Reassessing Economic Constraints: Maximum Employment or Maximum Hours?

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1. Introduction

The aggregate quantity of labor supplied to an economy can be decomposed into an extensive margin (the number of workers) and an intensive margin (the average hours worked per worker). Both in their public communications and in their internal analyses, central banks typically emphasize the extensive margin of labor supply over the intensive margin. For example, the primary measure of labor market slack in the economy is the unemployment rate, and the most common additional labor market indicators are the employment-population ratio, which going forward we refer to as the employment rate, and the labor force participation rate. As an illustration, consider the 2019 European Central Bank's macroeconomic projections for the euro area. These projections contain 79 mentions of the extensive labor market measures "employment," "unemployment," and labor force "participation" and only four mentions of hours worked. Thus, these typical labor market indicators all focus on "counting people."

This paper departs from the traditional emphasis on the extensive margin and argues that the intensive margin of labor supply also deserves attention, especially over longer horizons. We first document that in a sample of 18 European countries and the U.S. over the two

decades prior to the COVID-19 pandemic, trends in aggregate labor supply have been driven primarily by the intensive margin. Over this time period, aggregate hours worked per person declined in 14 of 19 countries and by 4.7 percent on average across all countries. This was largely due to a decline in the intensive margin: Average hours per worker declined in all 19 countries and by 9.2 percent on average. The widespread decline in the intensive margin contrasted with a widespread increase in the extensive margin: the employment rate increased in 14 of 19 countries and by 4.9 percent on average across all countries.[1]

Using standard growth accounting based on an aggregate Cobb-Douglas production function with a labor share of 0.67, the extensive margin alone *raised* per capita output growth by 0.16 percentage points per year, while the overall change in hours per person *lowered* per capita output growth by 0.16 percentage points per year. In other words, focusing only on the extensive margin overstates the average growth rate in output per person by 0.32 percentage points per year.

Standard drivers of hours per person considered in the literature—namely, taxation and income effects—always increase or decrease both margins at the same time. To help interpret the opposing patterns in the two margins of labor supply, we consider a highly stylized model that incorporates an additional mechanism. Two key ingredients of the model are (i) fixed costs of working, which induce an extensive margin choice, and (ii) heterogeneity in the disutility of working, which induces variation in labor supply among individuals. In the model, a decrease in the fixed costs of working leads to aggregate changes in labor supply that qualitatively resemble the stylized patterns in our cross-country data. Specifically, a decrease in the fixed costs of working draws marginal workers into employment (an increase in the extensive margin), but these workers have a relatively high disutility of working and so work fewer hours on average, implying a decrease in the intensive margin.

We discuss an array of suggestive evidence that is consistent with the mechanisms in our model. First, we find a negative cross-country correlation between the intensive and extensive margins of labor supply in our sample: Not only do countries with higher employment rates tend

to have lower hours per worker, but countries with larger increases in employment tend to have larger decreases in hours per worker. Second, within countries we point to disproportionate increases in employment for two demographic groups with a relatively high disutility of working: mothers with young children and older workers. Third, we document recent trends in social norms, working conditions, and government policies that may have reduced the fixed costs of working for many individuals.

An important task for central banks is to project potential labor supply several years into the future. In this context, a natural follow-up question is whether we expect fixed costs of working to continue to decline. The COVID pandemic clearly induced a temporary increase in the fixed costs of working, both directly by increasing the health risks of in-person work and indirectly through school and child-care closures. However, evidence from a national labor market survey of U.S. adults in June 2022 suggests that changing work arrangements since the pandemic had the opposite effect. In particular, the survey sheds new light on two developments that arguably have lowered the fixed costs of working since the COVID pandemic and are likely to outlast the pandemic itself: a rise in work from home and greater flexibility in work hours.

This paper relates to a recent literature on the importance of the intensive margin for macroeconomic outcomes in the short run. Based on a dataset of 14 Organization for Economic Cooperation and Development (OECD) countries, Ohanian and Raffo (2012) show that employment is a poor proxy for cyclical variation in aggregate hours worked, especially outside the U.S. Faberman et al. (2020) and Blanchflower and Bell (2021) construct related measures of underemployment that incorporate both unemployment and deviations of desired hours from current hours. They show that following the Great Recession these broader measure of underemployment recovered at a slower pace both in the U.S. and in Europe than unemployment, which indicates more slack labor markets and helps explain sluggish wage growth in both regions. In contrast, during the COVID labor market recovery, Faberman et al. (2022) find that their broader measure of underemployment suggests a tighter labor market for the U.S. than does the unemployment rate alone. Relatedly, several recent

structural analyses have argued that in the U.S. context the aggregate responsiveness of labor supply to business cycles and monetary policy depend on both the intensive and extensive margins of labor supply (Erosa et al., 2016; Chang et al., 2019; Ma, 2020). Relative to this existing work, the present paper highlights the role of the intensive margin for longer run trends in labor supply.

Our cross-country analysis closely relates to a literature starting with Prescott (2004), which analyzes large differences in both the levels and trends of aggregate hours per person across OECD countries since World War II.[2] In particular, Ohanian et al. (2008) and McDaniel (2011) analyze long run trends in hours per person for a subset of OECD countries from the 1950s through the early 2000s, ending near the start of our sample period. Their analysis attributes most of the decline in hours to income effects early in their sample period and to broad increases in income taxes later in their sample period.[3] Unlike our paper, these papers do not distinguish between the intensive and extensive margins of labor supply, and the driving forces they consider would not generate opposing movements between the two margins.

Within this literature, three recent papers do explicitly analyze both margins of labor supply.[4] Bick et al. (2019b) study the role of taxation for the time series of both employment and hours per worker between the early 1980s and 2015 in the U.S. and seven European countries, but they limit their analysis to married couples of core working age (ages 25-54). Bick et al. (2018) document a negative cross-country relationship between employment and hours per worker between middle- and high-income countries, which is similar to the dynamic patterns we document for the U.S. and 18 European countries over the past two decades. To explain these cross-country patterns, Bick et al. (2022c) develop a quantitative model that incorporates fixed costs of working that vary with a country's level of development. Relative to these papers, the present paper emphasizes the negative correlation between the extensive and intensive margins within countries over time and leverages novel evidence on the fixed costs of working.

Our evidence on reductions in the fixed costs of working relates to a literature documenting broad-based changes in work arrangements.

One important development has been an increase in work from home, which increased slowly in the decades before the pandemic and more rapidly since the pandemic (Barrero et al., 2021; Bick et al., 2022a). A related trend is increases in flexible work conditions (Goldin, 2014; Goldin and Katz, 2016; Goldin, 2022) and contingent or gig work (Abraham et al., 2018; Lim et al., 2019; Kass, 2022).

Finally, recent work argues that changes in the labor force composition, especially by age, impact business cycle volatility (e.g., Jaimovich and Siu, 2009; Jaimovich et al., 2013) as well as the propagation of tax and monetary policy (e.g., Ferraro and Fiori, 2020; Fujiwara and Teranishi, 2008; Kantur, 2013; Carvahlo et al., 2016; Kara and von Thadden, 2016; Sterk and Tenreyro, 2018; Cloyne et al., 2020; Wong, 2021; Leahy and Thapar, 2022). A related literature argues that trends in female labor force participation reduced the volatility of employment over the business cycle and contributed to the jobless recoveries during recent recessions (Doepke and Tertilt, 2016; Albanesi, 2019; Fukui et al., 2022). These findings suggest that a work force with higher employment rates and lower hours per worker will likely respond differently to business cycles, monetary policy, and tax shocks.

The rest of the paper is organized as follows. Section 2 introduces the main data sets we use in our cross-country analysis and Section 3 presents the main empirical evidence regarding trends in the two margins of labor supply. Section 4 proposes a stylized model that can generate movements of the two margins in opposite directions. Section 5 provides some evidence on decreasing fixed costs of working from a U.S. survey run in June 2022. The last section concludes.

2. Data

2.1 Main Data Sets on Hours and Employment

Our main data source for the U.S. is the IPUMS version (Flood et al., 2021) of the Current Population Survey (CPS), a monthly survey of around 60,000 households. The data cover around 1.17 million individuals ages 15 and older per year.

Our main dataset for Europe is the European Union Labor Force Survey (EULFS), a collection of annual labor force surveys from different European countries. The EULFS starts in 1983 with information from Belgium, Denmark, France, Germany, Greece, Italy, Ireland, the Netherlands, and the U.K. Data for more countries were integrated into the EULFS during the late 1990s, from which we add Austria, the Czech Republic, Hungary, Norway, Poland, Portugal, Spain, Sweden, and Switzerland. We thus have 18 European countries in our sample. The sample size of the EULFS varies over time and across countries but is always of considerable magnitude. For example, Denmark has the smallest population of our sample countries but still contains at least 14,400 observations for each year.

2.2 Sample Selection

Our basic sample covers all individuals ages 15 or older. Two exceptions are Norway and Sweden, which feature an upper age limit of 74 in their surveys.[5] We indicate this sample difference for the two countries by putting a star next to the country abbreviations in all figures that are affected by this different definition. The exclusion of individuals over age 74 in Sweden and Norway likely positively biases trends in employment for these countries: The intuition is that, due to population aging, over time we will exclude a larger and larger share of the population, and this population has a relatively low employment rate. To get a feeling for the size of this bias, we can compare employment trends in the remaining 17 sample countries when we alternatively include or exclude individuals over age 74: In these countries over our sample period, employment increased 4.4 percentage points among individuals ages 15-74, compared with 2.5 percentage points among all individuals ages 15 and older. By contrast, the age 74 ceiling has negligible effects on trends in hours per worker because individuals over age 74 make up a very small share of employment.

2.3 Definition of Hours Worked and Employment

We construct the employment rate based on the self-reported employment status of the individual; employment also includes both self-employment and unpaid family work. The employment rate

(as noted in the introduction, also referred to as the employment-population ratio) is then defined as the number of employed individuals divided by the total population ages 15 and older. Hours per worker are calculated based on actual hours worked among the employed in the reference week, which is usually the week prior to the interview.[6] Workers who are employed but absent from work in the reference week, e.g., because of illness or vacation, are assigned zero hours worked. Just as a positive employment status also covers self-employed individuals and unpaid family workers, hours per worker also include their hours. Relying on usual hours worked in a typical work week, we also distinguish between part-time hours (less than 35 hours), regular hours (35-49 hours), and long hours (at least 50 hours). The part-time share and long-hours share are defined as the shares of all employed individuals working part-time or long hours, respectively. Finally, hours per person are defined as the product of the employment rate and hours per worker.

3. Trends in Hours and Employment in Europe and the U.S.

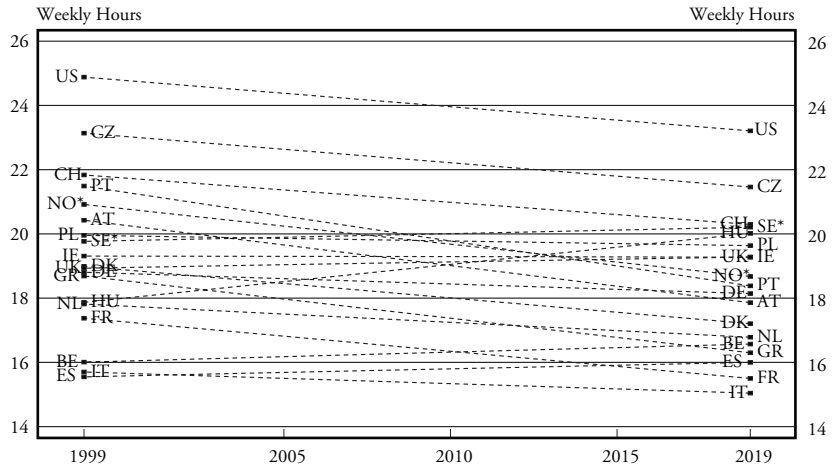
To document trends in hours and employment, we focus on the two past decades and the pre-pandemic time period. To make sure that our results on trends do not depend on a specific start or end year, we always report trends between three-year averages, namely the average for 1997 to 1999 and for 2017 to 2019. The choice of our starting period is motivated by data availability for many countries in the EULFS.

3.1 Decreasing Hours per Person over the Past Two Decades

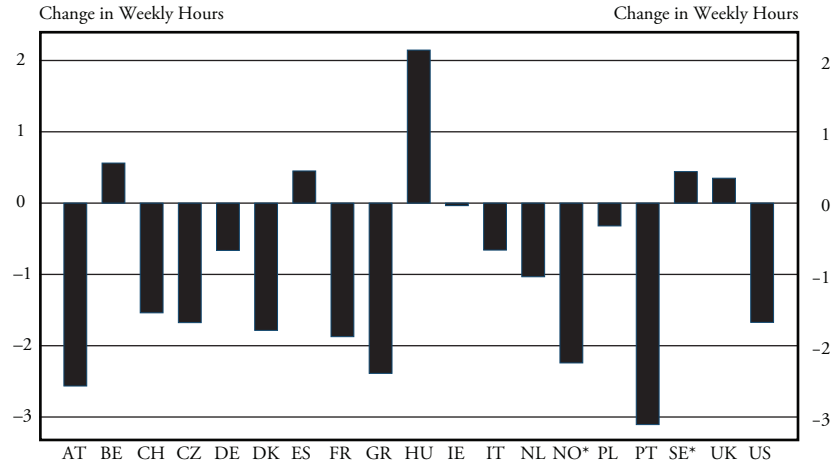
Chart 1 shows average hours per person, i.e., the product of the extensive and the intensive margins, in our sample of countries from the late 1990s to the late 2010s, in Chart 1A as (stylized) time-series and in Chart 1B directly as the change. Our main takeaway from this figure is a widespread decline in hours per person over this time period. Hours per person fall in 14 of the 19 sample countries. Across all sample countries, average hours per person decrease from 19.3 hours to 18.4 hours, a decline of 0.9 hour, or 4.7 percent.

