As Abraham and Rendell note, a decomposition shows that the decline in total work hours between 2019 and 2022 is as much due to fewer hours per worker as fewer workers (Lee, Park, and Shin 2023). The hours margin becomes more important when extending the analysis to early 2023 because the participation rate continued to rise between January and April 2023. The participation rate in April 2023 is only 0.37 percentage points below the average participation rate between 2017 and 2019, without adjusting for any preexisting trend. On the other hand, hours per worker did not increase in 2023, as of this writing.

Between 2019 and 2022, the average annual work hours per person in the United States fell by 36 hours from 1,229 to 1,193, or by 3 percent. Of these, 19 hours are due to the hours margin and the remaining 17 are due to the number of workers margin (Lee, Park, and Shin 2023).

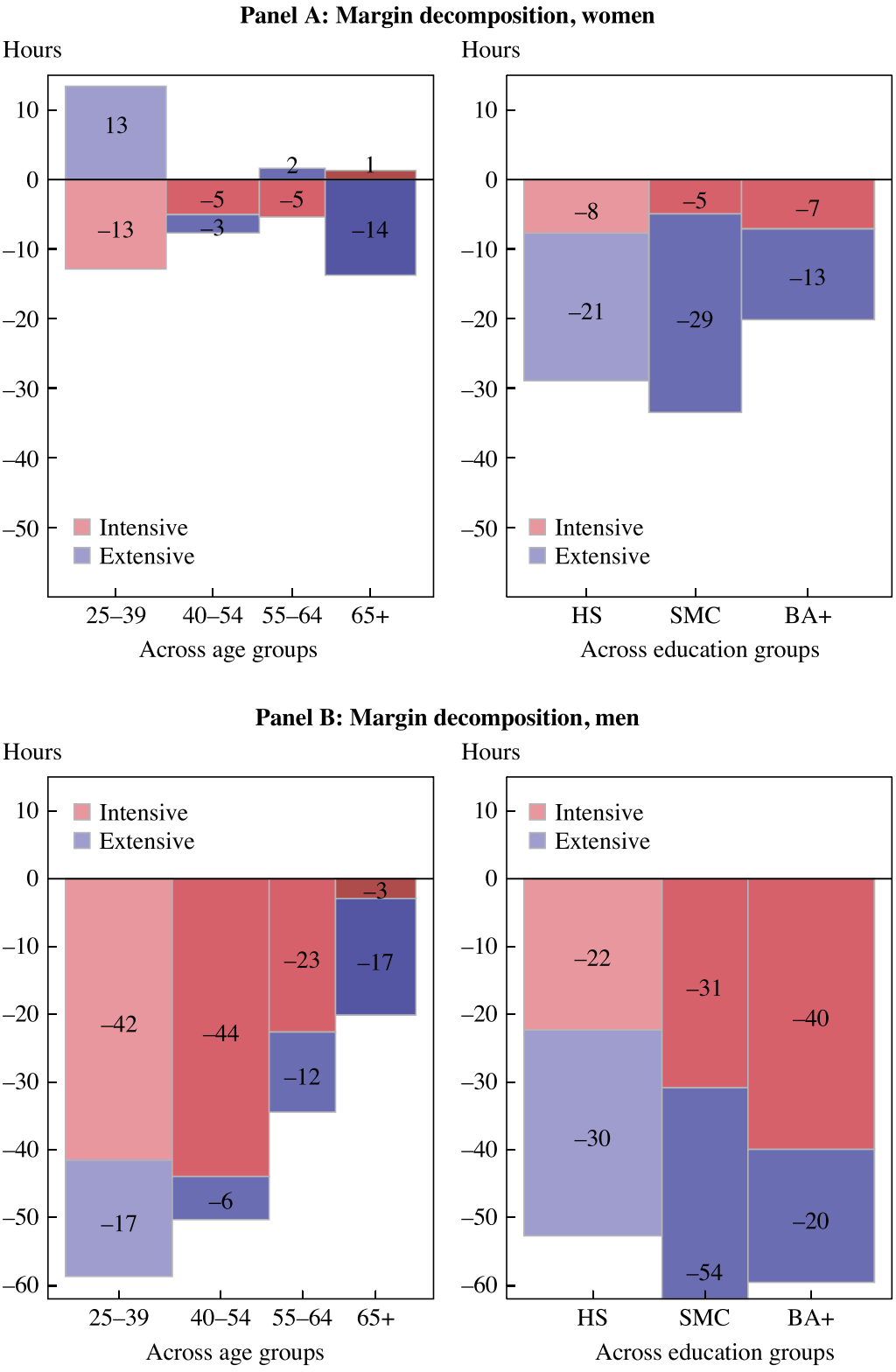
In figure 3, I divide the population by gender, age, and education to decompose the annual work hours changes into the hours margin (intensive) and the number of workers margin (extensive) for each demographic group. Panel A is for women and panel B is for men. For both women and men, the bars on the left represent age groups: 25–39, 40–54, 55–64, and 65 and older. The bars on the right are groups by educational attainment: high school graduates and dropouts (HS), those with some college education but no four-year degree (SMC), and those with a four-year degree or even more education (BA+).

