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ABSTRACT

There has been a dramatic rise in disability employment in the US since the pandemic, a pattern mirrored in other countries as well. A similar increase is not found for any other major gender, race, age or education demographic. At the same time, work from home has risen four-fold. This paper asks whether the two are causally related. Analyzing CPS and ACS microdata, we find the increase in disability employment is concentrated in occupations with high levels of working from home. Controlling for compositional changes and labor market tightness, we estimate that a 1 percentage point increase in work from home increases full-time employment by 1.1% for individuals with a physical disability. A back of the envelope calculation reveals that the post pandemic increase in working from home explains 80% of the rise in full-time employment. Wage data suggests that WFH increased the supply of workers with a disability, likely by reducing commuting costs and enabling better control of working conditions.

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1 Introduction

Employment of people with a disability is remarkably low relative to the rest of the population. While individuals without a disability had employment rates close to 80% in the US as of 2020, only 32% of those with a disability were employed. This disability employment gap has existed for decades (e.g., Acemoglu and Angrist, 2001), and is larger than for any other major demographic split (i.e., gender, age, education, race, nativity; see Appendix Figure A1). This is not unique to the US. The average disability employment gap is 27 percentage points across OECD countries and has changed little in the past decade (OECD, 2022).

One explanation for the disability employment gap is that individuals with a disability have low work capacity. An alternative explanation is that individuals with a disability could work, but are not offered accommodations which would allow them to. Indeed, disability advocates have been asking for accommodations for years without much success. Title I of the Americans with Disabilities Act (ADA) requires most employers to provide "reasonable accommodation." This includes any adjustment to the work environment, such as remote work, flextime and assistive technologies, that enables an individual with a disability to perform the functions of a job.[1] However, the reach of the ADA is limited, since it does not require a specific accommodation if its implementation would cause undue difficulty or expense. Indeed, employers have been reluctant to change the workplace, arguing that the perceived costs are too high (Kaye et al., 2011). Both the Equal Employment Opportunity Commission (EEOC) and court decisions have disproportionately ruled that employers are not obligated to adopt accommodations such as work from home (Krieger, 2010).[2]

However, recent years have seen a transformational change in flexible work arrangements, not coming from the ADA, but from the shock of Covid which forced firms to restructure and increase remote work options for all workers. To put the shift into perspective, prior to the pandemic only 7% of full days were worked from home in the US but this increased four-fold to 28% in 2023 (Barrero et al., 2023). This work from home (WFH) shock unintentionally created new employment opportunities for people with disabilities and jump started the goal of the United Nation's Agenda 2030 to make jobs more accessible for all.

At the same time as WFH became more common in the US, the employment rate for workers with a disability increased by 22% between 2019 and 2024.[3] In contrast, the employment rate for those without a disability has not materially changed.[4] This differs from previous recessions, where

[1] See U.S. EEOC: "Work at Home/Telework as a Reasonable Accommodation"; 2003. EEOCNVTA- 2003-1 https://www.eeoc.gov/laws/guidance/work-hometeleworkreasonable-accommodation

[2] The perceived high costs of accommodation versus the low threat of lawsuits could be one reason the ADA has been found to have a negative effect on disability employment (Acemoglu and Angrist, 2001; DeLeire, 2001).

[3] Calculations using the CPS show that the employment rate for workers with a disability age 18-64 rose from 31.5% in 2019 to 38.3% in the first half of 2024

[4] Similar trends have been reported by the New York Times, Economic Innovation Group, Center for Research on

the recovery in employment for individuals with a disability lagged behind (Kaye, 2010; Maestas et al., 2021). The disproportionate rise in disability employment post-Covid is not limited to the US; we find similar increases in Australia, Canada, France and Spain over the same time period. In a complementary analysis, we find that individuals who become newly disabled in the post-pandemic period are significantly more likely to remain employed.

In this paper we ask whether the sharp increase in employment for people with disabilities is driven by the rise in the ability to work from home. Estimating this causal link is difficult for several reasons. First, during the pandemic there was a large inflow of individuals categorized as having a cognitive disability. If these newly disabled people have higher employability because they have less severe disabilities, this compositional change could explain the rise in disability employment. To address this issue, we examine the set of disabilities whose population size remains similar pre-post Covid (i.e., including only physical disabilities).[5] Additionally, we reweight the data based on observables. Second, reverse causality could be present if workers with a disability have a high demand for WFH. To deal with this, we use the WFH rates of nondisabled workers to characterize how WFH opportunities have changed. Third, omitted variable bias could be a problem, since labor market tightness rose by roughly 60% pre-post Covid.[6] This general increase in labor demand could make firms more willing to hire disadvantaged workers, including those with a disability. Other changes could have been happening in the labor market as well. We deal with this in two ways: by controlling flexibly for labor market tightness using non-disabled employment growth, and by using an instrument based on the ex-ante probability occupations could be done from home as developed by Dingel and Neiman (2020).

More specifically, our research design is conducted at the occupation-level and leverages the fact that the change in WFH pre-post Covid varies dramatically by occupation. For example, WFH rose by 36 percentage points for computer occupations (e.g., software developers and database administrators) but by only 4 percentage points for teachers (e.g., secondary school teachers). If WFH enables disability employment, we would expect to find larger increases in disability employment for computer scientists than for teachers. The identifying assumption is that WFH changes are driven by changes in the supply and demand for workers without a disability, rather than by those with a disability. Since individuals with a disability make up just 3% of the work force, it is unlikely that they are driving the adoption of WFH post-pandemic. The empirical analysis uses Current Population Survey (CPS) data to contrast the pre-pandemic two-year period of January 2018 to December 2019 with the post-pandemic two-year period of July 2022 to June 2024 (i.e., when overall employment has returned to pre-pandemic levels).

Disability at the University of New Hampshire, Institute on Employment and Disability at Cornell, all using the same monthly CPS data provided by the US Bureau of Labor Statistics.

[5] If we include individuals with cognitive disabilities in the analysis, the results are similar or larger; see Section 3.3.

[6] https://www.stlouisfed.org/publications/regional-economist/2023/nov/labor-market-tightness-COVID19-recession-differences-across-industries

We find larger increases in disability employment in occupations with higher levels of working from home. All of the gains are driven by increases in full-time employment, which makes up 70% of disability employment, with no net change due to WFH for part-time employment.[7] Occupations with a 1 pp increase in WFH increase full-time disability employment by 1.1%. Our analysis controls for both compositional changes and labor market tightness. Reweighting based on observable characteristics or controlling for labor market tightness has little effect on the estimates. Using a pre-pandemic categorization of the probability an occupation could be done at home as an instrument likewise has only a modest impact on the estimates.[8] In contrast, we do not find an employment increase for any other major demographic group (by gender, race, age or education).

Quantitively, our results imply that 80% of the increase in full-time disability employment pre-post Covid can be explained by the increase in WFH. We arrive at similar conclusions using different measures of WFH: an ACS commuting question, Lightcast job postings mentioning WFH, and a CPS question on telework.

A natural question is whether labor supply or demand forces are behind the substantial increase in full-time employment for individuals with a disability. On the supply side, WFH could reduce costs borne by individuals (e.g., by lowering the burden of commuting, allowing better control of the working environment, and granting more flexibility in work times and hours). On the demand side, WFH could reduce accommodation costs or increase productivity for workers with a disability. To explore these explanations, we lay out a simple model and look at wage growth in high versus low WFH occupations before versus after the pandemic. We find evidence consistent with a reduction in costs borne by workers explaining the rise in disability employment, primarily pointing to a labor supply side story.

