

This Time It's Different: The Role of Women's Employment in a Pandemic Recession*

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Abstract

In recent US recessions, employment losses have been much larger for men than for women. In the current recession caused by the Covid-19 pandemic the opposite is true: unemployment is higher among women. In this paper, we analyze the causes and consequences of this phenomenon. We argue that women experience sharp employment losses in part because women's employment is concentrated in heavily affected sectors such as restaurants, but also because increased childcare needs due to school and daycare closures prevent many women from working. We analyze the repercussions of these facts using a quantitative macroeconomic model featuring heterogeneity in gender, marital status, childcare needs, and human capital. Our quantitative analysis suggests that a pandemic recession will i) feature a strong transmission from employment to aggregate demand due to diminished within-household insurance; ii) result in a widening of the gender wage gap throughout the recovery; iii) contribute to a weakening of gender norms that currently lead to a lopsided distribution of the division of labor in home work and child care.

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1 Introduction

Economic fluctuations display a number of regularities, such as comovement of output across sectors and higher volatility in aggregate investment than in aggregate consumption. These observations motivated Robert Lucas to famously claim that “business cycles are all alike” (Lucas 1977), and business cycle theory has been devoted to accounting for these regularities ever since.

As a consequence of the Covid-19 pandemic, in 2020 the United States and other countries entered the sharpest contraction in economic activity since the Great Depression. While this contraction displays some of the regularities of other economic downturns, in other dimensions it is unlike any other in recent history. Understanding the differences between regular and pandemic recessions is a key challenge for research, both to further our understanding of the shape of the recovery from the current downturn, and to inform policy responses to possible future pandemic recessions.

In this paper, we argue that a crucial difference between regular recessions and the current downturn lies in the role of and implications for women’s employment. We document that in recent recessions preceding the current crisis, men were more severely affected by employment losses. The disproportionate impact of recessions on men was particularly pronounced in the Great Recession that followed the financial crisis of 2007–2008, which gave wide currency to the term “mancession” for this and earlier downturns.

The Covid-19 recession reverses the usual pattern. This time, it is women rather than men who experience larger employment losses and higher unemployment. In the United States, women’s unemployment increased by 12.8 percentage points between February and April 2020, versus an increase of only 9.9 percentage points for men. Changes in employment rates (which also accounts for transitions into and out of the labor force) display the same pattern, with a substantially larger decline in employment for women compared to men during the crisis. Similar patterns are observed in other countries affected by the pandemic.

We identify two main causes of the large impact of the current pandemic recession on women in the labor market. Both relate to the fact that the recession was in large part triggered by the “lockdown,” i.e., social distancing measures, business shutdowns, and stay-at-home orders that were implemented during the pandemic.

The first cause relates to the impact of a lockdown recession on different sectors of the

economy. Regular recessions lead to large employment losses in sectors with a high male employment share, such as construction and manufacturing. In contrast, the current recession had the biggest impact on high-contact service sectors such as restaurants, hospitality, and travel, which were severely affected by social distancing. These are sectors where many women work, and hence women suffer a large share of the employment losses during the crisis.

The second cause of the large impact of the lockdown on working women relates to childcare. During the lockdown period, schools and daycare centers were closed and children were sent home. This massively increased families' childcare needs during working hours. We document in [Alon et al. \(2020a\)](#) that before the crisis, mothers took responsibility for a much larger share of childcare than fathers. In part, this is because there are many more single moms than single dads, and many more stay-at-home mothers than stay-at-home fathers. But even among married parents who both work full time, women spend more than 40 percent more time on childcare than men do. This lopsided division of labor is sustained in the crisis: women pick up a larger share of the extra childcare duties during the lockdown than men do. As a result, more women than men are unable to work either full time or at all during the crisis.

We examine the wider implications of the impact of a pandemic recession on working women using a macroeconomic model with rich household heterogeneity. In the model, we distinguish women and men, single and married households, and households with and without kids. Households decide on consumption, labor supply, and savings, and households with kids have to decide on how to meet childcare needs. The labor market is subject to search frictions: workers may lose jobs, and unemployed workers have to wait for job offers. Workers who receive job offers decide whether to accept or reject the offer, and if they accept, whether to choose full-time or part-time work. The skills of employed workers increase over time due to returns to experience, whereas the skills of workers who are out of employment depreciate. Workers' ability to combine work with childcare responsibilities depends on their occupation; specifically, workers who can telecommute have an easier time meeting childcare needs. The division of labor within the household is in part governed by a social norm: there is a fraction of "traditional" households who favor that the mother rather than the father provide most childcare.