Chart 1
Hours Per Person Across Countries, 1997-99 to 2017-19

(A) Levels of Hours Per Person

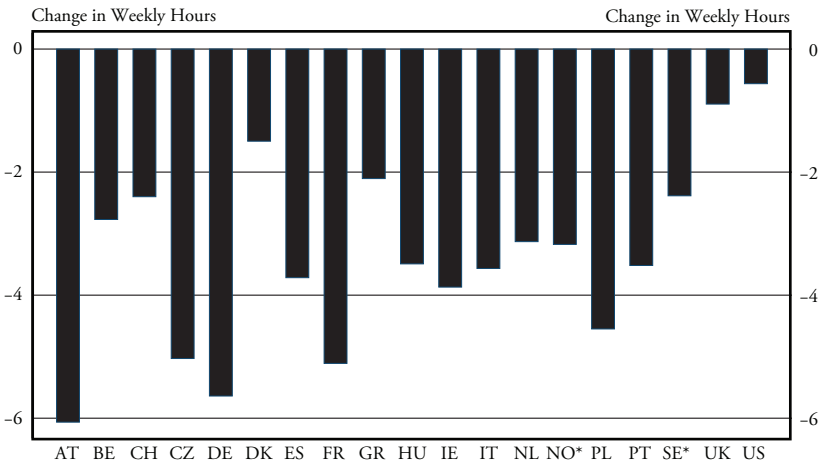


(B) Changes in Hours Per Person



Note: This chart plots weekly hours per person ages 15 and above across 18 European countries and the U.S. Chart 1A shows the average hours in 1997 to 1999, assigned to the year 1999, as well as in 2017 to 2019, assigned to the year 2019. Both values for each country are connected by a straight line. Chart 1B shows the change in weekly hours per person over the same time period. *For Norway and Sweden, individuals ages 75 and older are excluded.

Chart 2
Changes in Hours Per Worker Across Countries, 1997-99 to 2017-19



Note: This chart plots the change in weekly hours per worker for all working individuals ages 15 and above between the average for 1997 to 1999 and the average for 2017 to 2019 across 18 European countries and the U.S. *For Norway and Sweden, individuals ages 75 and older are excluded.

3.2 Intensive vs. Extensive: A Tale of Two Margins

This section decomposes trends in hours per person into an intensive margin (hours per worker) and an extensive margin (employment rates). We document starkly different trends in the two margins, both across and within countries.

3.2.1 Uniformly Decreasing Hours per Worker

Chart 2 displays the change in the intensive margin, weekly hours per worker, in our 19 sample countries from the late 1990s to the late 2010s. The central message is that hours per worker decreased in every country over this time period. The decrease was largest in Austria (6 hours) and smallest in the U.S. (0.6 hour). On average across countries, hours per worker decreased by 3.3 hours per week, which corresponds to a decrease of 9.2 percent.[7] Using standard growth accounting with an aggregate Cobb-Douglas production function with a labor share of 0.67, this decrease in hours per worker decreased per capita output by 6.3 percent over the two decades or, alternatively, reduced the average annual growth rate of per capita output by 0.32 percentage point.

The decline in country-level hours per worker is present across a range of demographic groups. Panel I of Chart 3 shows the change in hours per worker over the past two decades separately by gender. Hours per worker decreased for men in all countries and for women in all countries except the U.K. and the U.S. The average decline in hours per worker among men (3.7 hours) was larger than the average decline among women (2.3 hours).

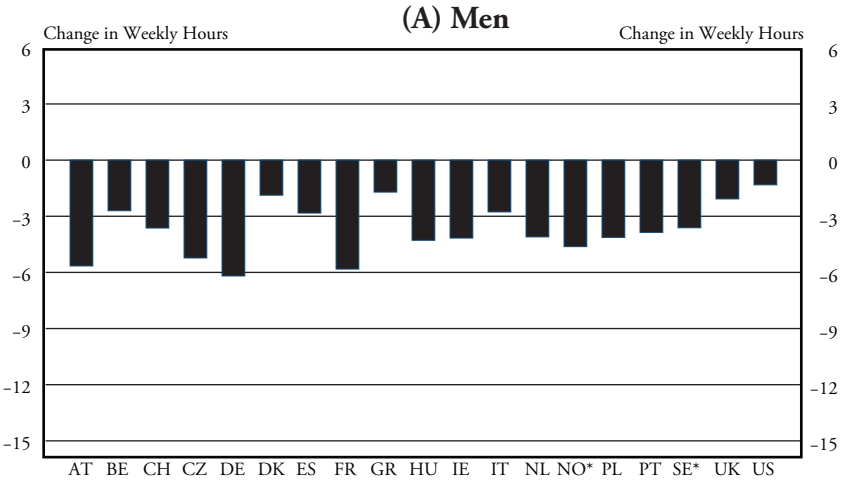
Panel II of Chart 3 shows trends in hours per worker for four different age groups: 15-24, 25-54, 55-64, and 65 and older. Hours per worker declined in all age groups and countries (i.e., in 76 bins) with the exception of individuals ages 55-64 in the U.S. and individuals ages 65 and older in the U.S., the U.K., and Poland. In both absolute and relative terms, the average decrease is largest for ages 65 and older (4.6 hours, or 15.3 percent), followed by ages 15 to 24 (4.1 hours, or 12.4 percent), ages 55-64 (3.2 hours, or 9.0 percent), and ages 25 to 54 (3.1 hours, or 8.4 percent). As Appendix Chart A.2 shows, hours per worker also decreased in all three sectors, with hours on average decreasing by 4.2 hours in agriculture, 2.4 hours in manufacturing, and 3.1 hours in services.

Finally, the decline in hours per worker reflects a leftward shift in the entire hours distribution.

Chart 4A shows the change in the share working part-time, defined as working strictly less than 35 hours in a usual work week. Chart 4B shows the change in the share who work long hours, defined as working 50 hours or more in a usual work week. The part-time share increased in the majority of countries, on average by 3.8 percentage points, while the long-hours share decreased in all but two countries, on average by -3.1 percentage points. Both of these changes contribute to a decrease in average hours per worker. Moreover, over the sample period, average hours per worker also decreased conditional on working part-time (-1.0 hour), regular hours (-2.2 hours), and long hours (-4.1 hours).

Chart 3
Changes in Hours Per Worker Across Countries By Demographics, 1997-99 to 2017-19

Panel I: Change in Hours Per Worker by Gender



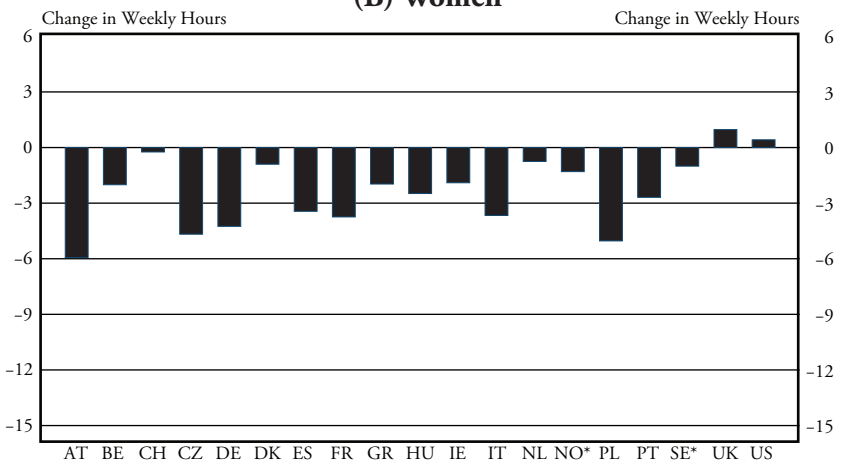
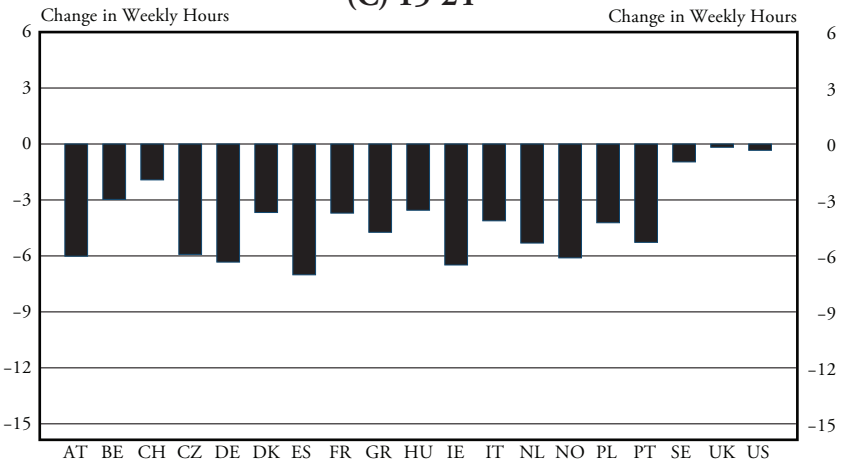


Chart 3 continued

Panel II: Change in Hours Per Worker by Age

(C) 15-24



(D) 25-24

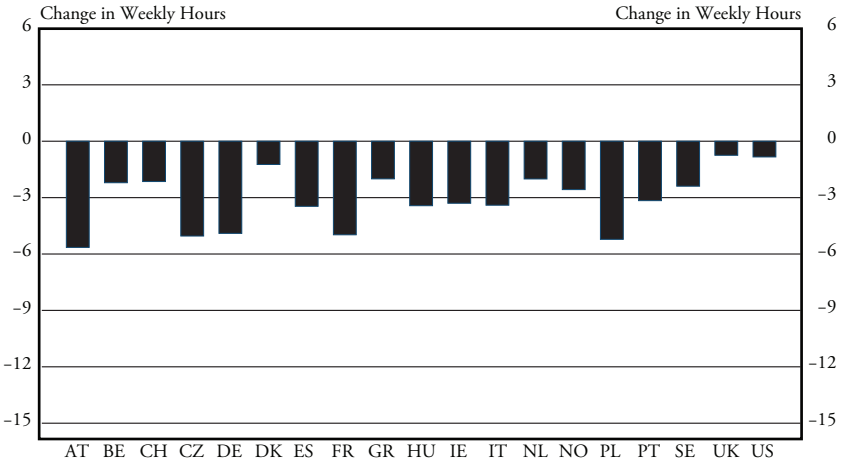
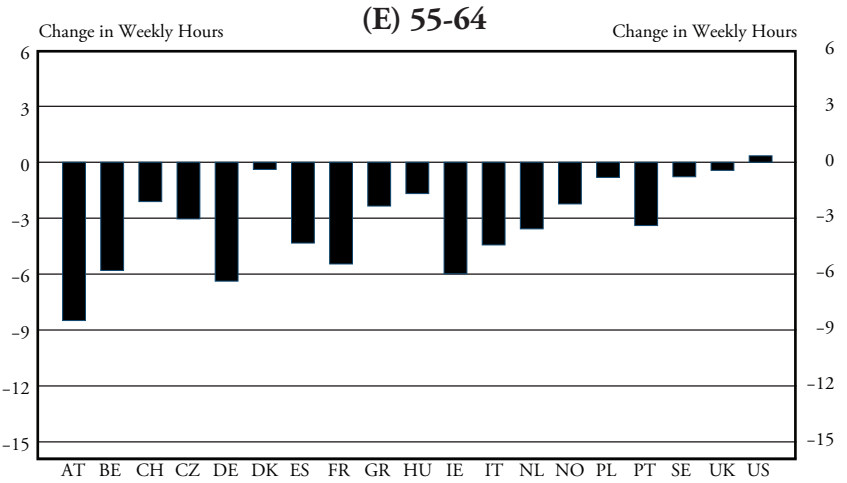
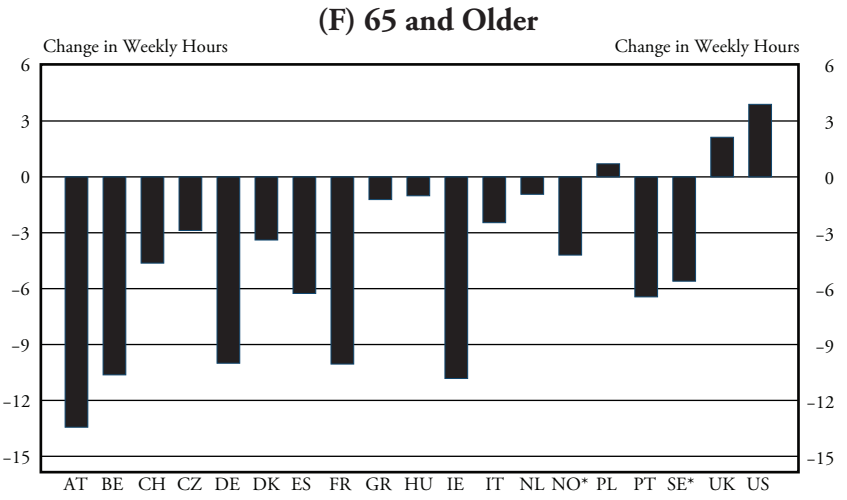


Chart 3 continued

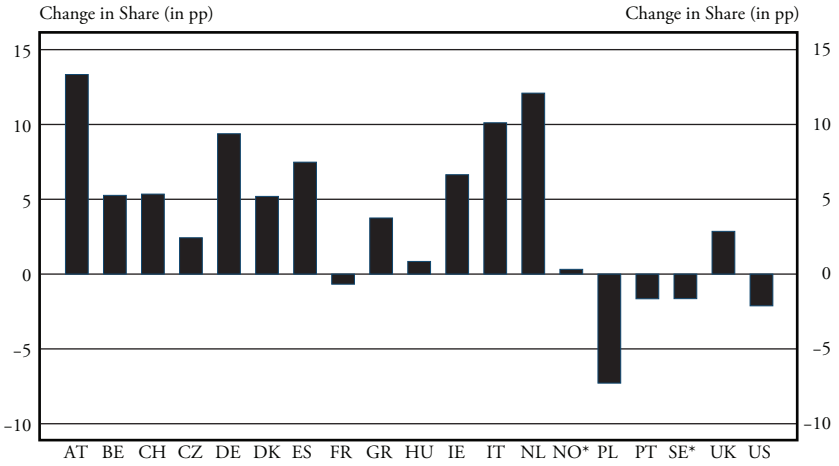




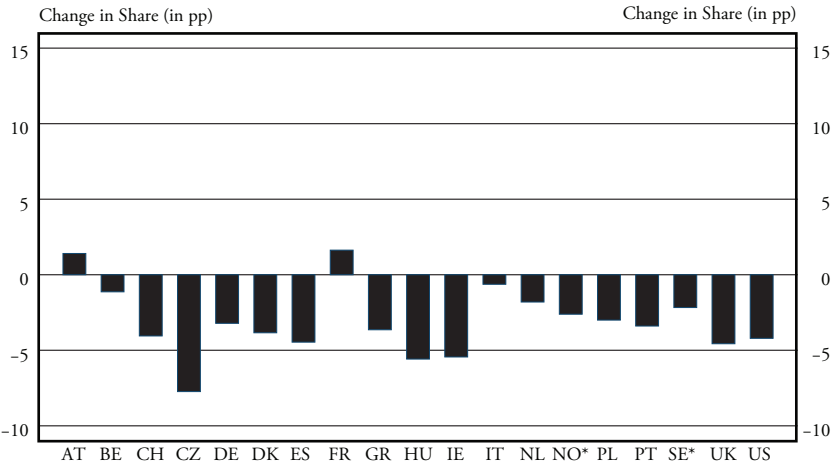
Note: This chart plots the change in hours per worker for all working individuals ages 15 and above between the average for 1997 to 1999 and the average for 2017 to 2019 across 18 European countries and the U.S. for different demographic groups. Panel I splits the sample into men and women, and Panel II splits the sample into four age groups. *For Norway and Sweden, individuals ages 75 and older are excluded.