Our paper is related to a literature on how financial incentives affect the employment of individuals with a disability. Black et al. (2002) show that when the economy is strong, disability program participation declines. A set of papers using quasi-experimental designs shows that less generous DI benefits induces DI recipients to work (Deshpande, 2016; French and Song, 2014; Kostøl and Mogstad, 2014; Maestas et al., 2013).[9] On the demand side, work has examined the impact of hiring quotas, finding an increase in disability employment (Lalive et al., 2013; Szerman, 2022). Our paper adds to this literature by demonstrating that universal changes in workplace flexibility have a first-order impact on drawing individuals with a disability into the labor market.

A second strand of literature, largely outside of economics, documents the extent of telework for

[7] While there is no net change for part-time disability employment due to WFH, it is possible that WFH drew some individuals into part-time work and caused others to switch from part-time to full-time work, with the net effect only showing up as an increase in full-time employment.

[8] The instrument uses the job characteristics and requirements from O*NET data to determine whether an occupation can be done from home and is taken from Dingel and Neiman (2020).

[9] For earlier work on social assistance programs and disability employment, see Autor and Duggan (2003); Bound and Burkhauser (1999). Recent work examines how DI receipt impacts financial distress and other family members (Autor et al., 2019; Deshpande et al., 2021; Deshpande and Lockwood, 2022).

those with a disability prior to the pandemic.[10] Immediately prior to the pandemic, people with a disability had low rates of WFH, which were only slightly higher than for those without a disability, 5.9% and 4.9% respectively (Schur et al., 2020). More recent research examines employment trends during the Covid period (from Q1 2018 to Q2 2022) and finds a larger increase in aggregate disability employment during the pandemic in telework-prone occupations (Ameri et al., 2023; Ne'eman and Maestas, 2023; Ozimek, 2022).[11] Our paper adds to this literature by looking at employment once markets are back to normal post-covid and using a research design which accounts for compositional changes, reverse causality, and omitted variable bias.

Finally, a related literature has examined the impact of working from home on various parts of the economy, including housing, commuting, property prices, employment promotions and retention and productivity (see Aksoy et al., 2022; Choudhury et al., 2021; Emanuel and Harrington, 2023; Emanuel et al., 2023; Gibbs et al., 2023; Gupta et al., 2022; Bloom et al., 2024). The magnitude of the impacts we find suggest that the rise in disability employment could be one of the largest long run effects of WFH, particularly with population aging which will steadily increase the share of workers with a disability.

2 Data

Our empirical analysis leverages monthly US labor force survey data (IPUMS-CPS, 2024), combined with different measures of work from home. The Current Population Survey (CPS) is a monthly survey of about 60,000 households providing information on the labor force status, demographics (including disability status), and other characteristics of the civilian non-institutional population age 16 and over. When households enter the CPS, they are surveyed for four consecutive months, not surveyed for the next eight months, and then surveyed again for four months before rotating out of the CPS.

Our estimation sample includes individuals between the ages of 18 and 64 in the CPS monthly files from January 2018 to June 2024. We use the standard definition from the CPS which classifies people as employed, unemployed or not in the labor force. Likewise, we follow the CPS definition which classifies individuals as full-time employed if they are working thirty-five hours a week or more. We aggregate the 4-digit Standard Occupational Code (SOC) for workers to a 2-digit level.[12] CPS sampling weights are used in all of our analyses.

[10] For example, see Bailey and Kurland (2002) and Linden and Milchus (2014).

[11] Ne'eman and Maestas (2023) categorize occupations into two groups using Dingel and Neiman (2020) while other work uses a CPS question which asks whether a person was teleworking due to Covid, thus potentially missing out on those teleworking for other reasons.

[12] There are 97 2-digit SOC occupational categories. Since some occupations are sparsely populated by people with disabilities, we merge these with similar occupations so that each category has at least ten observations in each period. This yields 86 occupation categories.

2.1 Definition of Disability

The CPS collects information on a respondent's disability status by using six questions which ask about: a) hearing difficulty, b) vision difficulty, c) cognitive difficulty, d) ambulatory difficulty, e) self-care difficulty, and f) independent living difficulty. Using this definition, 8% of the population, or roughly 15 million working age individuals (age 18-64) are classified as having a disability in the pre-Covid period.[13]

One of these disability categories, cognitive difficulties, expanded substantially after the pandemic, rising from around 6 million before Covid to over 7 million after Covid (see Appendix Figure A2). If the inflow of newly disabled individuals have higher employability, for example, because they have less severe disabilities, this compositional change could drive a rise in disability employment. In contrast, the other five disability categories remained stable before versus after Covid at around 9 million in total. We label these remaining categories as "physical disabilities", recognizing that self-care and independent living could involve non-physical limitations as well.

Our analysis uses the five physical disability categories whose population size remained similar before and after Covid to minimize compositional changes, noting if we include the cognitive category, the results are similar or larger (see Section 3.3). We compare employment outcomes for the two years prior to Covid (2018-2019), with the two years after Covid lock-downs have ended and employment is back at pre-Covid levels (July 2022-June 2024).[14]

Out of the 9 million individuals with a physical disability in our sample, 36% of them are working (3.2 million), of whom 7 out of 10 are employed full-time (2.3 million). The average age is 50.4, with 48% of the sample male and 76% white. In terms of education, 48% have more than high school.

2.2 Definition of Work from Home

We calculate WFH rates by occupation, using workers without a disability. Our main WFH measure is from the American Communities Survey transportation to work question, comparing the change between 2022 (the last year available) and 2019 (IPUMS-USA, 2024). The question reads: "How did this person usually get to work LAST WEEK?", with one possible response being "Worked from home". We calculate the fraction who answer "Worked from home" separately for each year and occupation.

We also show robustness using three other measures. One is the share of job-postings offering remote work by occupation from Hansen et al. (2023). Another is the CPS question from October

[13]The population with a disability who are 16 and over is roughly 30 million, or 12% of the population.

[14]During the Covid period of 2020-2021, there is an unexplained dip in the number of individuals with a disability, likely due to problems the Census Bureau encountered in interviewing people during Covid. We do not use this period in our analysis.

2022 which asks: "At any time last LAST WEEK, did (you/name) telework or work at home for pay?". The final measure, which is also our instrument, is the probability a two-digit occupation can be done from home, as developed by Dingel and Neiman (2020).[15]

3 Results

3.1 Trends in Disability Employment

We start by examining overall changes in disability employment. Figure 1 left panel starts by highlighting how disability employment (excluding cognitive difficulties) has surged post-pandemic. Prior to the pandemic, there were two years of stable employment followed by a sharp, temporary drop during Covid. The pre-pandemic employment trends mirror those for workers without a disability. However, post-Covid the employment patterns diverge. Disability employment rises by 12.4% while non-disability employment remains constant.[16] This represents the reduced-form effect of the Covid shock on the disability employment gap, but does not identify the role of WFH.

Figure 1 right panel shows that the entire increase in disability employment post-Covid comes from a drop in individuals not in the labor force. Early in the pandemic, there is a sharp drop in employment fully mirrored by a rise in unemployment, with little change in labor force participation. On the contrary, post-pandemic there is a sharp increase in employment driven by individuals with a disability entering the labor force, and little change in unemployment.

Figure 2 highlights how striking the increase in disability employment is by comparing it to five other key labor-market splits. The upper left graph copies the left panel of Figure 1 for comparability. The remaining five graphs show similar trends in employment growth, but with splits by gender, age, education, race and nativity. While disability employment growth is clearly higher than non-disabled employment growth, none of the other demographic splits show sizable differences. The conclusion is that individuals with a disability were uniquely impacted over this time period, with an exceptionally high level of post-pandemic employment growth.