Figure 3 clearly shows that the hours reduction between 2019 and 2022 was much larger for men than women. Men's annual work hours per person fell by 60 hours, while women's fell by 15.[1] And for men, the hours margin was the dominant one for all age groups except for those 65 and older. By education, the hours margin was especially important for the most educated group. Overall, the work hours per worker (that is, excluding those not working) fell the most among educated, prime-age men, who tend to work long hours and have high earnings. This last finding, together with the excess demand in the overall labor market, suggests that the reduction in hours is a voluntary decision, possibly because of a desire to strike a better work-life balance, as Abraham and Rendell conjectured.

CONCLUDING REMARKS Abraham and Rendell's masterful review convincingly accounts for the decline in labor force participation through the end of 2022. It also raises a few thought-provoking questions. Why does

1. Adding up the bars using population weights does not necessarily yield the averages for women and men because the bars do not capture the changes in the population weights of the age or education groups.

Figure 3. Change in Annual Work Hours per Person, by Gender, Age, and Education



Sources: Author's calculations using the Current Population Survey and the decomposition method in Lee, Park, and Shin (2023).

the labor force participation of young men and women without college degrees continue to fall? What explains the historic tightness of the current labor market? Did the massive reallocation of economic activities across sectors play a role? Most importantly, what are the reasons that many educated, prime-age men reduced their work hours, and is this a permanent change? I expect that future research by Abraham and Rendell, and by other researchers inspired by their work, will provide insights into these important questions.

REFERENCES FOR THE SHIN COMMENT

Aum, Sangmin, Sang Yoon Lee, and Yongseok Shin. 2022. "Who Should Work from Home during a Pandemic? The Wage-Infection Trade-off." *Federal Reserve Bank of St. Louis Review* 104, no. 2: 92–109. https://research.stlouisfed.org/publications/review/2022/01/24/who-should-work-from-home-during-a-pandemic-the-wage-infection-trade-off.

Buera, Francisco J., Roberto N. Fattal-Jaef, Hugo Hopenhayn, P. Andres Neumeyer, and Yongseok Shin. 2021. "The Economic Ripple Effects of COVID-19." Working Paper 28704. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w28704.

Lee, Dain, Jinhyeok Park, and Yongseok Shin. 2023. "Where Are the Workers? From Great Resignation to Quiet Quitting." Working Paper 30833. Cambridge, Mass.: National Bureau of Economic Research. https://www.nber.org/papers/w30833.

Lee, Sang Yoon, Minsung Park, and Yongseok Shin. 2021. "Hit Harder, Recover Slower? Unequal Employment Effects of the COVID-19 Shock." *Federal Reserve Bank of St. Louis Review* 103, no. 4: 367–83. https://research.stlouisfed.org/publications/review/2021/09/01/hit-harder-recover-slower-unequal-employment-effects-of-the-covid-19-shock.