Chart 4
Changes in Shares Working Part-Time and Long-Hours, 1997-99 to 2017-19

(A) Changes in Part-Time Shares



(B) Changes in Long-Hours Shares



Note: Chart 4A shows the change in the share of workers working part-time (strictly less than 35 usual hours per week) and Chart 4B the change in the share of workers working long hours (50 or more usual hours per week) in 18 European countries and the U.S. between the average values in 1997 to 1999 and the average values in 2017 to 2019. *For Norway and Sweden, individuals ages 75 and older are excluded.

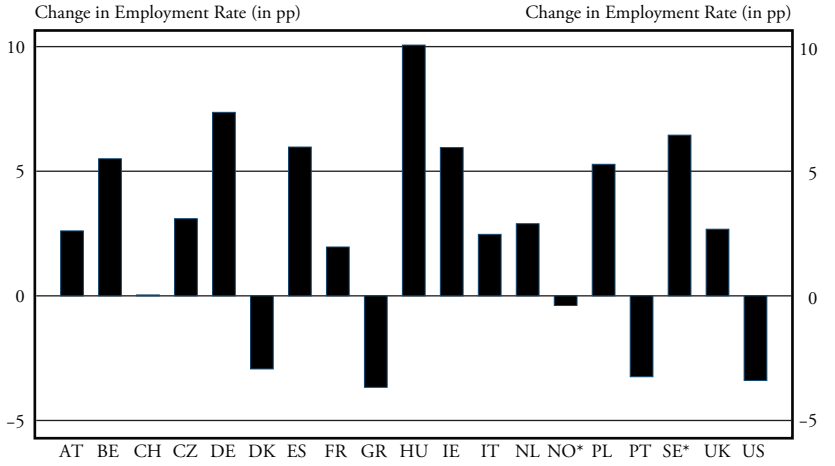
To summarize, from the late 1990s to the late 2010s, the intensive margin of hours worked decreased in Europe and the U.S. The decrease was large, with hours per worker on average falling 9.2 percent across countries. The decrease was also widespread across genders and ages and reflected a leftward shift of the entire hours distribution.

3.2.2 Mostly Increasing Employment Rates

In contrast to the widespread decrease in the intensive margin of hours worked, the extensive margin (the employment rate) increased in most countries over the sample period. Chart 5 displays the employment rate in our 19 sample countries from the late 1990s to the late 2010s.[8] The first takeaway from this figure is that, in contrast to the decline in hours per worker, employment increased on average over the sample period. Across all countries in our sample, the employment rate increases on average from 53.8 percent to 56.3 percent, a change of 2.5 percentage points, or 4.9 percent. If hours per worker would have stayed constant and only employment rates would have changed, this would have implied an increase in per capita output of 3.2 percent over the past two decades according to standard growth accounting. Alternatively, this increase can also be expressed as a 0.16 percentage point increase of the average annual growth rate of per capita output. This sizable increase in the extensive margin is nevertheless smaller in magnitude than the decrease in the intensive margin, implying an overall decrease in hours per person on average across countries. A second takeaway from Chart 5 is that the increase in employment is less uniform than the decrease in hours per worker. Employment increases in 14 of our 19 sample countries and decreases in five countries.

Chart 6 shows that employment increased fairly uniformly across countries among women and among workers over age 25. By contrast, two demographic groups who in many countries experienced a decline in employment were men and young workers. While female employment increased in 17 of 19 countries, male employment increased in only six countries and stayed essentially unchanged in two. Similarly, while employment increased in 15 countries for ages

Chart 5
Changes in Employment Rates Across Countries, 1997-99 to 2017-19



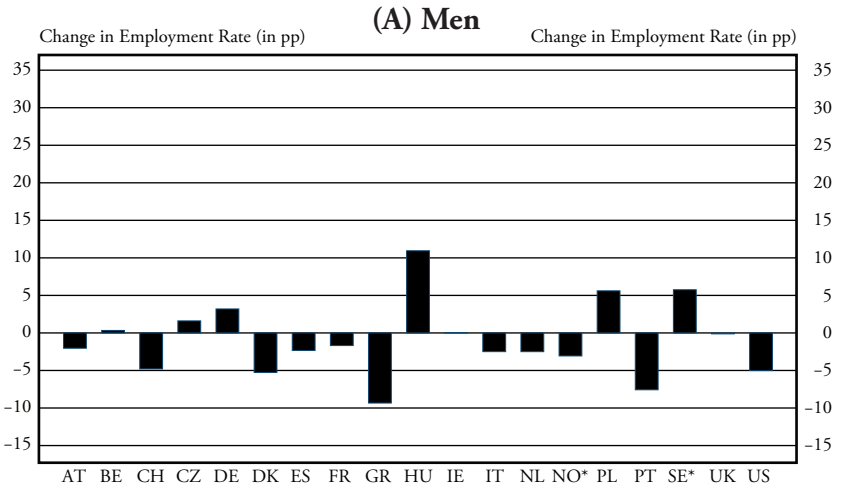
Note: This chart plots the change in employment rates among all individuals ages 15 and above between the average for 1997 to 1999 and the average for 2017 to 2019 across 18 European countries and the U.S. *For Norway and Sweden, individuals ages 75 and older are excluded.

25-54, all 19 countries for ages 55-64, and 16 countries for ages 65 and older, employment increased in only six countries for ages 15-24.[9,10]

One source of cross-country variation in employment trends are differential demographic trends. In the late 2010s, the average employment rate in our sample countries was 81.2 percent among the core working ages 25-54, compared to 60.0 percent for ages 55-64, 38.0 percent for ages 15-24, and 8.3 percent for ages 65 and older. These sizable level differences by age imply that population aging will exert downward pressure on employment (see, e.g., Aaronson et al., 2014, and Hornstein and Kudlyak, 2021). On the other hand, employment is strongly increasing in education. Again referring to the late 2010s, the average employment rate in our sample countries was 49.9 percent for individuals without a bachelor's degree compared to 74.7 percent for individuals with a bachelor's degree (among workers of core ages 25-54, the education-specific employment rates were 76.7 percent and 87.9 percent, respectively). Rising education levels over time will therefore exert upward pressure on employment (see, again, Aaronson et al., 2014, and Hornstein and Kudlyak, 2021).

Chart 6
Changes in Employment Rates Across Countries by Demographics, 1997-99 to 2017-19

Panel I: Change in Employment Rates By Gender



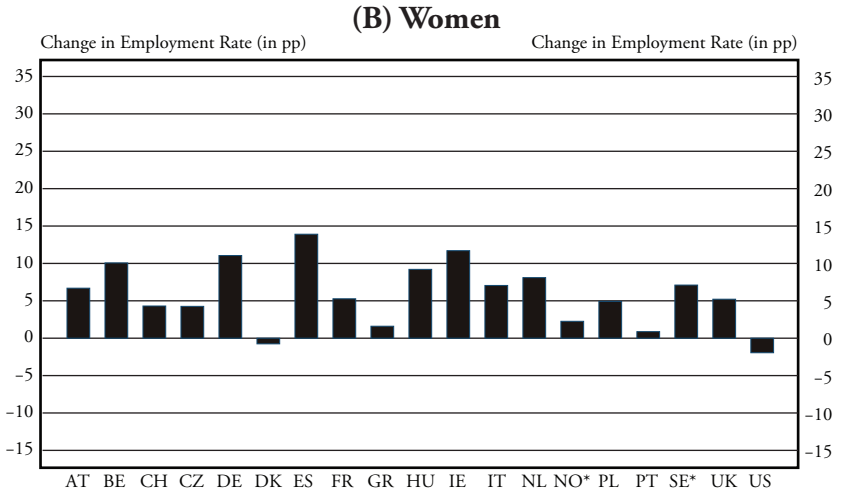
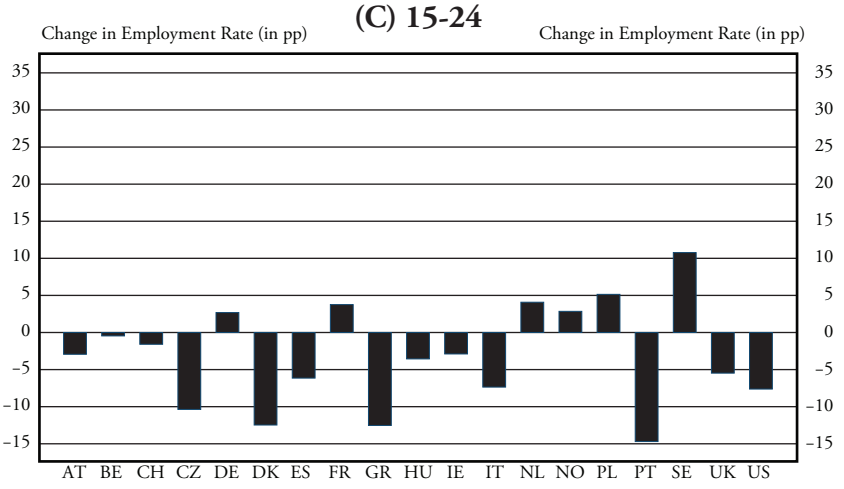


Chart 6 continued

Panel II: Change in Employment Rates by Age Groups

(C) 15-24



(D) 25-54

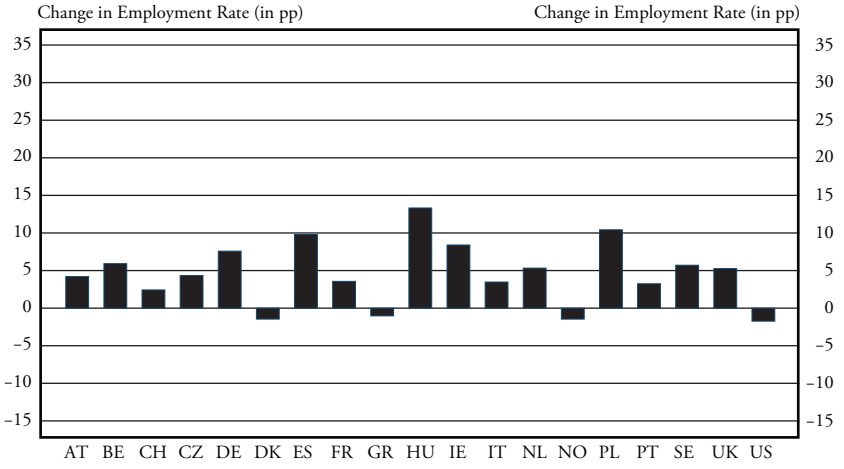
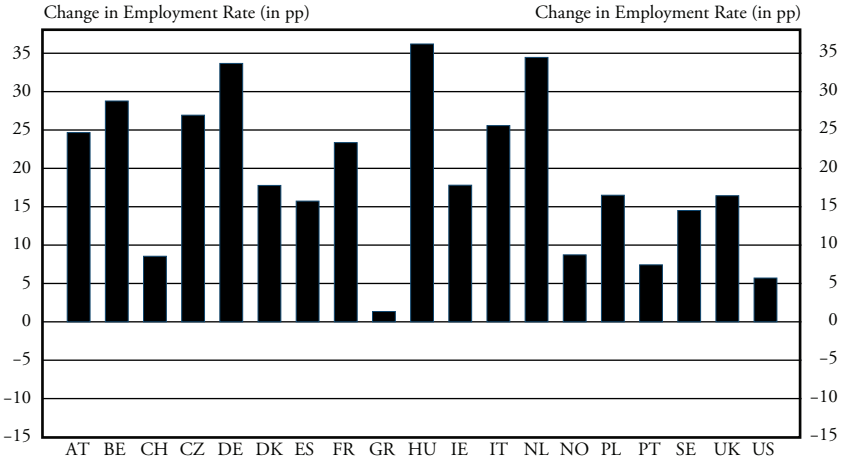
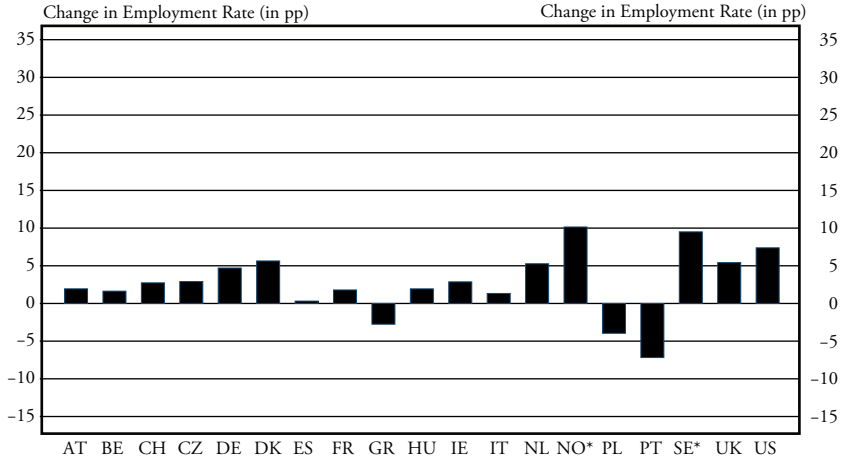


Chart 6 continued

(E) 55-64



(F) 65 and older



Note: This chart plots the change in employment rates for all individuals ages 15 and above between the average for 1997 to 1999 and the average for 2017 to 2019 across 18 European countries and the U.S. for different demographic groups. Panel I splits the sample into men and women, and Panel II splits the sample into four age groups. *For Norway and Sweden, individuals ages 75 and older are excluded.