The increase in disability employment appears to be an international phenomenon. We were able to obtain employment data by disability status for the United States and five other countries.[17] As Appendix Figure A3 shows, in five countries (Australia, Canada, France, Spain and the US) there is a substantially larger increase in disability employment (average of 10%) compared to non-disabled

[15]They classify nearly 1,000 occupations as able or unable to be done entirely from home using pre-pandemic data from O*NET, and take averages for aggregate occupation groups.

[16]The average monthly number of employed workers with a physical disability rises from 3.23 million in 2018-2019 to 3.63 million in July 2022-June 2024.

[17]The definition of disability varies across countries, and does not distinguish between types of disability as in the US data. We were able to collect data for 2022 and 2019 for a limited set of countries. We tried to get data for other OECD countries such as Germany, Japan, Italy and Sweden, but the appropriate data was not available.

employment (average of 2%) from 2019 to 2022. In one country (the United Kingdom) we see no difference, with no employment change for either group.[18]

3.2 Employment after the Onset of a Disability

Most individuals are not born with a disability, but acquire a disability as they age. At age 20 roughly 4% of individuals report that they have a disability. This share rises with age, particularly after age 40, reaching 9% by age 50 and 15% by age 60 (see Appendix Figure A4). In this subsection, we look at how employment changes after the onset of a disability, and how this differs pre versus post pandemic.

The structure of the CPS data is that individuals are asked their disability status in the first month they are surveyed (wave 1), and then again twelve months later (wave 5).[19] There is also contemporaneous information about employment status asked in waves 1 and 5. In Appendix Table A1 we first take the set of individuals who were employed and had no disability in wave 1. We then look at these individuals 12 months later to see if they are still employed, separately by whether they acquired a disability. We do this exercise first for the pre-pandemic period (2018-2019) and then for the post-pandemic period (July 2022-June 2024).

The top row of Appendix Table A1, panel A, reports that 92.9% of individuals not acquiring a disability remained employed one year later in the pre-pandemic period of 2018-19. Running the same analysis for July 2022-June 2024, the corresponding employment rate is 93.1%, an insignificant difference of 0.2% between the two periods. In the second row we examine individuals who gain a disability between months 1 and 12 of the CPS survey. In 2018-2019 we find that 70.9% are still employed a year later, but in July 2022-June 2024 78.9% are still employed a year later. This yields a statistically significant difference of 11.3% across the two periods.[20] The final column reports the difference in difference estimator, with a statistically significant 11.1% effect.

Panel B conducts a similar analysis, but for individuals who were not employed and had no disability in wave 1. Again, we see higher levels of employment for individuals moving into disability post-pandemic (10.2%) compared to pre-pandemic (6.7%); which translates into a noisily estimated 51.9% difference.[21] In contrast, individuals who do not acquire a disability experience almost no change pre-post pandemic.

In summary, panels A and B both highlight how moving into disability status post pandemic is associated with significantly higher relative employment compared to pre-pandemic.

[18] The UK differs from the other countries as it experienced no rise in unemployment during Covid due to extremely generous furlough schemes, see e.g., Spencer et al. (2023).

[19] CPS interviews individuals in 4 consecutive months, leaves them alone for 8 months, and then surveys them again for 4 more consecutive months.

[20] Note we report percent changes, i.e., 11.3=(78.9-70.9)/78.9.

[21] The percent change is 51.9=(10.2-6.7)/6.7.

3.3 Disability Employment and Work from Home

In the prior two subsections, we documented positive post-pandemic employment trends for individuals with a disability, both in the US and internationally. We also found rising levels of employment for individuals acquiring a disability post-pandemic. In this section, we examine whether WFH is responsible for the rise in disability employment.

Evidence from Survey of Workplace Arrangements and Attitudes. We start by presenting initial evidence from the Survey of Workplace Arrangements and Attitudes on the link between the ability to work from home and the employment of individuals with a disability. The survey polls 8,000 US residents aged 20 to 64 per month with questions on demographics, working status, and attitudes.[22] From March to July 2023 it also included a set of questions on individuals' physical ability, such as their capacity to carry groceries, climb stairs, walk one block, etc. (see Appendix Figure A5 for details). The answers to the ten questions on physical impairment are coded up to create an overall physical impairment index ranging from 0 (indicating no physical impairment) to 20 (indicating high physical impairment).

Figure 3 plots data from Barrero et al. (2024) on current working status against the physical impairment index for over 14,000 individuals, age 40 or more, who report whether or not their current (or most recent) job allows them to work from home. There is a strong negative relationship between physical impairment and working status for individuals who cannot work from home, going from 79.7% employment for those with no physical impairment to only 19.7% for those with the highest level of physical impairment. In contrast, for employees who can work from home, the decline is modest: it goes from 95% for those with no physical impairment to 89.7% for those with the highest level of physical impairment. In other words, the ability to work from home reduces the associated drop in employment from 60% to 5.3%. This is a large difference and hints at a potentially important role for working from home for enabling employees with a disability to work.

Evidence from occupation-level regressions using the CPS. To estimate the causal relationship between WFH and disability employment, we conduct an analysis at the occupation level using data from the CPS. Prior to the pandemic, WFH rates were low in most occupations. Post-pandemic, some occupations experienced large increases in WFH, while others did not (see Appendix Figure A6). Reverse causality could be present if workers with a disability have a high demand for WFH. To deal with this, we use the WFH rates of nondisabled workers to characterize how WFH opportunities

[22] Roughly 3,000 respondents are dropped each survey month due to failing one of three attention check questions or completing the survey too quickly, leaving a cleaned sample of around 5,000 each month for analysis (see Barrero et al. (2021) for details).

have changed at the occupation level. The identifying assumption is that WFH changes are driven by changes in the supply and demand for workers without a disability, but not for those with a disability (since they comprise only 3% of the overall workforce).[23] Omitted variable bias could also be present since labor market tightness rose post pandemic; this could make firms more willing to hire disadvantaged workers, including those with a disability. We deal with endogeneity in two ways: by controlling flexibly for non-disabled employment changes (as a measure of occupational labor-market strength) and by instrumenting for changes in WFH at the occupation level.

We regress the percent change in disability employment in an occupation on the change in WFH opportunities in an occupation. Let j index occupations and the superscripts d and nd denote "disability" and "no disability", respectively. We define the percent change in disability employment before versus after Covid in an occupation ($\%\Delta EMP_j^d$) as the number of individuals with a disability who are employed post-Covid (July 2022-June 2024) minus the number employed pre-Covid (2018-2019), all divided by the number employed pre-Covid.[24] We define the change in WFH for nondisabled workers before versus after Covid in an occupation (ΔWFH_j^{nd}) as the WFH rate post-Covid (2022) minus the rate pre-Covid (2019).[25]

Our full regression model is:

$$\%\Delta EMP_j^d = \Delta WFH_j^{nd} + f(\%\Delta EMP_j^{nd}) + \epsilon_j \tag{1}$$

where $f(\cdot)$ is a polynomial in the percent change in non-disability employment.[26]

Table 1 reports the regression results for full-time employment, since we find no effect on the part-time employment margin; results for total and part-time employment are discussed next. In column (1) we report the estimate without controls for labor market tightness or composition reweighting; there is a strong link between WFH and full-time disability employment. In column (2) we add in a third order polynomial in nondisability employment, which serves as a flexible control for labor market tightness. These terms make little difference, highlighting that the relationship between rising WFH and full-time disability employment across occupations is uncorrelated with overall employment growth. In columns (3) and (4) we account for observable changes in composition across our two time periods using inverse propensity score weighting based on age, gender, race, and education.[27] This results in only a small reduction in the estimates. Our baseline estimate in column (4), which controls for both labor market tightness and compositional change, is 1.120. In other words, a 1 percentage

[23] Chen et al. (2023) examines how preferences for remote work changed after the pandemic.