We use our macroeconomic model to compare the repercussions of a regular recession and those of a pandemic recession such as the current one. We model regular recessions as a temporary shift in job destruction rates and job finding probabilities, calibrated

to capture the larger impact of regular recessions on men's compared to women's employment. In contrast, a pandemic recession has an equally large impact on men's and women's labor market opportunities. In addition, a pandemic recession also incorporates a large increase in parents' childcare needs, which captures the effects of school and daycare closures. This shock leads to additional endogenous employment reductions, as some parents reduce hours or drop out of the labor force to take care of their children. We also allow for the possibility that a pandemic recession has a persistent effect on job characteristics (more jobs with the ability to telecommute) and on social norms (fewer traditional couples).

We calibrate the model to match a number of data moments for the US economy. The quantitative model successfully captures the much larger impact of a pandemic recession on women's employment compared to a regular recession. We find that regular and pandemic recessions not only affect women and men differently, but also differ in their aggregate impact on consumption, savings, and labor supply in the economy. In part, this is because a pandemic recession has a large impact on parents, whose marginal propensities to consume and save differ from those of average households. Single parents have an especially limited ability to offset income shocks, and hence income shocks have a large impact on their consumption.

The most important channel for distinct macro implications of regular and pandemic recessions concerns the role of within-family insurance. In regular recessions, given that men are more likely to lose jobs than women, many wives are able to partly compensate for a loss of earnings of their husbands by joining the labor force or working more. In line with recent findings in the literature, our model implies that such insurance in the family serves as an important shock absorber. In aggregate terms, within-family insurance lowers the transmission of aggregate income shocks into aggregate consumption during a regular recession. In contrast, we find that within-family insurance is more limited during a pandemic recession. In families with children, the increased childcare needs during the lockdown rule out increasing the labor supply of many secondary earners. Even in families without children, the fact that in a pandemic recession women and men are equally likely to lose jobs and face the same difficulties in finding new jobs limits possibilities for within-family insurance.

Taken together, these channels imply that in a pandemic recession, a shock to aggregate employment of a given size is transmitted more strongly into aggregate consumption and thus aggregate demand. In a setting where aggregate demand partly determines

output, all else equal in a pandemic recession we would observe a greater amplification of the initial shock, a deeper recession, and potentially a delayed recovery. In our analysis, we focus on the household sector and do not spell out such an aggregate demand channel explicitly. Rather, we view our analysis as characterizing one key element of the distinct aggregate consequences of regular versus pandemic recessions, which could then be combined with other relevant channels.

Our quantitative analysis also generates distinct implications of regular versus pandemic recessions for gender inequality in the labor market during the downturn and throughout the recovery. Workers who lose employment also lose skills, so that differences in the employment impact of recessions on women and men translate over time into changes in the gender wage gap. Given that regular recessions affect men more, they moderately reduce the gender wage gap. In contrast, a pandemic recession depreciates the skills of women who reduce hours or drop out of the labor force, leading to a substantial widening of the wage gap that persists after the recession.

Nevertheless, our analysis also suggests that over a long horizon, a pandemic recession ultimately reduces gender gaps in the labor market. Even though women do the majority of childcare, our model implies that during a pandemic recession fathers, too, substantially increase the time they spend on childcare. Moreover, there is an increase in the number of married couples where the husband is the primary provider of childcare. We conjecture that these changes erode social norms that underlie the unequal distribution of childcare between women and men and ultimately increase the share of “modern” couples with egalitarian social norms. We also conjecture that the wide adoption of working-from-home arrangements by employers during the crisis will have a persistent effect on the share of telecommutable jobs in the economy. Together, these changes imply that in the “new normal” after a pandemic recession the share of women in the labor force will ultimately be higher and the gender wage gap lower compared to the pre-recession economy.

Our work contributes to a growing literature on the role of women’s employment in economic fluctuations. In December 2019, women accounted for the majority of the US labor force for the first time, capping a decades-long convergence between male and female employment. Yet for a long time, most business cycle models were “unisex” models that did not allow for gender differences, and many macroeconomic studies of labor supply were calibrated to data on men’s employment only. More recently, studies such as [Albanesi \(2020\)](#) and [Fukui, Nakamura, and Steinsson \(2019\)](#) have argued

that the role of women in aggregate fluctuations has changed substantially over time due to rising female labor force participation. [Albanesi \(2020\)](#) provides evidence that women’s employment plays a crucial role in phenomena including jobless recoveries, the productivity slowdown, and the great moderation. [Bardoczy \(2020\)](#) argues that joint household-decision making is an important determinant of the transmission of macroeconomic shocks. Other contributions to the literature on women’s employment and household decision-making within macroeconomics include [Ortigueira and Siassi \(2013\)](#), [Doepke and Tertilt \(2016\)](#), [Mankart and Oikonomou \(2017\)](#), [Borella, De Nardi, and Yang \(2018\)](#), [Mennuni \(2019\)](#), [Olsson \(2019\)](#), and [Wang \(2019\)](#).¹ Also, [Albanesi and Şahin \(2018\)](#) and [Coskun and Dalgic \(2020\)](#) point out the impact of the industry composition of employment by gender for the different cyclicalities of male and female employment, which is a key element of how we model the impact of regular recessions.