To quantify the importance of these two demographic trends for cross-country trends in employment, we conduct the following shift-share analysis. Define $ER_{t,c}$ as the employment rate at time t in country c, $ER_{t,c,j}$ as the corresponding employment rate of group j in country c at time t, and $s_{t,c,j}$ as the population share of group j in country c at time t. Then we can decompose the change in the employment rate between 1999 (representing the average over the years 1997 to 1999) and 2019 (representing the average over the years 2017 to 2019) as

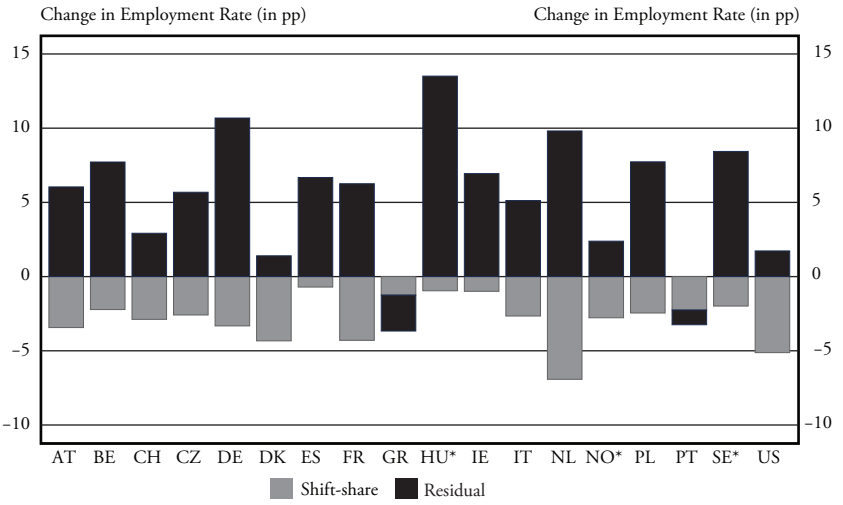
$$\begin{aligned} ER_{2019,c} - ER_{1999,c} &= \sum_{j=1}^{J} \left(s_{2019,c,j} ER_{2019,c,j} \right) - \sum_{j=1}^{J} \left(s_{1999,c,j} ER_{1999,c,j} \right) \\ &= \underbrace{\sum_{j=1}^{J} \left(s_{2019,c,j} s_{1999,c,j} \right) ER_{1999,c,j}}_{\text{shift-share component}} + \underbrace{s_{2019,c,j} \sum_{j=1}^{J} \left(ER_{2019,c,j} - ER_{1999,c,j} \right)}_{\text{residual component}}. \end{aligned}$$

The shift-share component captures the change in the employment rate if employment rates of all demographic groups would have remained at their levels of the late 1990s and only shares of the demographic groups within each country would have changed over time as they did in the data. Conversely, the residual component of the shift-share analysis captures the average change in employment rates within demographic groups, using their relative weights in the late 2010s in the aggregation.[11]

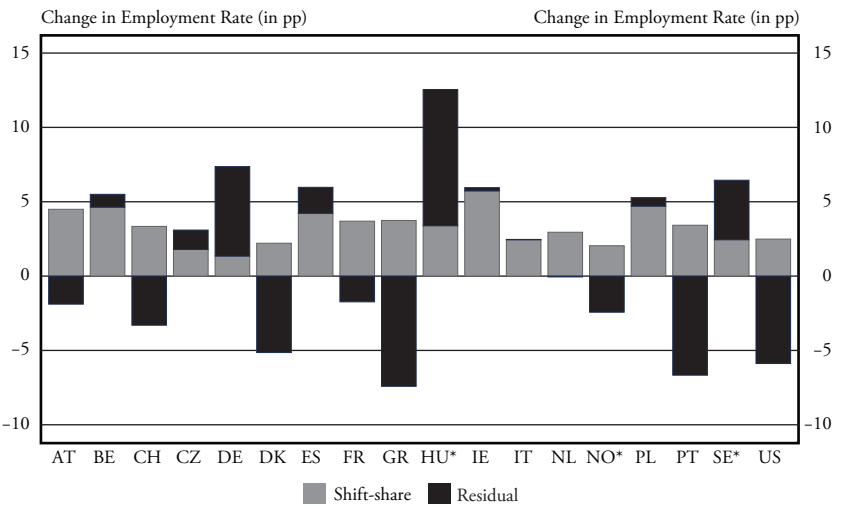
Chart 7A displays the results of the decomposition exercise using four age groups (15-24, 25-54, 55-64, 65 and older). The shift-share component is negative in all countries, implying that population aging uniformly decreased employment. Chart 7B uses only two education groups in the decomposition—those with and those without a bachelor's degree—and yields the opposite result to the decomposition based on age: Increasing shares of the population with a bachelor's degree uniformly increased employment. For the combined age-education decomposition (Chart 7C), the shift-share component is negative for most countries, indicating that the effect of aging on employment rates is stronger than the effect of increasing education. Accounting for the changes in the age and education composition, the residual component is positive in all sample countries except for Greece and Portugal. We conclude that the increase in employment is larger and more uniformly positive across countries after removing the effect of demographic trends.[12]

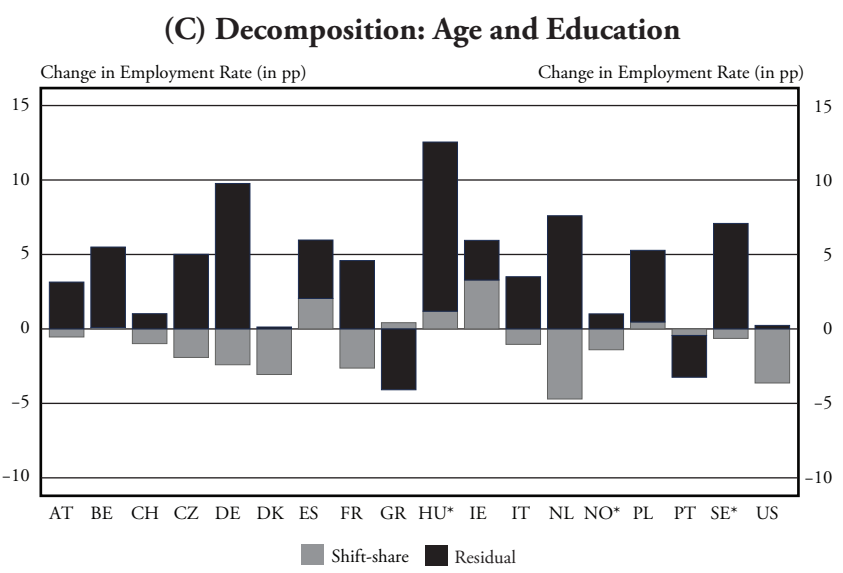
Chart 7
Shift-Share Decomposition of Employment Rate Changes, 1997-99 to 2017-19

(A) Decomposition: Age Only



(B) Decomposition: Education Only





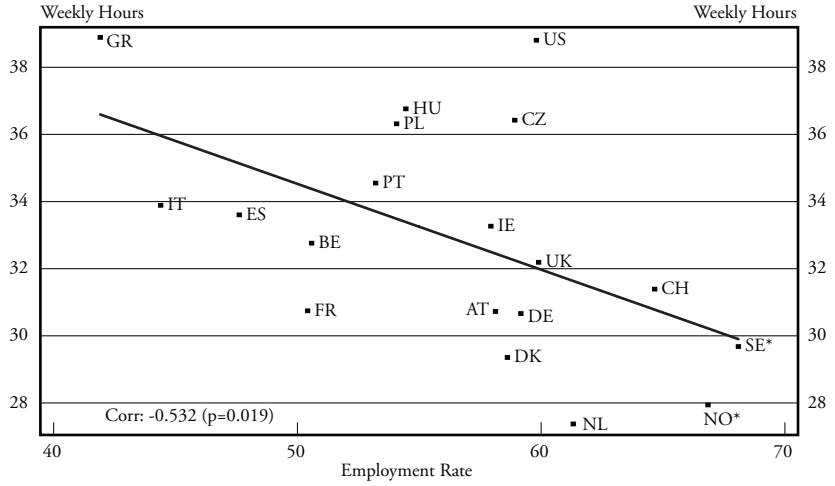
Note: This chart plots results from a shift-share analysis of employment rate changes between 1997 to 1999 and 2017 to 2019. Chart 7A uses four age groups: 15-24, 25-54, 55-64, and 65 and older. Chart 7B uses two education groups: with or without a bachelor's degree. Chart 7C uses the corresponding eight age-education groups. The U.K. is omitted from this figure due to missing education information for non-employed individuals ages 65 and older in 1997 to 1999. If an individual's education is missing, we assign the status via missing-at-random conditional on employment status. Specifically, we assume that the true education shares among the employed with missing education equal the reported education shares for the employed with non-missing education (and similar for the non-employed). *For Norway and Sweden, individuals ages 75 and older are excluded. For the shift-share analysis only, we also exclude individuals ages 75 and older for Hungary because in 1997 to 1999 education is missing for this age group (the change in the employment rate is 12.6 percentage points when dropping the age group 75 and older compared to 10.1 percentage points when including them)

3.2.3 Linking the Trends in Hours and Employment

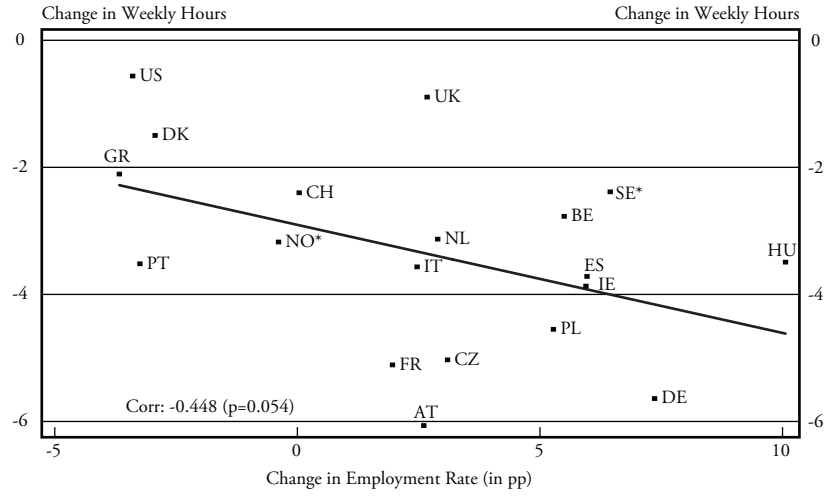
The previous subsections document that in the past two decades hours per worker decreased in every sample country and employment increased in most sample countries (especially after accounting for the effects of demographic trends). Are the opposing trends between hours per worker and employment rates linked? Before we turn to a theoretical model proposing a link between the two margins in Section 4, we present here some empirical evidence. Chart 8 shows a negative and significant cross-country correlation between hours per worker and employment rates both in the level in the recent cross-section (Chart 8A), with a correlation coefficient of -0.53, and, more importantly, in changes over the past two decades (Chart 8B), with a correlation coefficient of -0.45. Countries with high employment rates tend to have low hours per worker; moreover, countries experiencing larger increases in employment tend to experience larger

Chart 8
Correlation Between Hours Per Worker and Employment Rates, 1997-99 to 2017-19

(A) Cross-Section 2017-19



(B) Changes Between 1997-99 and 2017-19



Note: This chart plots hours per worker against employment rates in 18 European countries and the U.S. Chart 8A shows the correlation between average country values in levels in 2017 to 2019, while Chart 8B shows the correlation between changes over time between 1997 to 1999 and 2017 to 2019. *For Norway and Sweden, individuals ages 75 and older are excluded.

Chart 9
Post-War Employment and Hours Per Worker In the U.S., 1950 to 2019

Note: This chart plots the employment rate and average hours per worker for individuals ages 15 and above from 1950 (index=100) to 2019 in the U.S. The chart uses data from the FRED database: employment is the "EMRATIO" series and hours per worker is the "AVHWPEUSA065NRUG" series.

reductions in hours per worker. Adding more workers to the workforce thus does not necessarily imply increasing total hours worked. The U.S., with the smallest decrease in hours per worker and even a decrease in the employment rate between the late 1990s and the late 2010s, is at one extreme of the cross-country correlation but does not stand out in this correlation. Chart 9 shows that from a longer run perspective, the U.S. experience is also in line with the cross-country trends over the past two decades previously documented: The employment rate in 2019 is almost 10 percent above the 1950 level, while hours per worker are about 10 percent below the 1950 level.

We next turn to a model to interpret the fact that the two margins of labor supply moved in opposite directions over the past two decades.

4. Decreasing Fixed Costs as Driver of Negative Correlation

In this section, we discuss a highly stylized model that can generate opposing movements of the intensive and extensive margins of labor supply and is a modified version of the model presented in Bick et al. (2022c). The first key feature of the model is that individuals face fixed

costs of working, which introduces an extensive margin choice (Cogan, 1981). The second key feature is heterogeneity in the disutility of working, which generates heterogeneity in the intensive margin of labor supply. In this model, a decrease in the fixed costs of working leads to an increase in the share working (extensive margin) and a decrease in average hours per worker (intensive margin): The workers entering employment after a decrease in the fixed costs have higher labor disutility and thus work shorter hours than the already employed. The model also features other drivers of aggregate hours trends commonly discussed in the literature: taxes and transfers as well as income effects. However, in contrast to the negative correlation between the changes in hours per worker and changes in employment rates documented in Chart 8B, these other drivers cause both margins of labor supply to move in the same direction.

4.1 A Simple Model of Labor Supply

4.1.1 Environment

There is a unit mass of individuals i with preferences over consumption c_i and market work time h_i given by

$$\frac{c_i^{1-\frac{1}{\sigma}}-1}{1-\frac{1}{\sigma}}-\psi_i h_i - x\mathbb{1}(h_i>0). \tag{1}$$

Individuals are heterogeneous in their disutility from working $\Psi i > 0$, which should be interpreted as summarizing the net effect of several factors that impact the marginal utility of consumption relative to the marginal disutility of time devoted to market work. The distribution over work disutility is given by $F(\Psi)$. Individuals also face fixed utility costs of work χ: the indicator function $\mathbb{1}_{(h_i>0)}$ takes on a value of 1 if $h_i > 0$ and 0 otherwise.

All individuals receive a lump-sum transfer Υ from the government. Individuals who do not work simply consume $c_i = \Upsilon$. Individuals who do work face a budget constraint that is linear in hours h_i, and labor earnings are taxed at the rate τ:

$$c_i=(1-\tau)wh_i+\Upsilon. \tag{2}$$

For simplicity we neither model the firm side, the government budget constraint, nor the equilibrium that gives rise to the prevailing wage rate w, and simply take them as exogenous.

4.1.2 The Individual's Problem and Solution

An individual i solves the utility maximization problem:

$$u(c_i, h_i) = \max_{c_i, h_i \geq 0} \frac{c_i^{1-\frac{1}{\sigma}} - 1}{1-\frac{1}{\sigma}} - \psi_i h_i - \chi \mathbb{1}_{(h_i > 0)} \tag{3}$$

$$s.t.\ c_i = (1-\tau) w h_i + \Upsilon. \tag{4}$$

If the individual does work ($h_i = 0$), the solution is given by

$$h_i^o = 0 \tag{5}$$

$$c_i^o = \Upsilon. \tag{6}$$

If the individual does work ($h_i > 0$), the solution is given by

$$h_i^+ = \frac{\left[\frac{(1-\tau) w}{\psi i}\right]^{\frac{1}{\sigma}} - \Upsilon}{(1-\tau) w} \tag{7}$$

$$c_i^+ = \left[\frac{(1-\tau) w}{\psi i}\right]^{\frac{1}{\sigma}}. \tag{8}$$

An individual decides whether to work or not by simply comparing the implied utility of not working $u(c_i^0, h_i^0)$ to the utility of working $u(c_i^+, h_i^+)$:

$$(c_i^*, h_i^*) = arg \max_{(c_i, h_i)} \left\{ u(c_i^0, h_i^0),\ u(c_i^+, h_i^+) \right\}. \tag{9}$$

Solution Property 1: Conditional on not working, consumption c_i^* and utility are independent of the fixed costs of working χ.