GENERAL DISCUSSION Caroline Hoxby commented on a work-life balance evaluation that is ongoing, especially during the COVID-19 pandemic. For years, the United States has been an outlier in terms of hours and weeks of participation in a year. In the Scandinavian and continental European countries, people work fewer hours.[1] It's possible that the pandemic shocked Americans into thinking they didn't need to contribute so many hours or weeks of participation. So the question to ask is whether we're just converging to the norm or is there something else really going on.

1. OECD, "Average Annual Hours Actually Worked per Worker," https://stats.oecd.org/Index.aspx?DataSetCode=ANHRS.#

Jason Furman added that if we were looking only at labor market data from 2019 and before and now in 2023, there likely wouldn't be a paper or conversation about missing workers. He noted that in January 2020, Phillip Swagel, Wendy Edelberg, and Jeffrey Kling's forecast for the labor force participation rate in 2023:Q1 was 62.5 percent and that in February 2023, the labor force participation rate was 62.5 percent.[2] Employment is exceeding what Congressional Budget Office (CBO) had forecasted prior to the pandemic, which is remarkable when considering that the population, due to premature deaths and immigration, is smaller than what the CBO had forecast.[3] A 90 percent confidence interval around these forecasts in 2019 would have accurately predicted where we are today, and we would have had instead a paper about why employment is so surprisingly high right now.

Furman also questioned the paper's dismissal of persistent effects of labor supply programs, arguing that a vigorous recession response can be partly explained by the worry about unemployment in one year translating to future unemployment as well, such that even if the benefits are gone, we don't know if it's just a wealth effect. He also called attention to the difference in response between the United States and Europe, where Europe had a better employment response and less of an hours response.

Steven Davis spoke about the correct way to think about the shortfall in the labor force participation rate. Stephanie Aaronson and Katharine Abraham had both made the point that the new population controls introduced in 2022 in the Current Population Survey (CPS) caused the actual reduction to be understated by 0.3 percentage points.[4] He asked why that wasn't part of what we are trying to explain.

Also, in response to Furman's comment, Davis noted that the shift to remote work expanded labor market opportunities for several types of workers, who might be facing constraints such as mobility impairments or family obligations, or who are located in left-behind areas. The shift to remote work means an expansion of labor market opportunities and the

2. CBO, *The Budget and Economic Outlook: 2020 to 2030* (Washington: Congressional Budget Office, 2020), https://www.cbo.gov/system/files/2020-01/56020-CBO-Outlook.pdf; US Bureau of Labor Statistics, "Civilian Labor Force Participation Rate," https://www.bls.gov/charts/employment-situation/civilian-labor-force-participation-rate.htm.

3. Centers for Disease Control and Prevention, "COVID Data Tracker," https://covid.cdc.gov/covid-data-tracker/#demographics, https://www.census.gov/library/stories/2021/12/net-international-migration-at-lowest-levels-in-decades.html.

4. US Bureau of Labor Statistics, "Adjustments to Household Survey Population Estimates in January 2022," https://www.bls.gov/cps/population-control-adjustments-2022.pdf.

potential to draw some of these people into the labor force and push the labor force shortfall in the other direction.[5]

Davis then turned to fear of COVID-19 as an explanation in the paper for missing workers. In the summary table, the estimate is 0.3 percentage points but in figure 5, the average value from data in 2022 looks to be around 0.7 or 0.8 percentage points. He acknowledged that, in her presentation, Abraham explained there could be a sample selection or social desirability bias, which are reasonable concerns, but he suggested that that doesn't explain the pattern in figure 5, which is that the fear of COVID-19 is very large initially but declines by 2022.

Addressing Abraham's comments about measuring the fear of COVID-19, Davis added that an upcoming paper will have different numbers associated with fear of COVID-19 and other infection risks, smaller but still well above those in the Household Pulse Survey.[6] Lastly, he mentioned that, from past experience in surveying workers, there is a tendency for workers to include commuting time in hours worked. Yongseok Shin stressed in his discussion that the hours shortfall is showing up in the same groups that have cut back on their commute times. Davis questioned how much of the hours shortfall is a measurement issue, whereby the groups that say they are working less might simply be spending less time commuting.