One of the central mechanisms in our theory is within-family insurance of job loss and income shocks. In the labor literature, [Lundberg \(1985\)](#) introduced the notion of the “added worker effect,” i.e., a worker joining the labor force in response to their spouse’s job loss. More recent studies supporting an important role for within-family insurance include [Attanasio, Low, and Sánchez-Marcos \(2005\)](#), [Blundell, Pistaferri, and Saporta-Eksten \(2016, 2018\)](#), [Birinci \(2019\)](#), [García-Pérez and Rendon \(2020\)](#), [Pruitt and Turner \(2020\)](#), and [Guner, Kulikova, and Valladares-Esteban \(2020\)](#). The impact of within-family insurance on job search is analyzed in [Guler, Guvenen, and Violante \(2012\)](#) and [Pilossoph and Wee \(2020\)](#). [Ellieroth \(2019\)](#) uses a joint-search model similar to our setting to characterize the quantitative importance of within-household insurance over the business cycle. Unlike existing search models with within-family insurance, our model allows for the accumulation and depreciation of human capital, incorporates single and married households, accounts for childcare needs, and allows for different occupations and social norms. All of these features play a central role in our analysis.

Our work also contributes to a rapidly growing literature on the macroeconomic consequences of the Covid-19 recession. Much of this literature combines epidemiological and economic modeling to examine how policy interventions and endogenous behavioral adjustments shape the evolution of the pandemic and its macroeconomic consequences ([Eichenbaum, Rebelo, and Trabandt 2020](#), [Berger, Herkenhoff, and Mongey 2020](#), [Glover et al. 2020](#), and [Brotherhood et al. 2020](#), among others). Unlike this literature, we do not model the pandemic explicitly, but rather focus on the economic consequences of the

¹Macroeconomic studies of the policy implications of joint household decisions include [Guner, Kaygusuz, and Ventura \(2012\)](#), [Guner, Kaygusuz, and Ventura \(2020\)](#), [Bick \(2016\)](#), and [Krueger and Wu \(2019\)](#).

employment losses and increased childcare needs brought about by the pandemic.² In this regard, our approach is more similar to [Lorenzoni et al. \(2020\)](#), [Gregory, Menzio, and Wiczer \(2020\)](#), and [Danieli and Olmstead-Rumsey \(2020\)](#), who also focus on the macroeconomic transmission of the lockdown shock in models that abstract from epidemiology. These papers are complementary to ours in that they focus on different mechanisms, namely the role of incomplete markets and liquidity constraints, employment stability, and the sectoral distribution of the downturn, while abstracting from within-family insurance and differential impacts on women and men.

In the next section, we summarize evidence on how the current pandemic recession differs from earlier recessions. In [Section 3](#), we describe our model economy. The model is calibrated to the data in [Section 4](#). In [Section 5](#) we compare the short-run implications of regular and pandemic recessions in the calibrated model. In [Section 6](#) we consider repercussions of a pandemic recession for gender inequality in the labor market over a longer horizon, and consider how these repercussions depend on policy options such as opening schools or daycare centers early in the recession. [Section 7](#) concludes.

2 Evidence on the Role of Gender in Regular versus Pandemic Recessions

The social distancing measures and stay-at-home orders imposed in many US states and other countries during the Covid-19 crisis have resulted in a drop in employment, a rise in unemployment, and an economic contraction. In this section, we document how the implications of the current pandemic recession for women’s versus men’s employment differ from earlier recessions.

2.1 Gender Differences in Regular Recessions

In the economic downturns preceding the current crisis, including the Great Recession of 2007–2009, the employment of male workers was usually affected more strongly than the employment of female workers. [Doepke and Tertilt \(2016\)](#) summarize evidence on how employment varies over the business cycle for women and for men. [Table 1](#) shows that women’s aggregate labor supply is less volatile overall compared to men (here total volatility is measured as the percentage standard deviation of the Hodrick-Prescott

²The pandemic itself also has a gender dimension, as men appear to be at higher risk of death than women. However, to date vastly more people are affected by the economic repercussions of the pandemic rather than the Covid-19 disease itself.