Solution Property 2: Conditional on working, market work h_i^* and consumption c_i^* are independent of the fixed costs of working χ, and utility is decreasing in χ.

Solution Property 3: Conditional on working, market work h_i^*, consumption c_i^*, and utility are all decreasing in the individual disutility of work Ψ_i.

Solution Property 4: All else equal, the employment decision (i.e., whether to work or not) is summarized by a cutoff value of the disutility of work $\underline{\Psi}$. All individuals with $\Psi_i < \underline{\Psi}$. choose to work ($h_i^* > 0$), and all other individuals choose not to work ($h_i^* = 0$). The cutoff value $\underline{\Psi}$ is the value that equates the utility from working and not working.

4.1.3 The Impact of a Change in the Fixed Costs of Working

As a key result of our model, all else equal, a decrease in the fixed costs of working χ leads to an increase in employment and a decrease in average hours per worker.

Proof: By Solution Properties 1 and 2, a decrease in χ has no effect on the utility of not working and raises the utility of working. Therefore, by Solution Property 4, a decrease in χ will raise the cutoff value $\underline{\Psi}$, implying an increase in employment. Existing workers will work the same hours as before (Solution Property 2), and new workers will work less than existing workers (Solution Property 3), so overall work hours per worker will decline.

Thus, in this highly stylized model, the two margins of labor supply move in opposite directions after a change in the fixed costs of working. A decrease in the fixed costs of working draws more marginal workers—those with a higher disutility of working and thus lower optimal hours—into the workforce. As a result, the increase in the employment rate is accompanied by a decrease in average hours per worker. This decrease arises entirely due to a compositional effect in

this version of the model. We provide suggestive evidence for the presence of such a compositional effect in the next subsection.[13]

The model also incorporates other features that affect hours per person and that have been extensively analyzed in the literature, namely taxes and transfers (see, e.g., Prescott, 2004, and Rogerson, 2006) and income effects vs. substitution effects (see, e.g., Boppart and Krusell, 2020). If transfers increase, both employment rates and hours per worker in the model fall. If wages increase, the effect depends on the size of the income vs. substitution effect, i.e., on the value of the parameter σ, but again both margins of labor supply move in the same direction. The key point is that when these additional features generate changes in labor supply, they lead to intensive and extensive margin changes that move in the same direction, which contrasts with the main cross-country patterns documented in Section 3. These features can also explain why hours per person decrease, which cannot be generated by a decrease in fixed costs alone, because the hours of incumbent workers are unchanged in our basic setting.

4.1.4 Decreasing Fixed Costs of Working in Richer Models

Decreasing Hours among Incumbent Workers In the simple model above, a decrease in the fixed costs of working draws previously non-employed individuals into employment, who choose lower hours than the incumbent workers, which lowers average hours per worker. However, a decrease in the fixed costs has no impact on the hours of incumbent workers. Two natural extensions to the model would change this result, so that lower fixed costs of working would also induce incumbent workers to work fewer hours, thereby strengthening the negative relationship between the intensive and extensive margins.

The first extension would introduce couples who jointly decide their labor supply and share consumption. In such a setting, decreases in the fixed costs of working affect both total household hours and how these hours are spread among the two household members. If the fixed costs of working are high, it is optimal to have only one member of the household work, which is the member with the lower disutility of working, and have this person work relatively long hours. As fixed costs

decrease, the second household member starts working, which also reduces the optimal hours of the first earner.

Another possible extension would be to embed the model in a life-cycle set up, as in Rogerson and Wallenius (2009). In such a setting, a decrease in the fixed costs of working causes individuals to work more periods (e.g., to delay retirement). All else equal, this lowers the marginal utility of consumption and in response the individual works fewer hours each period.

Restrictions on Hours Choices In the model, workers can freely choose their optimal hours and earnings are linear in hours. However, a sizable literature points to evidence consistent with frictions in the hours choices of workers, such as the bunching of workers at certain points in the hours distribution and apparent "wage penalties" for workers who choose to work unusual hours levels (Barzel, 1973; Rosen, 1976; Moffitt, 1984; Aaronson and French, 2004; Bick et al., 2022b). Incorporating such frictions into the model would not affect the qualitative predictions relating to a decrease in the fixed costs of working, though it would dampen the impact on workers' responses.

Restrictions on hours choices or incentives to work a particular hours level could, among others, encompass regulations regarding the right to work part-time as well as government pension or health programs that condition benefits or costs on the amount of hours that an individual works. Direct cross-country evidence on these measures is scarce. For example, in 2010, the OECD created a generosity index regarding the rights of parents to work part-time that ranks the U.S. last among our sample countries. This low rank is consistent with a low share of part-time work among women in the U.S. as well as with the fact that the increase in employment for women in the core age group in the U.S. stopped at a lower employment rate than in the majority of the European countries.

Relatedly, in the U.S., the majority of workers receive health insurance through an employer-provided health care plan. The associated health insurance premia are typically independent of the employee's earnings and the employer pays the larger part of the health insurance premium. By contrast, in Europe, public health insurance is the

norm and, e.g., in Germany the health care premium is proportional to individual earnings (up to a cap). These institutional differences could also lead to different shares of part-time workers.

4.2 Evidence Consistent with Decreasing Fixed Costs of Working over Time

This section provides an array of evidence consistent with decreasing fixed costs of working over our sample period. We first point to indirect evidence that, consistent with the mechanics of the model, rising employment is largely driven by population groups with relatively high disutility of working. We then discuss a variety of more direct indicators of the fixed costs of working, ranging from social norms over workplace conditions to policies. Taken separately, each piece of evidence is only suggestive and is unlikely to quantitatively account for the entire trend in employment or hours per worker. Collectively, however, they point towards decreasing fixed costs of working in Europe and the U.S., and probably also other advanced economics, and might have a significant impact on labor supply.

Indirect Evidence of Compositional Effects In the model, a decrease in the fixed costs of working attracts individuals with a higher disutility of working into the workforce, and this composition effect lowers average hours per worker. Therefore, an increase in employment for individuals with high disutility of working can be viewed as indirect evidence of a decrease in the fixed costs of working.

One group that likely exhibits a high disutility of working is mothers, who on average spend a lot of time on child care and home production (see, e.g., Guryan et al., 2008). Women with children ages 0-14 indeed worked less than women without children across all sample countries and both observation periods (late 1990s and late 2010s), which is suggestive of their higher disutility of working. Consistent with decreasing fixed costs of working, over the sample period the employment rate increased more for mothers with children ages 0-14 than for women without children (11.0 percentage points vs. 6.5 percentage points).[14] Women as a whole might have a higher disutility of working than men. Together with decreasing fixed costs of working, this could explain the larger increase in women's employment rates than in men's (see Panel I of Chart 6). At the same time,

hours per working woman average 29 hours per week, substantially below the 36 hours per week average for working men in the later sample period. To sum up, increasing female employment is (i) an important driving force behind the increase in overall employment and (ii) contributing significantly to the decrease in average hours per worker.

Another group that likely exhibits a high disutility of working is older workers. Again, across all sample countries and both observation periods (late 1990s and late 2010s), workers ages 55 and older work less than workers of core ages 25-54. Consistent with decreasing fixed costs of working, over the sample period, the employment rate increased more for workers ages 55 and older than for workers of core ages 25-54 (9.2 percentage points vs. 4.6 percentage points).[15]

Together, increasing employment rates among mothers, women, and older workers, i.e., groups with plausibly higher average disutility from work, are consistent with recent decreases in the fixed costs of working for many individuals.

Social Norms As discussed in the previous paragraph, women and specifically mothers with children ages 0-14 saw above average increases in their employment rate. One possible explanation is that over our sample period, societies became more supportive toward working women and especially working mothers. We document this trend using data from the module on Family and Changing Gender Roles in the International Social Survey Programme (ISSP). We use data from the years 1994 and 2012, the two years closest to our sample start and end years, for the 11 of our sample countries that are also covered by the ISSP.[16] We then create two indices of support for working women, one for women in general and the other for mothers specifically (details on the data and the construction of the indices are in Appendix B). From 1994 to 2012, the share of the population supporting or strongly supporting positive statements regarding working women increased from 44.2 to 52.2 percent, an increase of 7.9 percentage points. The corresponding share for working mothers specifically increased from 49.2 to 58.4 percent, an increase of 9.2 percentage points.

It is likely that these large societal shifts have reduced the fixed costs of working for women in two ways. First, breaking social norms is inherently costly (see, e.g., Bertrand et al., 2015, and Bertrand, 2020). Therefore, greater public support for working women could have directly lowered the disutility of working for this group. Second, more favorable social norms towards working mothers might lead to more support infrastructure, e.g. to more comprehensive child care or more generous parental leave policies.

Working Conditions Through the lens of the model, the fixed cost of working is the additional disutility of the first hour of work relative to all subsequent hours worked. One determinant of the first hour's disutility is *when* that first hour needs to be supplied. For example, inflexible jobs that require workers to arrive at a workplace early in the morning every workday—which could affect workers' sleep schedules, make it difficult to care for children before school, and require longer commutes during rush hour—may entail a higher fixed costs of working relative to more flexible jobs.

Unfortunately, we do not have systematic evidence on workplace flexibility with comparable data over time and across countries. However, information for select countries points towards greater work flexibility over our sample period. For the U.S., in a special CPS supplement from 1997, 27.3 percent of U.S. workers indicated that they had flexible work schedules allowing them to change the time they began and ended work, while this was the case for 56.9 percent of the workers in the 2017-2018 American Time Use Survey (ATUS). One other country for which we have comparable data over time is Germany. Germany's institution of working-time accounts allows a subset of workers to flexibly allocate hours across days, weeks, or even longer periods. Based on the German Socio-Economic Panel, 17.5 percent of workers had access to working-time accounts in 2003 and this percentage increased to 21.5 percent in 2018, again suggesting an increase in work flexibility.

Another feature that likely affects the fixed costs of working is the ability to work from home. In Section 5, we provide evidence that work from home reduces the fixed costs of working through various channels, e.g. by avoiding a commute. Over our sample period,

work from home gradually increased in both the U.S. and Europe. In the ATUS, workers on average worked 12 percent of all workdays from home in 2003 and 16 percent in 2019 (see Chart 10A). In our European sample countries, the share of workers who usually or sometimes worked from home increased from 7.4 percent in 2008 to 9.6 percent in 2019. Using French administrative data, Barbanchon et al. (2021) find that gender differences in commute valuation can account for a 0.5 log point lower hourly wage for women compared to men. This suggests that the increased opportunities to work from home might increase the propensity to work especially for women. We discuss the surge in work from home following the COVID pandemic in Section 5.

Another recent development is the 4-percentage-point (36 percent) increase between 1997 and 2016 in taxpayers who are self-employed but non-employers; see Abraham et al. (2018). Relatedly, Lim et al. (2019) document a 1.5-percentage-point (22 percent) increase between 2001 and 2016 in the share of workers with income receipt from independent contract (IC) work—often also referred to as contingent work—based on administrative tax data. Kass (2022) documents that the second most stated reason for contingent work is schedule flexibility (mentioned by about a quarter of the respondents; the top reason is enjoying being their own boss/independence). The fastest growing group of IC recipients were in the bottom quartile of the overall earnings distribution and primarily received IC income, and women experienced stronger growth in IC income receipt than men (Lim et al., 2019). This suggests that the growth in IC labor in the U.S. expands beyond individuals seeking supplemental income and may represent a structural shift in the labor market, again particularly for women. Part of the increase in IC work is related to the emergence of gig work. Collins et al. (2019) document that by 2016 about 1 percent of the workforce was working (not necessarily exclusively) for online platforms. For Europe, an Internet survey run by the Joint Research Center of the EU found that in 2018, 11 percent of Internet users ages 16-74 reported having provided labor services via an online platform at some point in the past (Brancati et al., 2020). Lim et al. (2019) show that smaller firms saw more growth in IC labor usage than larger firms, which suggests that the

long run growth in IC labor in the U.S. expands beyond a few online platform firms and rather represents a broader shift.

Government Policies Last, policies affect the incentives to work. The simplest way to consider government policies in the context of our model is by adding transfers conditional on working to the budget constraint. Introducing a transfer conditional on working, e.g. the earned income tax credit (EITC), effectively decreases the threshold of working $\overline{\Psi}$. As a consequence, more workers with a high disutility of working enter the workforce, thereby increasing the employment rate and decreasing average hours per worker (on the EITC, see, e.g., Eissa and Liebman, 1996, and Meyer and Rosenbaum, 2001). Policies such as welfare or pension policies can be thought of as the opposite, namely transfers conditional on not working. Reducing the generosity of these systems effectively reduces the threshold of working and thus again increases the employment rate and reduces hours per worker. We already cite in Section 3.2.2 some of the literature that documents the different elements of pension reforms undertaken over the past two decades in the sample countries to improve the sustainability of social security systems. For context, the mean gross pension replacement rate of men with average earnings in our sample countries fell from 57.8 percent in 2005 to 53.1 percent in 2018, and the mean statutory retirement age increased from 64.7 to 66.9 over the same time period (OECD, 2005, and OECD, 2019). These reforms are likely to continue into the future, given the aging of the Western societies. Other policies also were reformed over time. For example, again according to the OECD, the net replacement rate in unemployment insurance payments for a single person without children earning the average wage decreased from 57.9 percent in 2001 to 56.2 percent in 2019 in our sample countries. Yet, in contrast to pension policies, it is less clear in which direction these policies will be reformed in the future.

4.3 A Quantitative Model with Fixed Costs of Working

The analysis in the previous subsection does not address whether the mechanisms that we emphasize can quantitatively explain the

hours and employment trends documented in Section 3. However, in related work Bick et al. (2022c) estimate a richer variant of the model presented here which offers some assurance that our mechanisms are quantitatively important. That model incorporates income effects and a tax-transfer system that gets more expansive as countries grow richer, which help explain decreasing hours per person, but also allows for fixed costs of working that can vary with development. The estimation strategy backs out the latter as a wedge that is needed to explain the change in employment rates and hours per worker between low-and high-income countries, after allowing for a dominating income effect and increasing tax-transfer systems. Rather than using time-series data from one country, the data moments reflect variation across countries of different income levels. Reassuringly, the cross-country patterns line up closely with U.S. time-series data.