[24] I.e., $\%\Delta EMP_j^d = (EMP_{j,June2022-July2024}^d - EMP_{j,2018-2019}^d)/EMP_{j,2018-2019}^d$.

[25] I.e., $\Delta WFH_j^{nd} = WFH_{j,2022}^{nd} - WFH_{j,2019}^{nd}$.

[26] I.e., $\%\Delta EMP_j^{nd} = (EMP_{j,July2022-June2024}^{nd} - EMP_{j,2018-2019}^{nd})/EMP_{j,2018-2019}^{nd}$.

[27] Specifically, we regress the probability an observation will be in the pre-period on a fully-interacted model of age (5 categories), gender (2 categories), race (3 categories), and education (3 categories). We then reweight each post-period observation so that the distribution based on observables is the same as in the pre period.

point rise in WFH in an occupation leads to a 1.1% increase in full-time disability employment. A back of the envelope calculation reveals that the post pandemic increase in working from home explains 80% of the rise in full-time employment.[28]

Columns (5)-(7) use an instrumental variable approach as an additional way to estimate the causal impact. Our instrument is the Dingel and Neiman (2020) measure for the probability an occupation can be done entirely from home. They use O*NET data prior to the pandemic to classify occupations. This instrument strongly predicts the rise in working from home by occupation (with first-stage t-statistics greater than 8) and is plausibly independent of other occupation level demand shocks which occurred as a result of Covid. As in columns (2)-(4), controls for labor market tightness and composition reweighting make little difference. The IV estimate in the last column is 1.541. This is 38% larger compared to our non-instrumented estimate in column (4), which could be due to measurement error in our WFH variable. However the difference is not statistically significant given the relatively large standard errors.

As a reminder, our estimation sample excludes individuals with a cognitive disability, since there was a large inflow of these individuals and compositional changes could potentially explain the rise in disability employment. Nonetheless, if we include the cognitive category and re-estimate our regressions, the results are similar or larger (see Appendix Table A2).

Returning to the sample which excludes cognitive disabilities, Appendix Table A3 reports estimates for both total employment and part-time employment. For part-time employment, none of the estimates are statistically signficant. Using our baseline specification, column (4) reports an estimate of -0.034, which indicates that WFH had virtually no impact on part-time disability employment. The IV estimates are too imprecisely measured to be informative. For total employment, we find estimates which are smaller than for full-time employment, which is not surprising since total employment is the sum of full-time and part-time employment.

So far, we have been using a WFH measure based on the transportation-to-work question from the ACS, coding WFH as an answer of "worked from home". In Appendix Table A4, we use several other WFH measures as robustness checks. For comparison, the first row repeats our analysis using the baseline ACS measure. In row 2, we use the number of job postings which mention WFH using data collected by Lightcast (see Hansen et al., 2023). In row 2 column (4), which controls for labor market tightness and compositional changes, we estimate a 1.108 percent increase in disability employment for every 1 percentage point increase in WFH mentions in job postings. Turning to the IV estimate in column (7), which uses the same instrument as before, we estimate a 2.013 percent increase. When

[28] Work from home increased by 9 percentage points, which when multiplied by our coefficient estimate of 1.120 equals 10.1%. This is 80% of the observed increase of 12.6% over the same regression bsample period of January 2018 to December 2019 vs July 2022 to June 2024

scaled relative to the average change in WFH, the IV estimate using the job posting variable is similar to the IV estimate using the ACS variable.[29] In panel B, we use the telework variable from the CPS to measure WFH levels in 2023. For this measure, we cannot construct a changes variable, as the question was not asked pre-Covid. Despite the ACS variable being measured in changes and the CPS in levels, the correlation between the two is 0.95. Hence, it is not surprising that the estimates in row 3, when scaled relative to the average (by a factor of $2 = 0.18/0.09$), are roughly similar to the effect sizes found in row 1. For completeness, we also report the reduced form effect of our instrument using the Dingel and Neiman classification measured pre-Covid, and find roughly similar effects after scaling (by a factor of $4.2 = 0.38/0.09$).

In summary, using a variety of WFH definitions and estimation approaches, based on information coming from both workers and employers, we find a robust effect on disability employment.

4 Mechanisms

A natural next question is whether labor supply or demand forces are behind the substantial increase in full-time employment for individuals with a disability. On the supply side, WFH could lower the cost of working for individuals with a disability. On the demand side, WFH could lower the cost of employing workers with a disability or raise their productivity.

To explore whether supply or demand factors dominate, consider a simple model where individuals with a disability differ in their productivity, firms operate in a competitive labor market, and there are no general equilibrium effects of employing more workers with a disability on the margin. Of course, other models are also possible.

One possibility is that workers directly pay the costs associated with working. Costs of working include commuting as well as dealing with other aspects of the work environment that could be particularly challenging for those with a disability (e.g., stairs, noise, work times, and hours). When deciding whether to work, an individual compares the wage to the costs. As costs fall, marginal individuals with lower productivity are drawn into the labor force. Since firms pay workers their marginal product, these newly employed individuals will have lower wages.

Another possibility is that firms directly pay the costs associated with employing individuals with a disability. Cost could include accommodations such as modifying the work environment (adding ramps, elevators, automatic doors etc) or allowing a worker to work from home. Firms will pay

[29] Since the mean change in WFH using the job posting variable is two-thirds the size of the mean ACS change (.06 versus .09), to compare the estimates in row 2 to row 1, we multiply by two-thirds. When we do this, the scaled estimate in row 2 columm (4) for job postings is 34% smaller than the comparable ACS estimate in row 1 (1.108*.67 = .742 versus 1.120). When we use the instrument, the scaled estimate is very similar (2.013*.67 = 1.349 versus 1.541). The fact the estimate in column (4) is somewhat smaller than the IV estimate in column (7) is likely due to measurement error in the job posting data.

workers the difference between their marginal product and the cost of these accommodations. Prior to the pandemic, few firms offered a work from home option, and so making this accommodation for a single worker would be costly. Post-pandemic, in high WFH occupations, the marginal cost of allowing a worker with a disability to work from home is small. Hence, as marginal costs fall in high WFH occupations, firms will hire more workers. Even though these newly hired workers have lower productivity, they will be paid higher wages on average.[30] On the demand side, WFH could also increase the productivity of workers with a disability. If WFH raises marginal product, demand by firms for these workers will increase and wages should likewise rise.

In sum, both supply-side and demand-side factors predict an increase in employment, but differ in their prediction for wages. In Table 2, we explore wage growth in high versus low WFH occupations before versus after the pandemic.[31] For workers with a disability, wages fell by 2.1% in high WFH occupations, but rose by 2.0% in low WFH occupations. The difference-in-difference is a statistically significant -4.0%. This is consistent with a reduction in labor supply costs borne by workers with a disability in high WFH occupations. Of course, the drop in relative wages could be due to lower wage growth in high versus low WFH occupations more generally. To account for this possibility, we take a triple difference, i.e., differencing out the corresponding change for workers without a disability. If anything, wages grew slightly faster for nondisabled workers in high versus low WFH occupations (0.6% versus 0.2%). The triple difference is a statistically significant -4.4%.

