Effects of Changes in Disability on the Labor Force and the Workweek

In this note, we explain our calculations of the labor force shortages and hours reductions because of changes in disability. Our basic question is: how different are labor force participation and hours of work because of long COVID and remote work?

Calculation of labor force shortages

To calculate the shortages, we define the following variables, denoting variables that represent the counterfactuals of what would have occurred without the pandemic with ^s:

- D is the number of people with a disability
- p is the participation rate of those with a disability
- p_n is the participation rate of people *without* disabilities.
- $\widehat{D}$ is the number of people who would have had a disability in the absence of the pandemic, which we refer to as people with "existing" disabilities
- $\hat{p}_d$ is the participation rate of people with existing disabilities that would have prevailed absent the pandemic
- p_d is the participation rate of people with existing disabilities that actually prevailed
- X is the number of people who acquired a disability because of the pandemic, who we refer to as those with "long COVID"
- $\hat{p}_x$ is the participation rate of people with long COVID that would have prevailed absent the pandemic
- p_x is the participation rate that actually prevailed

To calculate $\widehat{D}$, we assume that the disability rates in the absence of the pandemic would have followed their recent trend, meaning that rates would have increased just a bit from 2019 levels for 16- to 44-year-olds but would have declined for 45- to 64-year-olds. This decline seems consistent with the fact that physical limitations—the most common disability for 45- to 64-year-olds and one of the disabilities that seems less affected by COVID—continued to decline for older workers during the pandemic.

With this estimate of $\widehat{D}$, we calculate X, the incidence of long COVID, as the difference between the actual number of people with disabilities less the number there would have been absent the pandemic:

$$X = D - \widehat{D}$$

We assume that if people with long COVID hadn't become ill, they would have participated in the labor force at the same rate as those of their same age and sex without a disability: $\hat{p}_x = p_n$.

The change in the labor force because of the pandemic is then: $\widehat{D}(p_d - \hat{p}_d) + X(p_x - p_n)$

The first term captures the effects of changes in the participation rate (from $\hat{p}_d$ to p_d) of those with existing disabilities ($\widehat{D}$). The second term is the reduction in the labor force from the decreasing participation rate (from p_n to p_x) of people with long COVID (X).

In the data, we only observe the participation rate for all people with a disability—that is, we can't distinguish between the participation rates of people with existing disabilities and people with long COVID. Thus, we observe p, the labor force participation of those with a disability post-COVID, which is a weighted average of p_d and p_x:

$$p = \frac{\widehat{D}p_d + Xp_x}{D}$$

Rewriting this, we see: $Dp = \widehat{D}p_d + Xp_x$

Thus, the change in the labor force,

$$\widehat{D}(p_d - \hat{p}_d) + X(p_x - p_n)$$

can be rewritten as follows:

$$\left(Dp - \widehat{D}\hat{p}_d\right) - Xp_n$$

The change in the labor force is equal to the difference in the number of people with a disability in the labor force because of the pandemic, $Dp - \widehat{D}\hat{p}_d$, plus the loss of labor force participants without disabilities, Xp_n.

As described in the main text, we estimate shortages under two different assumptions for $\hat{p}_d$, the participation rate that would have prevailed for those with a disability in the absence of the pandemic: (1) participation would have remained at its 2019 level, and (2) participation would have kept on increasing as it had been since about 2017.

<u>Calculating the fraction of people with long COVID who left the labor force</u>

It is impossible with these data to observe p_d and p_x separately —the participation rates of people with existing disabilities and with long COVID.

However, if we assume a participation rate for people with existing disabilities, p_d, we can calculate what the participation rate of those with long COVID must be.

$$Xp_x = Dp - \widehat{D}p_d$$

$$p_x = \frac{Dp - \widehat{D}p_d}{X}$$

As discussed in the main text, we think it is plausible that participation rates of people with existing disabilities were unchanged because of the pandemic, but also think it is possible that remote work has boosted participation rates of 45- to 64-year-olds with existing disabilities by at most 5% above trend (for 45- to 64-year-olds, there is virtually no trend in labor force participation in 2017-2019, so little difference between participation rates in 2019 and those predicted by trend.)

We thus calculate p_x under three different assumptions about the participation rate of those with existing disabilities: (1) it equals pre-pandemic participation of those with disabilities; (2) it equals the predicted value of the participation rate of those with disabilities given pre-pandemic trends; and (3) it is 5% higher than the predicted trend for older workers (while being equal to trend for younger workers).

Of people who acquired long COVID who were in the labor force, Xp_n, the share who left the labor force because of it is then: $1 - \frac{p_x}{p_n}$

Calculation of hours shortages

We also examine what has happened to the hours of work of people with long COVID. In addition to the variables above, we define the following:

- u is the unemployment rate of those with a disability
- h is the average hours worked by those with a disability
- h_n is the average hours worked by those *without* a disability
- h_d is the average hours worked by those with existing disabilities
- h_x is the average hours *actually* worked by those with long COVID

We assume that people with long COVID *would have* worked the same hours on average as those without a disability if they hadn't become ill, h_n.

For simplicity, we assume that the unemployment rate for those with long COVID is the same as for those with existing disabilities, u. Then, the change in total hours of people with disabilities because of long COVID is:

$$Xp_x(1-u)(h_x - h_n)$$

We only observe the weighted average of the hours worked by people with existing and new disabilities, h.

$$h = \frac{\widehat{D}p_d(1-u)h_d + Xp_x(1-u)h_x}{Dp(1-u)}$$

Thus, we can write the change in hours as:

$$Xp_x(1-u)(h_x - h_n)$$
$$= (1-u)\big((Dph - \widehat{D}p_d h_d) - Xp_x h_n\big)$$

The change in hours is just the change in the total observed hours of people with disabilities in the labor force less the hours people with long COVID would have worked had they not become ill, adjusted by the unemployment rate.

It is impossible to compute the hours shortage without an assumption about the unobserved participation rate of those with existing disabilities, p_d (which, given the observed participation rate of everyone with disabilities, gives us a value for the participation rate of those with long COVID, p_x). We calculate the hours shortage assuming that the participation rate of people with existing disabilities is equal to either (1) the rate observed in 2019; or (2) the rate predicted by pre-pandemic trends.[1]

Calculating the fraction of hours lost from those with long-COVID

The hours of work of employed people with long COVID is calculated as:

$$h_x = \frac{Dph - \widehat{D}p_d h_d}{Xp_x} = \frac{Dph - \widehat{D}p_d h_d}{Dp - \widehat{D}p_d}$$

And the fraction of hours lost is just: $1 - \frac{h_x}{h_n}$.

[1] The larger the share of people with existing disabilities who work, the smaller the hours shortage. Thus, the shortages would be even smaller under the third assumption that older workers have increased their participation because of remote work.