Bick et al. (2022c) show that the estimated model explains the full cross-country patterns beyond the targeted moments well, providing confidence in the estimated model. The paper then proceeds by predicting employment rates and hours into the future under the assumption that the tax-transfer system continues to increase and fixed costs of working continue to decrease as countries grow richer in the same way as they did in the past. The model predicts that decreasing fixed costs of working will increase employment rates despite the fact that a dominating income effect and an increasing tax-transfer system depress employment. These latter two features also predict lower hours per worker, an effect amplified by the decreasing fixed costs of working.[17] However, increasing employment and decreasing hours per worker effectively offset each other. As a result, hours per person barely change over the next few decades.

5. Fixed Costs of Working since COVID-19

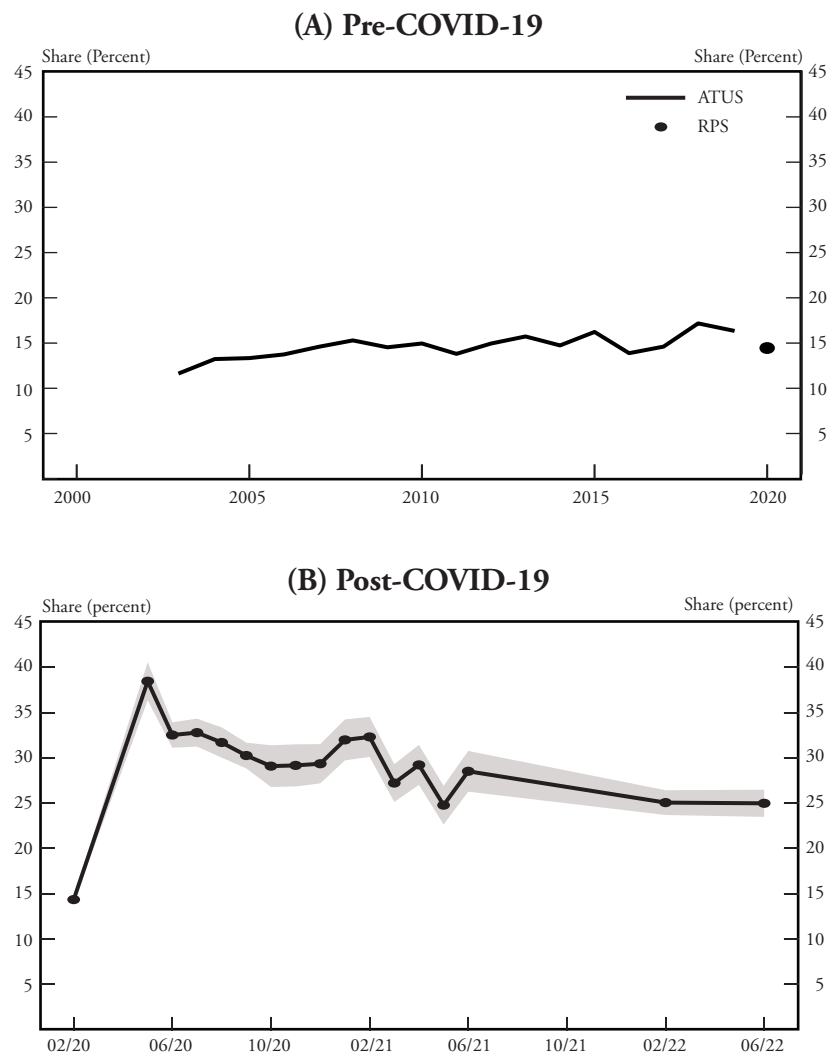
The COVID-19 pandemic had dramatic effects on the labor market, with several factors causing the drop in employment during the first two years. The pandemic itself can be viewed as a temporary increase in the fixed costs of working, directly through health costs and indirectly through school and child-care closures and government mandated lockdowns. In this section, we provide evidence that (i) in response to this, work arrangements changed in a way that possibly lowered

the fixed costs of working for many individuals and (ii) these effects are likely to persist beyond the pandemic itself. Through the lens of the model in Section 4, such reductions in fixed costs will, *ceteris paribus*, further reduce the intensive margin of labor supply even as they increase the extensive margin.

To investigate the impact of the pandemic on the fixed costs of working, we leverage the Survey of Work Costs and Flexibility (SWCF), a novel national labor market survey of adults ages 18-70 administered in June 2022. The survey was designed by the authors and fielded online by Qualtrics, a large commercial survey provider. The SWCF mirrors the CPS along key dimensions, borrowing questions on demographics and labor market outcomes in the basic CPS and CPS Outgoing Rotation Group as outlined in the CPS Interviewing Manual (U.S. Census Bureau, 2015). In particular, it replicates the sequence of questions that the CPS uses to assign labor market status. However, the survey also collects information on work arrangements, work flexibility, and the nature of work not contained in the CPS.[18] The survey collected responses from 4,358 individuals between June 12 and June 22, 2022. As in the CPS, the SWCF also asks respondents to answer the same questions on behalf of spouses or any unmarried partners in the same household, yielding a final sample of 6,864 observations. The survey sample was selected to be representative of the U.S. in several demographic dimensions, and sample weights were constructed so that the sample aligns with the CPS along an even richer set of targets (see Appendix C for details).

Work from Home One factor already mentioned in Section 4.2 that could potentially reduce the fixed costs of working today and in the future is work from home. Chart 10 combines data from the ATUS, the Real-Time Population Survey (Bick and Blandin, 2022), and the SWCF to document the evolution of work from home in the U.S. over the past two decades and specifically since the start of the pandemic. Chart 10A shows that work from home was relatively rare prior to the COVID pandemic, although it was gradually becoming more common: The share of workdays from home increased from 12 percent in 2003 to 16 percent in 2019. Chart 10B shows that work from home surged at the outset of the pandemic, increasing from 14

Chart 10
Share of Workdays Worked Entirely From Home in the U.S., 2003-2022



Note: This chart plots the share of workdays worked entirely from home in the U.S. from 2003 to 2022. Data from 2003 to 2019 are from the ATUS. Data from 2020 to 2021 are from the Real-Time Population Survey (RPS). Data from February 2022 are from a follow-up survey to the RPS, and data from June 2022 are from the SWCF. All data points are for individuals ages 18-64.

Table 1
Share Who Multi-Tasked at Main Job Last Week (percent)

	Shopping online	Shopping in person	Cooking	Laundry	Cleaning	Bills	Family	Job Search	Any
Work from Home	42	27	35	37	34	35	18	8	70
Commute Only	26	21	20	20	20	25	9	7	47
Difference	16	6	15	17	14	10	9	1	23

Note: This table reports the among the respondents in the SWCF who were employed and worked in the reference week the share who performed each of those activities at least once last week during their normal work hours of their main job by their commuting status. The work from home category includes individuals who work from home every workday or at least some workdays.

percent in February 2020 to 40 percent in May 2020. Work from home subsequently declined as the pandemic progressed, but as of June 2022, 25 percent of workdays were still worked entirely from home, nearly double the pre-pandemic level.[19] Bick et al. (2022a) show that over 60 percent of workers who began working from home during the pandemic did so because of greater access to work from home, suggesting that the pandemic may have unlocked new and potentially long-lasting work arrangements, rather than temporarily changing workers' commuting preferences. Consistent with this, the work from home share has barely decreased over the past few months and workers expect 21 percent of workdays to be still entirely worked from home one year later in June 2023.[20] Collectively, the evidence suggests that elevated rates of work from home are likely to persist.

The rise in work from home directly reduced the fixed costs of commuting. In the SWCF, average weekly commuting time fell from 266 minutes just before the pandemic to 222 minutes in June 2022, a decline of 44 minutes per week, or 17 percent. This was primarily driven by a decline in days commuted, which fell by 12 percent.

The SWCF also contains two pieces of suggestive evidence that work from home could reduce the fixed costs of working beyond the direct effect of avoiding a commute. First, workers who work from home report higher rates of multi-tasking during normal work hours. Table 1 displays the share of workers who reported doing any of the following during their main job's normal work hours in the previous week: shopping, cooking, laundry, cleaning, paying bills, caring for family, or searching for a new job. For each specific task, the reported

share is higher among workers who worked at least one full day from home relative to workers who commuted every workday. Across all tasks, the average difference in the share of workers who did any of these activities at least once in the previous work week was 11 percentage points. Overall, 70 percent of workers who worked at least one day from home reported to have done at least one task, compared to only 47 percent of workers who commuted every day.[21]

Second, individuals who can work from home may be able to relocate geographically without changing jobs, which should reduce the fixed costs of working—especially for dual-career couples. To measure this, the SWCF asks workers, *"If you wanted to, could you move out of state and keep your current job?"*[22] We classify workers as able to "work from anywhere" if (i) their current main job does not require them to commute and (ii) they report that they could move anywhere in the U.S. and keep their current job. In the SWCF, 11 percent of respondents indicate that they can work from anywhere now, while only 5 percent indicate they could have done so just before the COVID pandemic. So the share of workers who could "work from anywhere" more than doubled during the pandemic.

Last, consistent with our model's prediction that lower fixed costs of working attract marginal workers, rates of work from home are higher for demographic groups that likely have a higher disutility of working. In the SWCF, 16 percent of women worked entirely from home in the previous week versus 13 percent of men. Similarly, 18 percent of workers ages 55-64 worked entirely from home, compared to 13 percent of workers below age 55.

Flexible Work Hours Another factor lowering the fixed costs of working we mention in Section 4.2 is flexibility in deciding when to start and stop work during the day. In the SWCF, the share of workers with flexible hours increased by 9 percentage points between June 2022 and just before the pandemic. This increase at least partly reflects the recent increase in work from home: 45 percent of workers who commute full time report flexible hours, compared with 74 percent of workers who worked from home at least one day in the previous week.

In summary, a variety of recent evidence suggests that the fixed costs of working have fallen during the COVID-19 pandemic and that this decrease will likely persist beyond the pandemic itself.

6. Conclusion

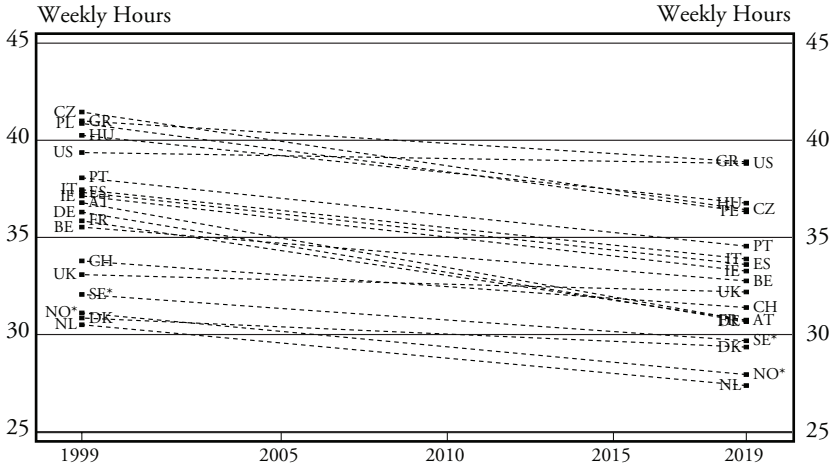
In this paper, we show that labor market trends over the last two decades have been dominated by trends in hours per worker. Thus, when projecting labor supply and potential output into the future, hours per worker require at least as much attention as employment. We argue that decreasing fixed costs of working can generate the evidence of increasing employment rates and decreasing hours per worker, with a negative cross-country correlation between the two trends. Income effects and increasing tax and transfer systems are additional features that put negative pressure on both margins of labor supply.

Our findings point to several open issues for future research. First, we need a thorough measurement of factors affecting the fixed costs of working. Second, the response of both margins of labor supply to decreasing fixed costs is possibly more muted in some countries than in others. Understanding which features of the labor market and government policies contribute to this differential response would be helpful for projecting the impact of further decreases in the fixed costs of working. Third, the changing composition of the workforce with decreasing fixed costs of working could also affect the responsiveness of labor to business cycle shocks, monetary policy shocks, and tax policy shocks. These issues clearly deserve attention by policy makers.

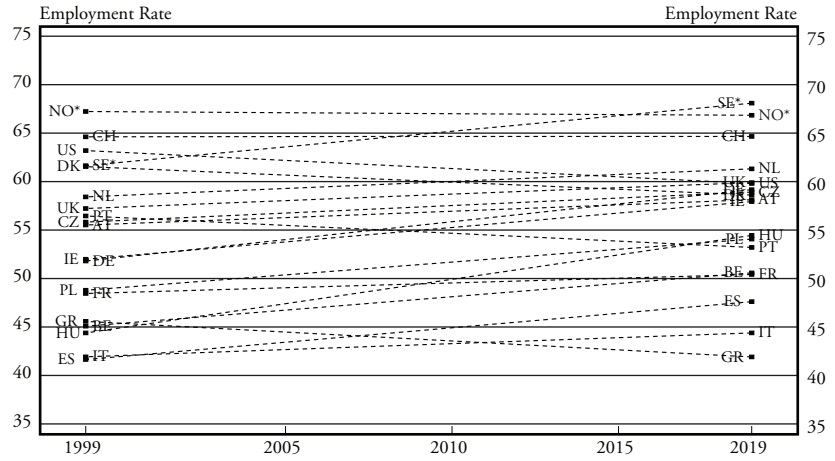
A. Appendix Charts and Tables

Chart A.1
Hours Per Worker and Employment Rates Across Countries, 1997-99 to 2017-19

(A) Levels of Hours Per Worker



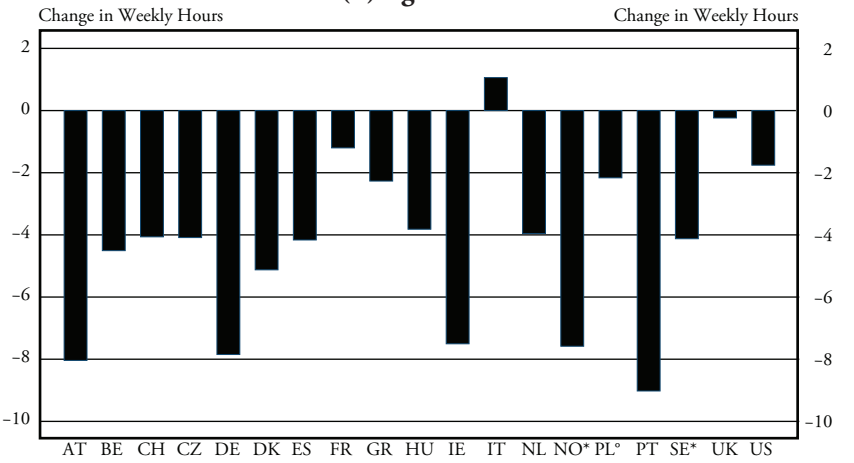
(B) Levels of Employment Rates



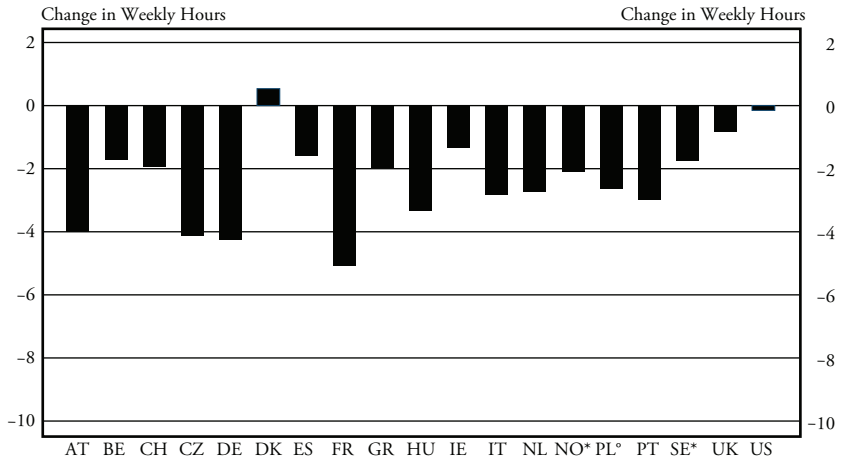
Note: This chart plots weekly hours per worker ages 15 and above in Chart A.1(A) and employment rates among the population ages 15 and above in Chart A.1(B) across 18 European countries and the U.S. Each figure shows averages for 1997 to 1999, assigned to the year 1999, as well as in 2017 to 2019, assigned to the year 2019. *For Norway and Sweden, individuals ages 75 and older are excluded.