While we recognize that other models are also possible, these results are consistent with reduced costs borne by workers being the dominant force in explaining the increased employment of workers in WFH occupations post-pandemic. For example, commuting costs fall directly on workers, and WFH reduced these costs. Increases in productivity or reductions in costs borne by employers could also be in play, but are more than offset.

5 Conclusion

The pandemic fundamentally changed many aspects of the labor market. New technologies such as remote teleconferencing altered the structure of the workplace, affecting both where and how work got done. These adaptations were not put into place to target workers with a disability, but rather introduced due to Covid and applied universally to all workers. This paper provides causal evidence that the increase in WFH due to Covid led to a dramatic increase in disability employment. Our

[30]To see this, suppose that accommodating work from home costs the firm $3 per hour before the pandemic, and firms are willing to hire workers whose net productivity (productivity - cost) is at least $20 an hour. In the pre-period, firms would then be willing to hire a worker whose productivity was $23, paying them $20. In the post-period, if WFH costs are eliminated, then the firm is willing to hire a worker whose productivity is $22 an hour, paying them $22. This model also predicts that existing workers who require accommodations will be paid more in the post-period.

[31]For this analysis, we use three-year windows before and after the pandemic to increase precision.

estimates imply that the post-Covid rise in WFH increased the full-time employment of individuals with a disability by 12% on average, and by as much as 40% in computer occupations. Moving forward, WFH could have even larger impacts on disability employment as firms continue to develop and adopt remote work technologies.

Our findings indicate that individuals with a disability have substantial work capacity. WFH provides individuals with a disability who were previously not able to realize this capacity the means to do so. Indeed, we find that WFH brings individuals into the labor market and enables full-time employment. This not only benefits individuals, but also improves public finances as tax revenues rise and expenditures such as disability insurance payments fall.

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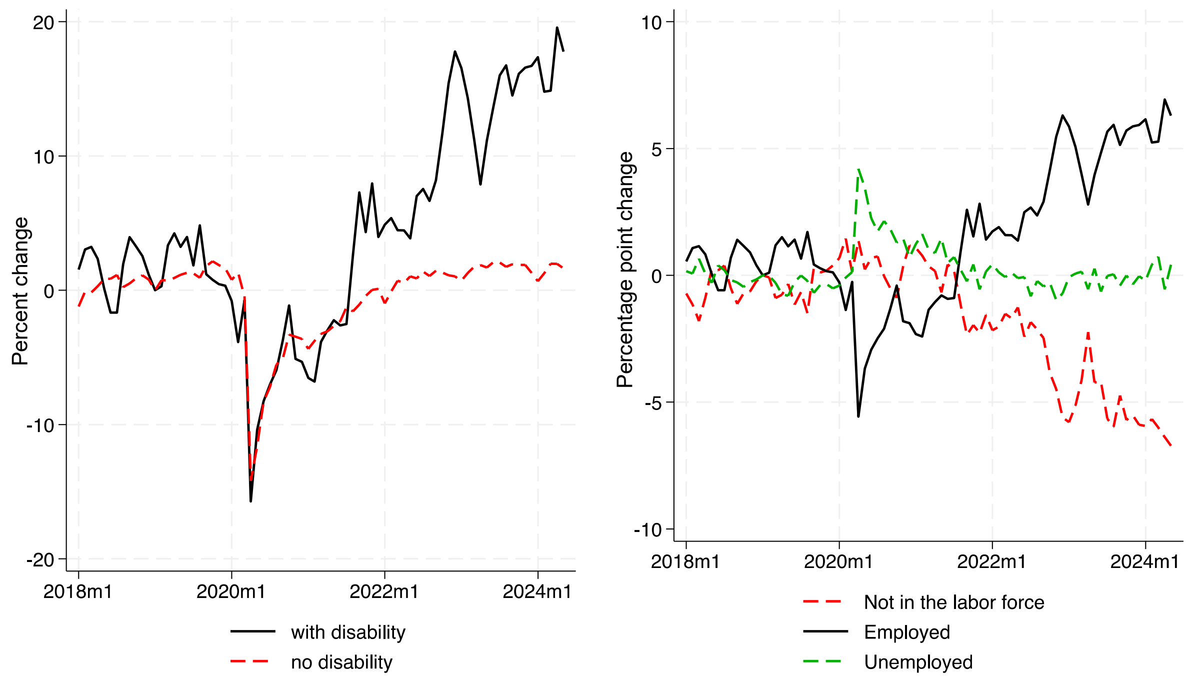
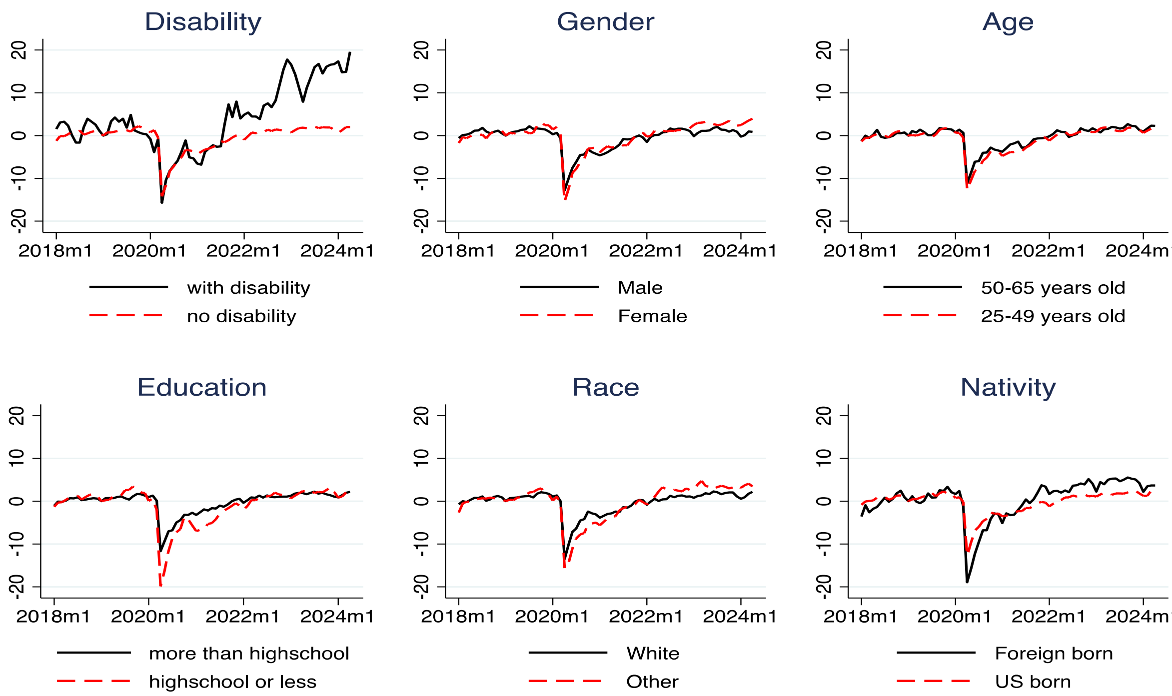
Figure 1. Disability employment increased post pandemic from rising labor force participation