Table 1: Volatility of Hours Worked by Gender and Marital Status

| | All | | | Married | | Single | |
|---------------------|-------|-------|-------|---------|-------|--------|-------|
| | Total | Women | Men | Women | Men | Women | Men |
| 1989–2014 | | | | | | | |
| Total Volatility | 1.15 | 0.87 | 1.47 | 0.79 | 1.16 | 1.30 | 2.25 |
| Cyclical Volatility | 0.91 | 0.51 | 1.23 | 0.38 | 0.95 | 0.70 | 1.82 |
| Hours Share | | 42.64 | 57.36 | 25.89 | 39.83 | 16.75 | 17.53 |
| Volatility Share | | 23.68 | 76.32 | 10.80 | 41.51 | 12.88 | 34.81 |
| 1962–1988 | | | | | | | |
| Total Volatility | 1.35 | 1.19 | 1.48 | 1.26 | 1.36 | 1.37 | 2.44 |
| Cyclical Volatility | 1.08 | 0.87 | 1.19 | 0.87 | 1.09 | 0.79 | 1.65 |
| Hours Share | | 33.71 | 66.29 | 21.99 | 55.29 | 11.72 | 11.00 |
| Volatility Share | | 27.14 | 72.86 | 18.02 | 56.29 | 8.67 | 17.02 |

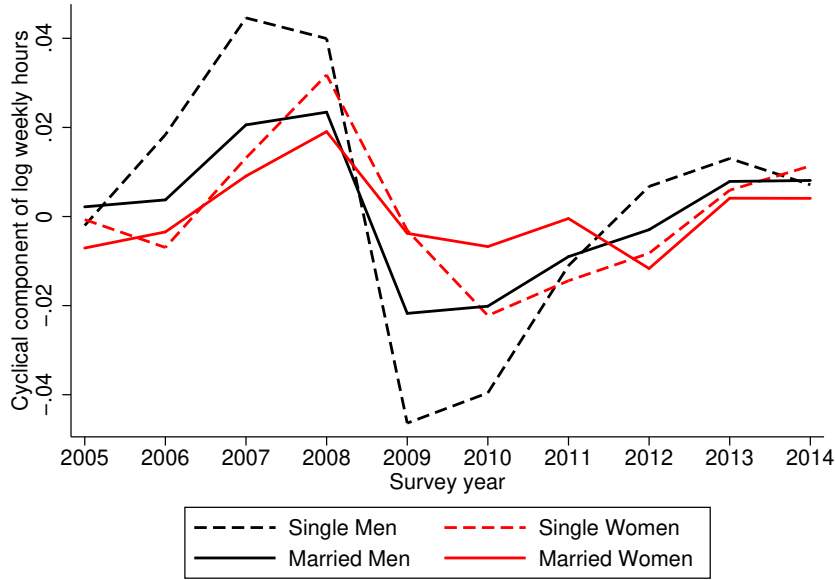
Notes: All data from Current Population Survey, March and Annual Social and Economic Supplements, 1962 to 2014. Total volatility is the percentage standard deviation of the Hodrick-Prescott residual of average labor supply per person in each group. Cyclical volatility is the percentage deviation of the predicted value of a regression of the HP-residual on the HP-residual of GDP per capita. Hours share is share of each component in total hours. Volatility share is share of each group in the cyclical volatility of total hours. See [Doepke and Tertilt \(2016\)](#) for further details.

residual of average labor supply per person). For cyclical volatility, i.e., the component of overall volatility that is correlated with aggregate economic fluctuations, the gap between women and men is even larger. For the period 1989–2014, men account for more than three quarters of overall cyclical fluctuations in employment, and women for less than one quarter.

The table also shows that in the earlier period 1962–1988 qualitatively the same pattern is observed, but the quantitative differences between the cyclical volatility of women’s and men’s employment are much smaller. Compared to 1989–2014, in 1962–1988 women accounted for a smaller fraction of the labor force (about one-third), but a larger share of aggregate volatility.

Figure 1 illustrates these results by displaying the cyclical component of hours worked for different groups for the period 2005–2014, i.e., from just before to after the Great Recession of 2007–2009. Single men and women experience larger employment losses during the recession than their married counterparts, and within each group employment losses are much larger for men compared to women. Overall, married women experience the smallest variation in employment throughout the Great Recession and the subsequent recovery.

Figure 1: Cyclical Component of Hours by Gender and Marital Status



Notes: Data on average weekly work hours for United States (Cyclical component is deviation from Hodrick-Prescott trend, smoothing parameter 6.25). Source: Current Population Survey, March and Annual Social and Economic Supplements, 1962 to 2014. See [Doecke and Tertilt \(2016\)](#) for further details.