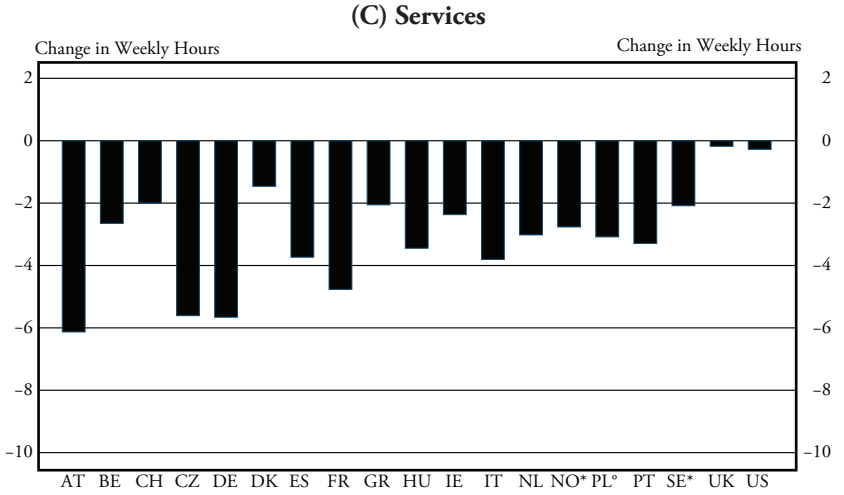
Chart A.2
Changes in Hours per Worker Across Countries by Sector, 1997-99 to 2017-19

(A) Agriculture



(B) Manufacturing





Note: This chart plots the change in hours per worker for all working individuals ages 15 and above between the averages of 1997 to 1999 and the averages of 2017 to 2019 across 18 European countries and the U.S. by sector of employment. *For Norway and Sweden, individuals ages 75 and older are excluded. For Poland, sectoral data is only available since 2000, and we use average over the years 2000 to 2002 as the starting point.

Chart A.3
Changes in Male Employment Rates Across Countries by Age Groups, 1997-99 to 2017-19

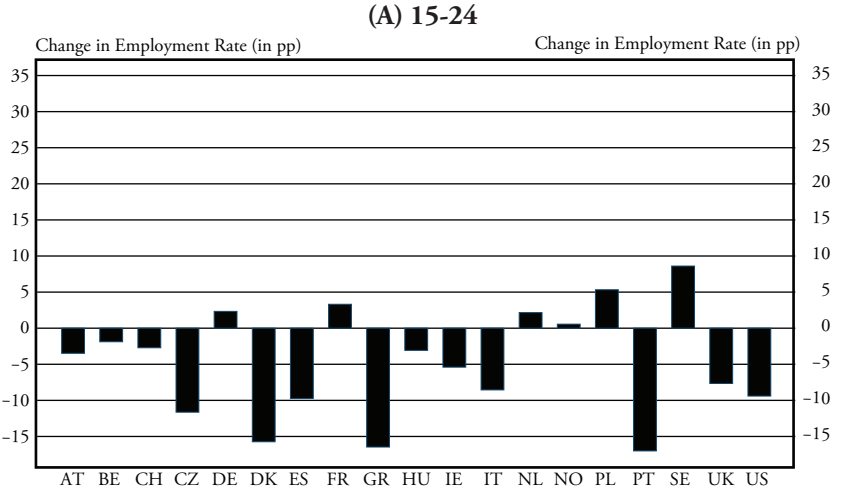
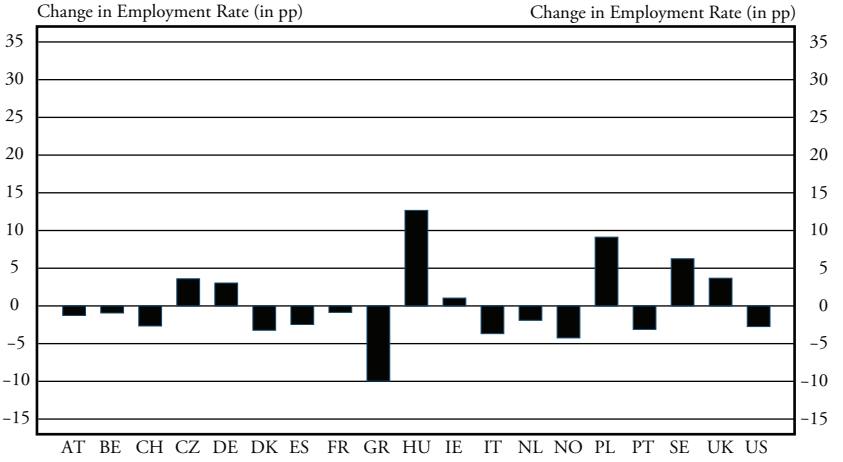


Chart A3 continued

(B) 25-54



(C) 55-64

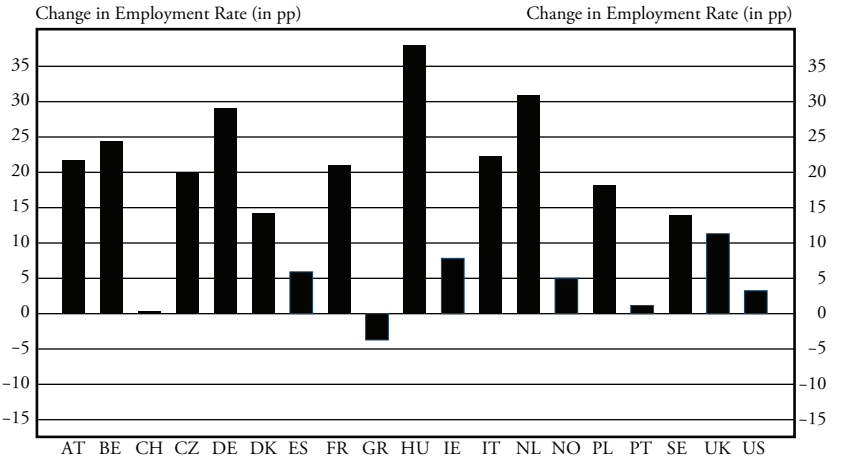
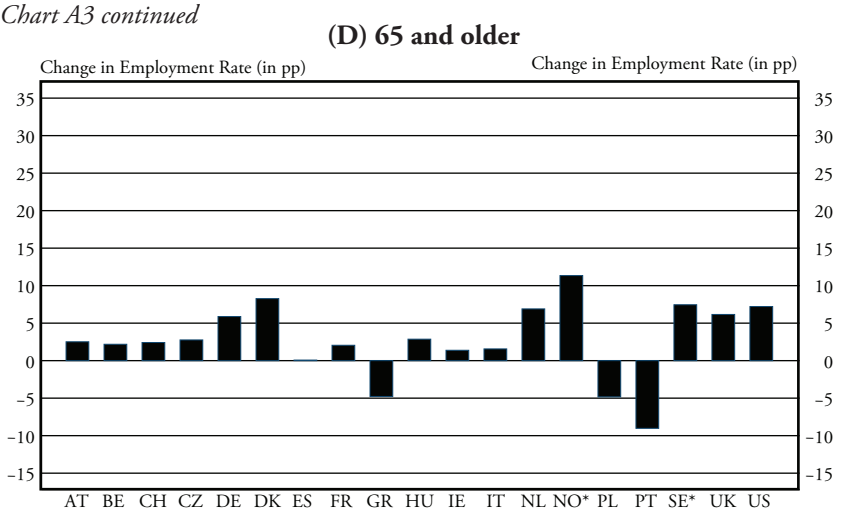


Chart A3 continued



Note: This chart plots the change in employment rates for all working individuals ages 15 and above between the averages of 1997 to 1999 and the averages of 2017 to 2019 across 18 European countries and the U.S. for different age groups. *For Norway and Sweden, individuals ages 75 and older are excluded.

Chart A.4
Shift-Share Decomposition of Employment Rate Changes for Men, 1997-99 to 2017-19

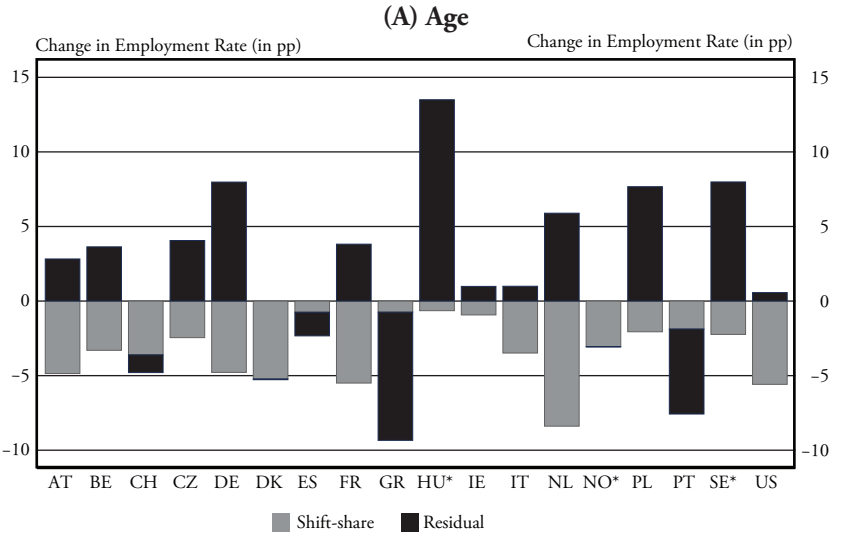
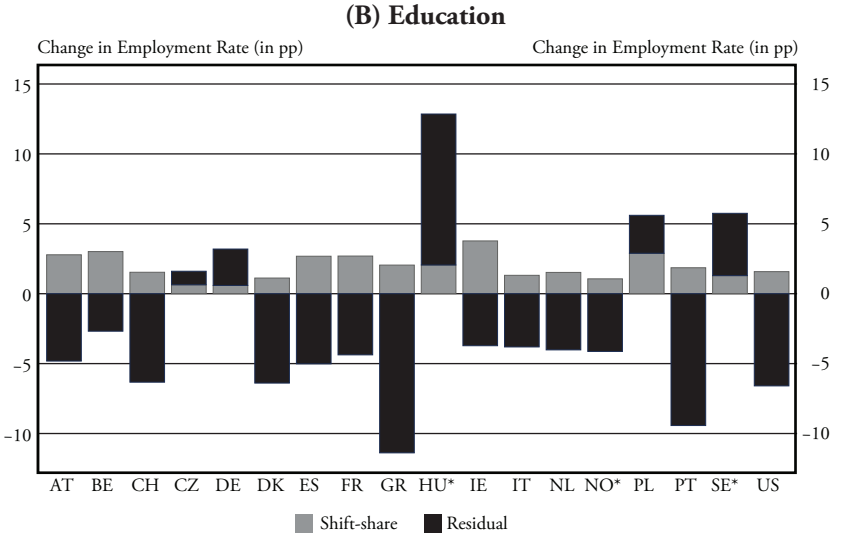
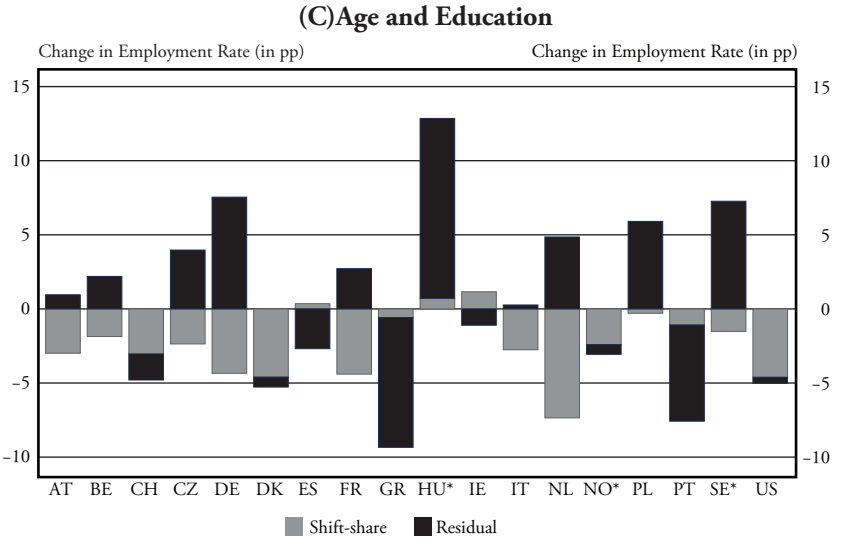


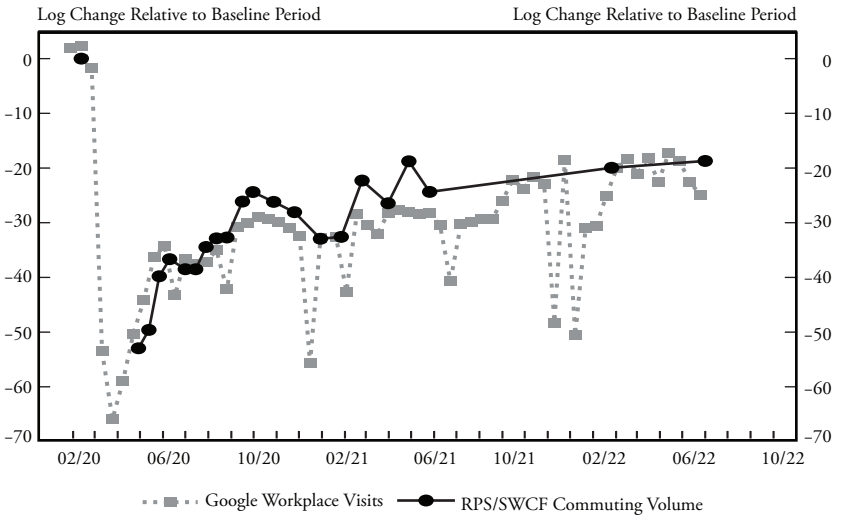
Chart A.4 continued





Note: This chart plots results from a shift-share analysis of employment rate changes for men between 1997 to 1999 and 2017 to 2019. Chart A.4(A) uses four age groups: 15-24, 25-54, 55-64, and 65 and older. Chart A.4(B) uses two education groups: with or without a bachelor's degree. Chart A.4(C) uses the corresponding eight education-age groups. The U.K. is omitted from this figure due to missing education information for non-employed individuals ages 65 and older in 1997 to 1999. If an individual's education is missing, we assign the status via missing-at-random conditional on employment status. Specifically, we assume that the true education shares among the employed with missing education equal the reported education shares for the employed with non-missing education (and similar for the non-employed). *For Norway and Sweden, individuals ages 75 and older are excluded. For the shift-share analysis only, we also exclude individuals ages 75 and older for Hungary because in 1997 to 1999 education is missing for this age group.