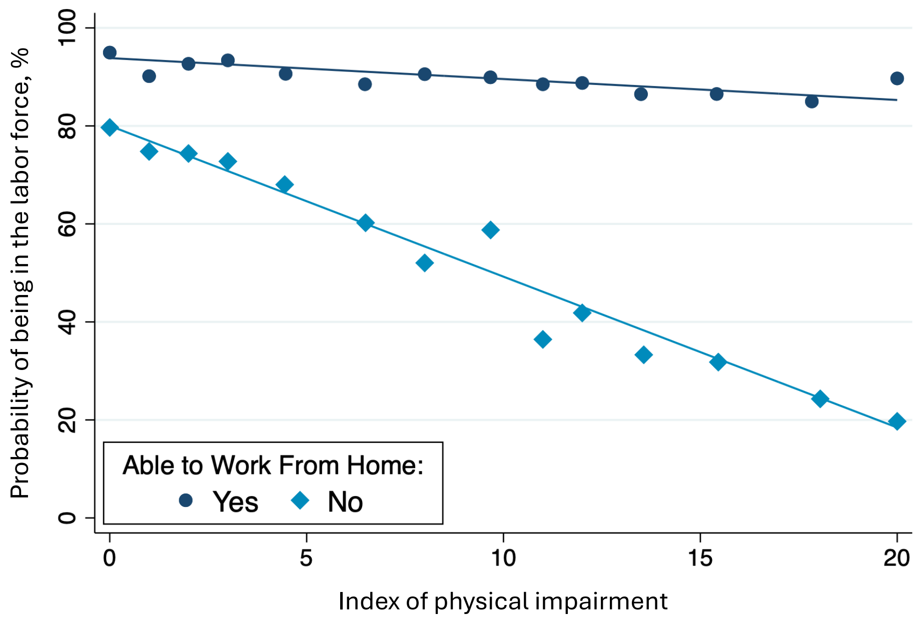
Notes: The left panel graphs the percent change in the employment rate relative to January 2019 for those with and without a physical disability (18-64 years old) using CPS data. The right panel decomposes the population with a physical disability into employment, unemployment and not being in the labor force (relative to January 2019).

Figure 2. Disability employment rose faster than for any other major demographic group



Notes: See notes to Figure 1. Foreign born is defined as born abroad and immigrated after the year 2000.

Figure 3. The ability to work from home reduces the employment disability gap



Notes: N=14,314. Index of physical impairment constructed using the question: "The following items are about activities you might do during a typical day. Does your health currently limit you in these activities?" Index sums up answers of 0 ("No, not limited at all"), 1 ("Yes, limited a little"), and 2 ("Yes, limited a lot") for 10 activities (see Appendix Figure A5). Labor force status is constructed using the question: "Last week what was your work status?" Data are from March to July 2023 waves of the Survey of Workplace Arrangements and Attitudes. The sample includes persons aged 40 or more who pass all attention check questions, reweighted for those earning $10,000 or more in a prior year to match the Current Population Survey by age, sex, education, and earnings. N = 14,314. Source: Data from Barrero, Bloom, Buckman and Davis (2024).

Table 1: The effect of WFH on full-time employment of workers with a disability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Panel A: Outcome regressions			
			Dependent variable: Percent change in full-time disability employment pre/post covid				
Change in occupation WFH share	1.265***	1.310***	1.133***	1.120***	1.619***	1.420**	1.541**
	(.388)	(.409)	(.370)	(.378)	(.580)	(.571)	(.713)
				Panel B: First stage regressions			
				Dependent variable: Change in occupation WFH share			
Predetermined probability an occupation can be done remotely					.152***	.149***	.133***
					(.015)	(.015)	(.017)
Controls for labor market tightness		X		X			X
Composition reweighted			X	X		X	X
WFH instrumented					X	X	X

Notes: The dependent variable is the percent change in the number of individuals with a physical disability working full time (≥35 hours) in an occupation between 2018-2019 and July 2022-June 2024 in the CPS. The independent variable is defined as the change in the fraction of people *without* a disability who report "worked from home" in 2022 versus 2019 using the transportation-to-work question from the ACS. Controls for labor market tightness are a third-order polynomial of the change in nondisabled employment pre versus post covid. Composition reweighted uses the underlying micro-data to create an inverse propensity score weight based on a fully interacted model for age (5 categories), gender (2 categories), race (3 categories), and education (3 categories). The instrument is the predetermined WFH probability for an occupation taken from Dingel & Neiman (2020). Occupation is defined using 2-digit standard occupational classification codes (97 occupations), merging occupations if there are less than 10 workers with a disability, which yields 86 occupations for estimation. Robust standard errors in parentheses.

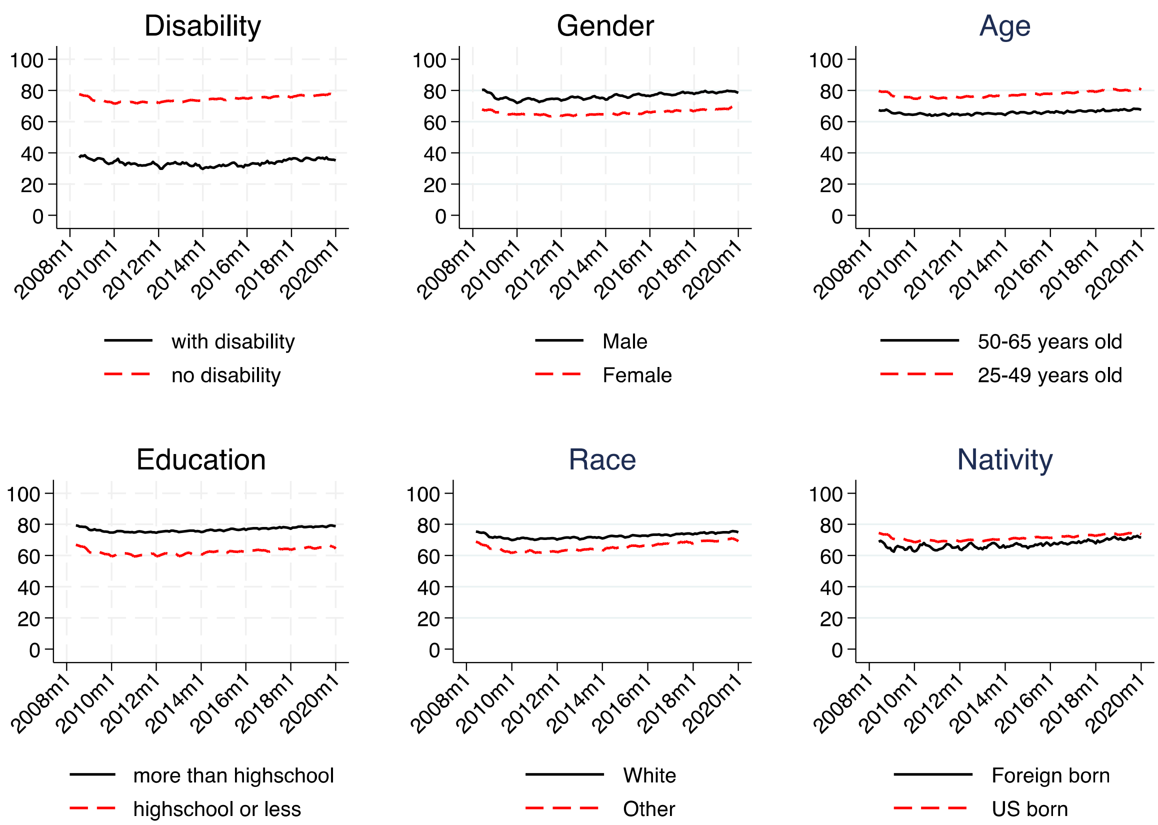
***p<.01, **p<.05, * p<.10

Table 2: Wages by disability status in high versus low WFH occupations before and after the pandemic