Robert Hall agreed with Aaronson's comment that it's a mistake to identify the labor force participation rate—the sum of employment and unemployment—as a single variable that measures labor supply. The paper does break labor force participation into its two components by showing that, for some months, the unemployment rate before and after the pandemic was the same 3.5 percent, which is useful to untangle the separate

5. Adam Ozimek, "Remote Work Is Enabling Higher Employment among Disabled Workers," Economic Innovation Group, October 15, 2022, https://eig.org/remote-work-is-enabling-higher-employment-among-disabled-workers/; Arlene S. Kanter, "Our New Remote Workplace Culture Creates Opportunities for Disabled Employees," Harvard Law School, Petrie-Flom Center, Bill of Health, March 10, 2022, https://blog.petrieflom.law.harvard.edu/2022/03/10/remote-work-disability-ada/; Jose Maria Barrero, Nicholas Bloom, and Steven J. Davis, "Why Working from Home Will Stick," working paper 28731 (Cambridge, Mass.: National Bureau of Economic Research, 2021), https://www.nber.org/papers/w28731; Yuting Chen, Patricia Cortés, Gizem Koşar, Jessica Pan, and Basit Zafar, "The Impact of COVID-19 on Workers' Expectations and Preferences for Remote Work," working paper 30941 (Cambridge, Mass.: National Bureau of Economic Research, 2023), https://www.nber.org/papers/w30941.

6. Jose Maria Barrero, Nicholas Bloom, and Steven J. Davis, "Long Social Distancing," working paper 30568 (Cambridge, Mass.: National Bureau of Economic Research, 2023), https://www.nber.org/papers/w30568; to be published in the *Journal of Labor Economics* 41, no. S1 (October 2023).

influences.[7] But overall, Hall suggests it would be better to present this paper as giving important information about unemployment, employment, and hours instead of saying it is about labor supply.

John Haltiwanger brought up the limitations of the CPS in measuring self-employment. There was some evidence that, pre-pandemic, the CPS was not keeping up with administrative data on tracking employment, and there's a growing gap between the two.[8] While the CPS showed a moderate rise in self-employment, a brand-new series—the Business Formation Statistics—saw an enormous surge in what the US Census calls likely employers and likely non-employers. The surge for likely non-employers has been larger: in January and February of 2023, more than 50 percent higher on a monthly basis in terms of new applications for likely non-employers relative to the same months in 2019.[9] Haltiwanger suggests that this can tell a different story, especially given that this activity is missing in the CPS, and that this might even be related to the discussions on work-life balance.

Melissa Kearney brought attention to the question of childcare as an explanation for trends in the labor force participation rate and was surprised Abraham had not mentioned it. Kearney and Furman investigated this aspect in 2021, and Claudia Goldin looked at it in 2022, and they didn't find any evidence of childcare being a factor, which upset some people.[10] She suggested it might be worth discussing in the paper because it has been such a prominent issue.

Jonathan Pingle pointed out that negative labor supply shocks are fairly persistent for those over the age of 65. Even conditional on Furman's point, the shortfall is pretty large. The paper's results show that most of the remaining shortfall in participation is among those over 65. If that is

7. FRED, "Unemployment Rate," https://fred.stlouisfed.org/series/UNRATE.

8. Katharine G. Abraham, John C. Haltiwanger, Claire Hou, Kristin Sandusky, and James R. Spletzer, "Reconciling Survey and Administrative Measures of Self-Employment," *Journal of Labor Economics* 39, no. 4 (2021): 825–60, https://www.journals.uchicago.edu/doi/abs/10.1086/712187.