Chart A.5
Commuting Volume in Google Mobility Data and Our Surveys



Note: This chart plots Google Workplace visits, expressed in log changes relative to a baseline period of Jan. 3 to Feb. 6, 2020, and commuting volume in the RPS from May 2020 to February 2022 and the SWCF for June 2022, expressed as the log change relative to February 2020. In the RPS and SWCF, respondents also provide retrospective information about February 2020, just before the COVID-19 pandemic. Commuting volume in the RPS and SWCF is the weighted average of the number of commuting trips reported by all survey respondents, with a value of zero for those not working.

B. International Social Survey Programme

We use the ISSP module "Family and Changing Gender Roles" to construct suggestive evidence on changing attitudes towards working women and working mothers, respectively. We rely on statements about working women and working mothers to which ISSP respondents could voice their agreement or disagreement on a 5-point scale. These data are available for 10 European countries (Austria, Czech Republic, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, Sweden, and the U.K.) and the U.S. for the years 1994 and 2012.

To create an index on attitudes towards working women, we use these five statements:

1. All in all, family life suffers when the woman has a full-time job.

2. A job is all right, but what most women really want is a home and children.

3. Being a housewife is just as fulfilling as working for pay.

4. A man's job is to earn money; a woman's job is to look after the home and family.

5. Both the man and woman should contribute to the household income.

To create an index on attitudes towards working mothers, we use these two statements:

6. A working mother can establish just as warm and secure a relationship with her children as a mother who does not work.

7. A pre-school child is likely to suffer if his or her mother works.

For all statements, respondents could select their answer on a scale from 1 ("strongly agree") to 5 ("strongly disagree"). To ensure consistency, we recoded questions 5 and 6 such that the highest score always represents the most progressive attitude towards women.

After organizing the individual-level data, we compute the share of progressive answers to each question, defined as answers stating 4 ("disagree") or 5 ("strongly disagree"), per country and year. We then construct a country-level progressivity index reflecting the attitudes towards working women (mothers) by calculating the average share of progressive answers across questions 1-5 (6-7). Finally, we take the simple average across countries' progressivity indices to obtain a yearly cross-country progressivity index.

C. Survey of Work Costs and Flexibility

C.1 Overview

Our data source is the SWCF, a national labor market survey of 4,358 adults ages 18-70, which we ran from June 20 through June 28, 2022. We also asked respondents to provide the same information about their spouses or partners if they lived in the same household, which provided an extra 2,615 observations. The survey was designed by the authors and fielded online by Qualtrics, a large commercial survey provider, and follows the survey methodology described in Bick and Blandin (2022).

The survey mirrors the CPS along key dimensions. In particular, the survey follows questions on demographics and labor market outcomes in the basic CPS and CPS Outgoing Rotation Group as outlined in the CPS Interviewing Manual (U.S. Census Bureau, 2015), using the same word-for-word phrasing when practical, and replicates the intricate sequence of questions necessary to assign labor market status. However, the survey also collects information not contained in the CPS that is more specifically relevant for our analysis. In particular, we use novel questions on commuting behavior, job flexibility, and desired hours. Like the CPS, our survey asks respondents to report their labor market status in the week prior to the interview.[23] Unlike the CPS, the survey also consistently asks respondents to report retrospectively on their labor market status during February 2020, the month prior to the declaration of the global pandemic by the World Health Organization. This allows us to measure individual-level changes in outcomes with respect to a pre-pandemic baseline.

C.2 Sample

Online panels such as Qualtrics are commonly used by academics for survey research as well as by federal agencies for survey pre-testing and evaluation.[24] Qualtrics provides access to members of online panels who have agreed to participate in surveys, and those participating in and completing our survey receive 30 to 50 percent of the $5 we paid per completed survey. The Qualtrics panel includes about 15 million members and is not a random sample of the U.S. population, even if one would condition on the 94 percent of individuals ages 18-64 living in households with internet access according to the 2019 American Community Survey. This is in contrast to the CPS which is a probability based sample. However, researchers can direct Qualtrics to target survey invitations to desired demographic groups. In our case, the sample was targeted to be nationally representative for the U.S. along several broad demographic characteristics: gender, age, race and ethnicity, education, marital status, number of children in the household, Census region, and household income in 2020.

Even with the sampling targets, there remain some potential concerns about the representativeness of the sample for the population of U.S. adults ages 18-70. First, the targets are not always met exactly. Second, the characteristics of live-in spouses and partners are not taken into account by the Qualtrics sampling procedure. Third, budget constraints limit our sample size, preventing even greater granularity in the sampling targets. To alleviate these concerns, we construct sample weights using the iterative proportional fitting (raking) algorithm of Deming and Stephan (1940). Our application of the raking algorithm ensures that the weighted sample proportions across key demographic characteristics match those in the CPS for the same month, using more disaggregated categories for education and marital status than those included in the Qualtrics sampling targets and interacting categories with gender. In addition, our sampling weights also replicate the employment rate in February 2020 in the CPS, as well as the employed-at-work rates, the employment rates, and the labor force participation rates in June 2022. We match these key labor market statistics not only in the aggregate but also conditional on demographic characteristics.[25]

We discard 1.6 percent of the sample for whom we could either not construct a labor market status or one of the background variables used in the targeting procedure because a relevant question was skipped. The resulting sample consists of 6,864 individual-level observations.

Author's Note: We thank Mariia Bondar, Elisabeth Harding, and Teresa Schildmann for outstanding research assistance. We thank Jason Faberman, Carlos Garriga, Bart Hobijn, Lydia Johnson, Julian Kozlowski, Jeffrey Lacker, Karel Mertens, B Ravikumar, Todd Schoellman, and Mark Wright for helpful discussions. Fuchs-Schündeln gratefully acknowledges financial support from the European Research Council under the ERC Consolidator Grant No. 815378 and from the DFG under the Leibniz-Preis. The views in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of St. Louis or the Federal Reserve System. All potential errors are our own.

Endnotes

[1]In the entire post-war period, hours per worker decrease in all of our sample countries. The tendency for employment rates to increase at the same time is in turn a more recent phenomenon.

[2]This literature traces lower hours in Europe to several potential causes, including labor income taxation (e.g., Prescott, 2004; Rogerson, 2006; Faggio and Nickell, 2007; Olovsson, 2009; McDaniel, 2011; Bick and Fuchs-Schündeln, 2018), institutions (Alesina et al., 2005; Faggio and Nickell, 2007), and social security systems (Erosa et al., 2012; Wallenius, 2013; Alonso-Ortiz, 2014). Olivetti and Petrongolo (2017) documents longer run trends of female employment across OECD countries through 2016, but do not consider the intensive margin or trends of male employment.

[3]Boppart and Krusell (2020) show theoretically that in the presence of a dominating income effect, decreases in hours per person are consistent with balanced growth.

[4]Recent trends in employment for the U.S. have been the subject of investigation in an active literature. Olsson (2020) and Albanesi and Prados (2022) explore quantitative explanations behind the stagnating employment rate of married women since the mid-1990s. Potential explanations for the decreasing employment and labor force participation rate of U.S working-age men range from demand side-factors—like the decline of manufacturing, accelerated by import competition coming from China (Autor et al., 2013) and increases in automation (Acemoglu and Restrepo, 2020)—over supply-side factors—like the opioid crisis (Krueger, 2017 and Greenwood et al., 2022), increasing video game usage (Aguiar et al., 2021), and decreasing marriage rates and thus decreasing roles of bread winners (Binder, 2021)—to broader societal issues—like high incarceration rates accompanied by low employment rates of former inmates (Mueller-Smith, 2015).

[5]This age limit is present in Sweden from 2010 onwards and in Norway until 2018. To make the data internally consistent over time for each country, we impose an upper age limit of 74 for both countries throughout.

[6]This measure faces two challenges: (i) differences in the sampling of reference weeks across countries and over time and (ii) underreporting of vacation days. In Bick et al. (2019a), we describe in detail how both challenges affect measurement.

[7]Appendix Chart A.1A shows the country-specific levels of hours per worker in addition to the decrease, analogous to Chart 1A.

[8]Appendix Chart A.1B shows the country-specific levels of employment rates in addition to the change, analogous to Chart 1A.

[9]Part of the decrease in employment rates for the age group 15-24 is accounted for by increases in the share enrolled in full-time education.

[10]In almost all countries, the largest increases in employment rates are among 55-64 year olds, with an average increase of 19.2 percentage points. This pattern also holds for men, see Chart A.3 in the Appendix. These increases are at least partly driven by substantial pension policy reforms in Europe during our sample period to increase the sustainability of public pensions in the light of population aging. These reforms involved reducing early retirement benefits, raising statutory pension ages, and introducing sustainability factors (see, e.g., Whiteford and Whitehouse, 2006, and Carone et al., 2016).

[11]Note that within-group changes in employment rates could reflect within-group changes in other demographic characteristics (e.g., changing rates of marriage or the number of children over time).

[12]Chart A.4 in the Appendix shows that this also holds true for the male sample: the residual component, indicating changes in employment rates within age-education groups, holding their weights constant, is positive in nine countries. This is in contrast to only six countries with a positive change in the employment rate for men in Chart 6.

[13]Note that Hobijn and Şahin (2021) point out that cyclical movements in labor force participation are not driven by marginal workers. However, we are analyzing trends in employment generated by changes in fixed costs, so this evidence is not contradictory.

[14]We do not observe the presence of children in Denmark, Norway, Poland, Sweden, and Switzerland. For the U.S., the age category is children ages 0-13 years.

[15]For men, the increase in the employment rate of individuals ages 65 or older alone is also larger than the increase in the employment rate of the core age group; see Chart A.3 in the Appendix. For women, part of the increase in employment rates in the core age group is a cohort effect: Younger cohorts entering the labor market were raised with more progressive gender attitudes. A discussion of such social norms follows further below.

[16]These are Austria, the Czech Republic, Germany, Hungary, Ireland, the Netherlands, Norway, Poland, Sweden, the U.K. and the U.S.

[17]The link between decreasing fixed costs of working and decreasing hours per worker in Bick et al. (2022c) is slightly different from the model presented here because the model in Bick et al. (2022c) (i) features heterogeneity in the fixed utility costs of working (χ) rather than in the disutility of hours worked (ψ) and (ii) relies on intra-household insurance.

[18]The SWCF is modeled after the Real-Time Population Survey (RPS). See Bick and Blandin (2022) for additional details on the survey design and implementation, as well as a host of validation exercises documenting similar estimates in the CPS and RPS.

[19]Chart A.5 compares commuting volume from February 2020 through June 2022 in Google mobility data and in the labor market surveys used to construct estimates of work from home in Chart 10B. Both series display similar levels and time trends for commuting during the pandemic, which provides validation for our work from home estimates.

[20]Starting in December 2020, respondents in the Real-Time Population Survey stated their expectations about work from home one year ahead. The expectations stated in February 2021 and June 2021 for February 2022 and June 2022, respectively, lined up closely with the actual realizations.

[21]A non-trivial share of commute only workers report tasks like cooking, laundry, and cleaning that may seem difficult to complete at the workplace. However, our classification scheme only requires that commute-only workers commute each workday, it does not rule out working from home for part of a workday.

[22]The answer options were (a) "No," (b) "Yes, but I would need to live in a nearby state," (c) "Yes, I could move anywhere in the country and keep my current job," and (d) "Yes, I could move anywhere in the world and keep my current job."

[23]Fielding of the survey started on Monday, June 20, 2022. Questions regarding the last week thus referred to the week June 12-June 18, 2022 (respondents were provided those dates explicitly), which was the June CPS reference week. By Friday night, June 24, 2022, we had collected 3,173 responses and paused the survey until Monday morning, June 27, 2022. The remaining 1,185 responses were collected by June 28, 2022. To avoid confusion, for any respondent answering the survey on June 27 or 28, we changed the dates of the reference week to June 19-June 25, 2022.

[24]See Yu et al. (2019) for an overview of online survey methods and and how these methods are used by the U.S. Census Bureau and Bureau of Labor Statistics. The Qualtrics platform has been widely used in economic research in experimental settings, see, e.g., Bursztyn et al. (2014), Kuziemko et al. (2015), Bhargava et al. (2017), and Zimmermann (2020), and more recently in the context of the COVID-19 pandemic, see, e.g., Adams-Prassl et al. (2020), and Knotek II et al. (2020).

[25]These demographics are gender, age (18-24, 25-34, 35-44, 45-54, 55-64, 65-70), race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, all other racial and ethnic groups), education (high school or less, some college or associate's degree, bachelor's degree or more), marital status (married + spouse present, never married, other), relationship status (spouse living in the same household, partner living in the same household, other), presence of children in the household (yes or no), and region (Midwest, Northeast, South, and West, using the Census definition).

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