	2017-2019 (1)	July 2021-June 2024 (2)	Difference, % (2)-(1) / (1)	Diff in Diff row (b) – row(a)	Triple Diff
	Mean Hourly Real Wage				
Workers with a disability					
a. High WFH occupation	26.04	25.50	-2.1		
			(1.4)		
b. Low WFH occupation	19.81	20.20	2.0		
			(1.4)		
				-4.0**	
				(1.9)	
Workers without a disability					
a. High WFH occupation	28.38	28.55	0.6***		
			(0.2)		
b. Low WFH occupation	21.21	21.26	0.2		
			(0.2)		
				0.4	
				(0.3)	
					-4.4**
					(2.0)

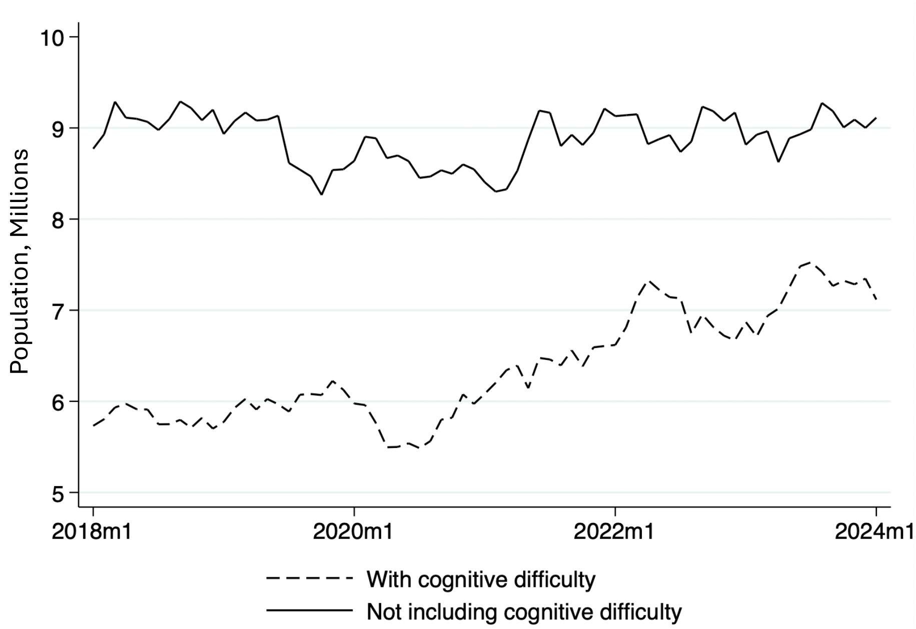
Notes: Each cell reports average wages using data from the CPS, adjusted using the CPI with 2017 as the base year. High WFH and Low WFH occupations defined as occupations with above or below median occupational WFH rates. We trim wages by excluding values below the Federal minimum wage of $7.25 and by excluding values greater than $100 ($99^{th}$ percentile). Standard errors calculated using the bootstrap with 500 iterations.
***p<.01, **p<.05, * p<.10

Appendix Figure A1. The disability employment gap is larger than for other demographic splits



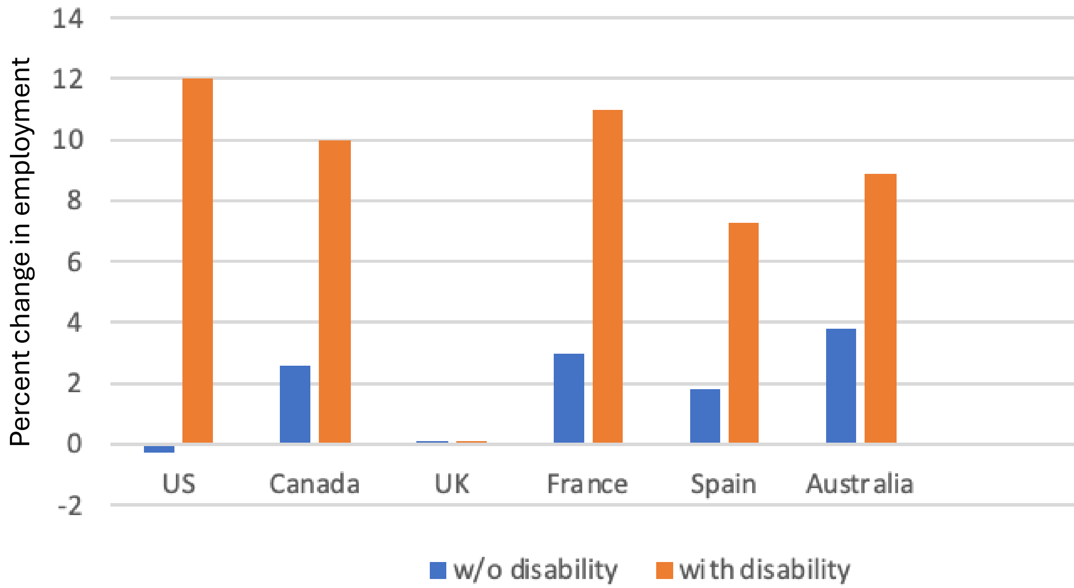
Notes: Employment gaps by disability status, gender, age, race, education and nativity using CPS data. Foreign born is defined as born abroad and immigrated after the year 2000.

Appendix Figure A2. Number of people with cognitive and physical disabilities over time



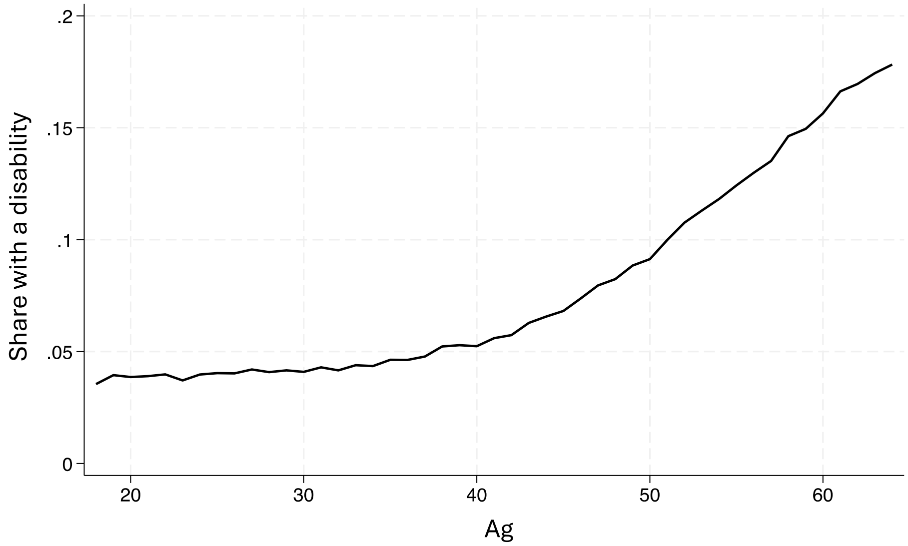
Notes: CPS counts of the number of people (18-64 years old) with cognitive difficulties and physical difficulties (i.e., not including a cognitive difficulty). Physical difficulties include hearing, vision, ambulatory, self-care and independent living.

Appendix Figure A3. Changes in disability employment across countries, 2022 versus 2019



Notes: Percent changes in the employment rate between 2019 and 2022 for those with and without a disability. Calculations using data from the US CPS, the UK Labor Force Survey and the Australian HILDA Survey. The numbers for Canada, France and Spain are from publicly available statistics from national labor force surveys.

Appendix Figure A4. Fraction of individuals with a disability, by age



Notes: Fraction of individuals in the US with a disability by age based on CPS data between May 2008-December 2019.