9. US Census Bureau, "Business Formation Statistics," https://www.census.gov/econ/bfs/index.html.

10. Jason Furman, Melissa Schettini Kearney, and Wilson Powell, "The Role of Childcare Challenges in the US Jobs Market Recovery during the COVID-19 Pandemic," working paper 28934 (Cambridge, Mass.: National Bureau of Economic Research, 2021), https://www.nber.org/papers/w28934; Claudia Goldin, "Understanding the Economic Impact of COVID-19 on Women," working paper 29974 (Cambridge, Mass.: National Bureau of Economic Research, 2022), https://www.nber.org/system/files/working_papers/w29974/w29974.pdf.

the case, then the next question is how much of that is expected due to the shock and how much of that is due to ongoing effects of COVID-19. Pingle also commented on the lack of increased take-up of Social Security as particularly interesting given the labor supply shortfall for those older workers.[11] Lastly, he mentioned cohorts. Older age groups' participation should resume rising as the younger cohorts age into the older groups. With rising education and life cycle labor force attachment of women, he noted that going forward the labor force participation trends should be rising among the older age groups.

Edelberg mentioned a related upcoming piece from the Hamilton Project looking at the labor force participation rate by age, race or ethnicity, and sex (but not education). Edelberg and coauthors found there was no net effect on the labor force participation rate from within-group changes in propensity to work from 2019 to February 2023.[12] However, Abraham and Lea Rendell get 0.5 percentage points, which could be due to the comparison period being a bit different. In 2019, the labor force participation rate was a little bit lower than the twelve-month period through February 2020. The labor force participation rate in February 2023 was three-tenths higher than the 2022 average.[13] Using backcast data, they find that the reductions in population growth point to a smaller labor force by about a million people. In response to Furman's comment about CBO projections, Edelberg noted that if the population estimates that the CBO put out in January 2022 were available, there would have been a larger projected level of employment. Therefore, she suggested, it is not a good idea to take the level of employment they had projected and compare it to the current revised data.

Alan Blinder asked if there might be some information in the geographic differences across states in the incidence of COVID-19 and vaccination rates that could be helpful in attempting to gauge to what extent the changes

11. Social Security Administration, Annual Statistical Supplement, 2021, OASDI Benefits Awarded: Retired Workers, Table 6.B3, https://www.ssa.gov/policy/docs/statcomps/supplement/2021/6b.pdf; Owen Davis, "Employment and Retirement among Older Workers during the COVID-19 Pandemic," working paper 6 (New York: Schwartz Center for Economic Policy Analysis, the New School for Social Research, 2021), https://www.economicpolicyresearch.org/images/docs/research/nssr_working_papers/NSSR_WP_062021.pdf.

12. Lauren Bauer, Wendy Edelberg, Sara Estep, and Brad Hershbein, "Who's Missing from the Post-Pandemic Labor Force?" (Washington: Brookings Institution, 2023), https://www.brookings.edu/2023/04/04/whos-missing-from-the-post-pandemic-labor-force/.

13. US Bureau of Labor Statistics, "Civilian Labor Force Participation Rate," https://www.bls.gov/charts/employment-situation/civilian-labor-force-participation-rate.htm.

in labor supply are due to COVID-19 or something else, and then holding this up against where the jobs were missing or the labor force declined.

Abraham commented that there are legitimate questions about the right benchmark to use for evaluating current participation but concluded that no matter the benchmark used, there isn't a very large decline in participation left to explain. Responding to Aaronson's suggestion, she agreed that it could be informative to look at usual hours in addition to actual hours. She also expressed appreciation for Shin's comments about how declines in hours and participation are related to COVID-19 exposure, as well as how those declines vary across occupations and across states. His finding that it is the educated high earners who are working fewer hours is consistent, she suggested, with the idea that those who can afford it are driving a change in work-life balance.

In response to Kearney's question about childcare, Rendell confirmed that they did not find any notable differences in patterns between parents and nonparents during their analysis, in line with the findings of Furman and Kearney.[14] Regarding questions about retirement, a recent Federal Reserve paper found that these excess retirements represent individuals choosing to retire a little earlier than planned, but over the next few years the retired share of population should return to its pre-pandemic path.[15]

14. Furman, Kearney, and Powell, "The Role of Childcare Challenges."

15. Joshua Montes, Christopher Smith, and Juliana Dajon, "'The Great Retirement Boom': The Pandemic-Era Surge in Retirements and Implications for Future Labor Force Participation," Finance and Economics Discussion Series 2022-081 (Washington: Board of Governors of the Federal Reserve System, 2022), https://doi.org/10.17016/FEDS.2022.081.