Appendix Figure A5. Physical impairment survey question

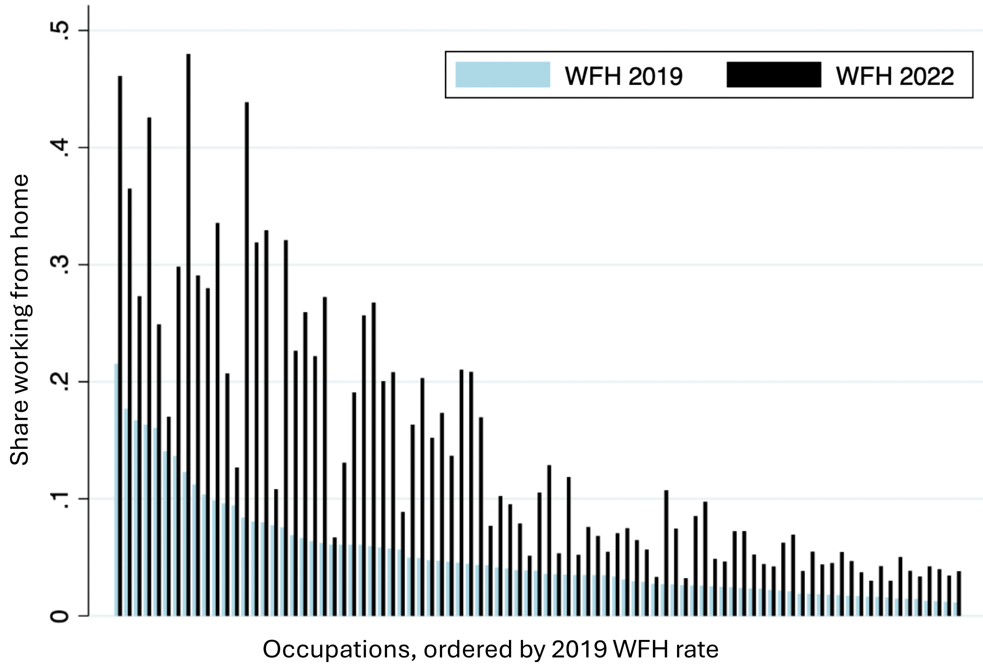
The following items are about activities you might do during a typical day. Does ***your health <u>currently</u> limit you*** in these activities?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
Vigorous activities (running, lifting objects, strenuous sport)	○	○	○
Moderate activities (moving a table, pushing a vaccum cleaner, golf)	○	○	○
Lifting or carrying groceries	○	○	○
Climbing **several** flights of stairs	○	○	○
Climbing **one** flight of stairs	○	○	○
Bending, kneeling, or stopping	○	○	○
Walking **more than a mile**	○	○	○
Walking **several blocks**	○	○	○
Walking **one block**	○	○	○
Bathing or dressing yourself	○	○	○

Continue

Note: Survey question from the Survey of Workplace Arrangements and Attitudes. The "Index of Physical Impairment" is on a 0 to 20 scale, with 1 given for each answer of "Yes, limited a little" and 2 for each answer of "Yes, limited a lot".

Appendix Figure A6. WFH rates in 2019 and 2022 across occupations



Notes: Work from home rates (WFH) for workers without a disability in 2019 and 2022 using the transportation-to-work question from the ACS. There are 86 occupations.

Appendix Table A1: Employment after acquiring a disability before versus after covid by initial employment status

	2017-2019 (1)	July 2021-June 2024 (2)	Difference, % (2)-(1) / (1)	Difference in Difference row (b) – row (a)
Panel A: Employed with no disability in wave 1				
a. Share employed if no disability one year later	92.9	93.1	0.2 (0.3)	-
b. Share employed if disability one year later	70.9	78.9	11.3*** (3.9)	-
				11.1*** (3.9)
Panel B: Not employed and no disability in wave 1				
a. Share employed if no disability one year later	26.9	26.8	-0.4 (2.6)	-
b. Share employed if disability one year later	6.7	10.2	51.9 (36.9)	-
				52.3 (37.1)

Notes: Each cell is the probability of being employed in the fifth wave of the CPS (12 months after the first wave). Standard errors calculated using the bootstrap with 500 iterations.
***p<.01, **p<.05, * p<.10

Appendix Table A2: The effect of WFH on full-time employment of workers with a disability; including cognitive disabilities

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Outcome regressions						
	Dependent variable: Percent change in full-time disability employment pre/post covid						
Change in occupation WFH share	1.689***	1.297***	1.516***	1.121***	2.156***	1.944***	1.612***
	(.370)	(.338)	(.361)	(.324)	(.582)	(.538)	(.604)
	Panel B: First stage regressions						
	Dependent variable: Change in occupation WFH share						
Predetermined probability an occupation can be done remotely					.149***	.151***	.134***
					(.015)	(.015)	(.017)
Controls for labor market tightness		X		X			X
Composition reweighted			X	X		X	X
WFH instrumented					X	X	X

Notes: See notes to Table 1. Robust standard errors in parentheses.
***p<.01, **p<.05, * p<.10

Appendix Table A3: The effect of WFH on employment of workers with a disability; by total, full-time, and part-time status

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: Total employment						
	Dependent variable: Percent change in total disability employment pre/post covid						
Change in occupation WFH share	.890***	.728**	.791**	.596*	.923	.735	.744
	(.339)	(.323)	(.333)	(.317)	(.594)	(.578)	(.528)
	Panel B: Full-time employment						
	Dependent variable: Percent change in full-time disability employment pre/post covid						
Change in occupation WFH share	1.265***	1.310***	1.133***	1.120***	1.619***	1.420**	1.541**
	(.388)	(.409)	(.370)	(.378)	(.580)	(.571)	(.713)
	Panel C: Part-time employment						
	Dependent variable: Percent change in part-time disability employment pre/post covid						
Change in occupation WFH share	.053	.031	-.028	-.034	-.918	-1.041	-.849
	(.562)	(.513)	(.528)	(.480)	(1.062)	(1.035)	(1.064)
Controls for labor market tightness		X		X			X
Composition reweighted			X	X		X	X
WFH instrumented					X	X	X

Notes: See notes to Table 1. Full-time and part-time employment are defined as working ≥35 and <35 hours per week, respectively. Robust standard errors in parentheses.
***p<.01, **p<.05, * p<.10

Appendix Table A4: The effect of WFH on full-time employment of workers with a disability; using different WFH measures

	Dependent variable: Percent change in disability employment pre/post covid by occupation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Panel A: Change in occupation WFH share				
ACS WFH measure	1.265***	1.310***	1.133***	1.120***	1.619***	1.420**	1.541**
(mean=.09)	(.388)	(.409)	(.370)	(.378)	(.580)	(.571)	(.713)
Job postings (Lightcast)	1.450***	1.267**	1.331***	1.108**	2.274***	2.063***	2.013**
(mean=.06)	(.468)	(.512)	(.453)	(.478)	(.713)	(.669)	(.904)
			Panel B: Level of occupation WFH share				
CPS WFH measure	.553***	.560***	.483***	.470**	.716***	.622**	.647**
(mean=.18)	(.188)	(.203)	(.184)	(.188)	(.264)	(.260)	(.310)
Dingel&Neiman	.245***	.246***	.212**	.205**	-	-	-
(mean=.38)	(.082)	(.092)	(.083)	(.086)			
Controls for labor market tightness		X		X			X
Composition reweighted			X	X		X	X
WFH instrumented					X	X	X

Notes: See notes to Table 1. See Section 2.2 for definitions of the different WFH measures. Robust standard errors in parentheses.
***p<.01, **p<.05, * p<.10