There are multiple reasons why female employment usually varies less over the cycle. One reason is insurance in the family—women’s employment may be less affected by downturns precisely because some married women increase their labor supply to compensate for unemployment or higher unemployment risk of their husbands.³ One indication for the role of this channel is that in Table 1 and Figure 1, the cyclical volatility of labor supply is much lower for married women (to whom the family insurance channel applies) compared to women who are single. The compensating role of married women’s labor supply can also account for the differences between the earlier and later periods in Table 1. The 1960 to the 1990s experienced a substantial increase in married women’s labor force participation and relative earnings. Hence, in the later period the within-household insurance effect is more pronounced, both because more married women work and because their earnings are sufficiently high to provide substantial insurance. These observations explain why from the earlier to the late period women’s hours share rose but their volatility share fell.⁴

³See [Ellieroth \(2019\)](#) for a study documenting the quantitative importance of this mechanism.

⁴The impact of married women’s rising labor force participation on aggregate fluctuations has been explored by [Albanesi \(2020\)](#) and [Fukui, Nakamura, and Steinsson \(2019\)](#), among others.

There are additional channels beyond within-family insurance that also contribute to differences in the volatility of women's and men's labor supply. We can see this by noting that there is also a large volatility gap between single women and single men. The second crucial channel is the different sectoral composition of female and male employment. In typical recessions, sectors such as manufacturing and residential construction are more severely affected compared to, say, education and health care. Men's employment is more concentrated in sectors with a high cyclical exposure, whereas women are highly represented in sectors with relatively stable employment over the cycle. These facts are documented in a recent paper by [Coskun and Dalgic \(2020\)](#). For example, they find that in two sectors, "Government" and "Education and Health Services," employment is actually countercyclical. These two sectors account for 40 percent of women's employment, but only 20 percent of men's employment. Conversely, the highly cyclical sectors of "Manufacturing," "Construction," and "Trade, Transportation, Utilities" account for 46 percent of male but only 24 percent of female employment.

These two channels are not exhaustive, and neither are they independent—for example, some women may choose to work in a countercyclical sector to compensate for their husbands' cyclical employment risk. But the bottom line is clear: past downturns have affected men's employment more severely than that of women, and especially so in the recent decades of relatively high female labor force participation.

2.2 Why a Pandemic Recession is Different

In [Alon et al. \(2020a\)](#) we predicted that unlike a regular recession, the current pandemic recession was going to reduce women's employment by more than men's employment. This prediction, which has since been confirmed by the evidence, was based on two channels. The first channel is the impact of the social distancing measures in a pandemic across sectors and occupations; here we argued that women account for a large share of employment in parts of the economy that were likely to be strongly affected by lockdown measures. The second channel is childcare. Social distancing measures in most countries included closures of schools and daycare centers, resulting in a large increase in the childcare burden for parents with young children. This channel is further amplified by the reduced availability of other childcare from relatives, neighbors, nannies, or babysitters during a lockdown with minimal social contacts. This channel affects the ability to work of all parents, but given that women generally provide a much larger share of childcare than men do, the effect on women was likely to be larger.

To quantify the occupation channel, in [Alon et al. \(2020a\)](#) we combined data from the American Community Survey (ACS), the American Time Use Survey (ATUS), and the Current Population Survey (CPS) to rank occupations by the ability to work from home (meaning that work during the lockdown is possible) and by whether an occupation is critical during the lockdown (such as healthcare workers). We documented that women are underrepresented in the occupations with the highest ability to telecommute and in the critical occupations, implying that women's employment has a stronger exposure to the pandemic recession shock.

For the childcare channel, in [Alon et al. \(2020a\)](#) we combined CPS and ATUS data to document that women provide a much larger share of overall childcare than men. There are many more single moms than single dads, and many more married mothers than fathers who work part-time or are a stay-at-home parent with their spouse working full-time. Even among married parents who both work full time, mothers provide about 40 percent more childcare than fathers.⁵ Taken together, these observations suggested that women were going to shoulder most of the increased childcare needs during the recession, and hence face reduced opportunities for employment.⁶

Since the onset of the current recession, a number of studies have provided additional evidence on the importance of these channels. [Mongey, Pilossoph, and Weinberg \(2020\)](#) use O*NET data on occupational characteristics to examine the burden of social distancing policies, based on the ability to work from home and a measure of physical proximity at work in different occupations. They find (unlike in the time-use data used by [Alon et al. 2020a](#)) that women are more likely to be able to work from home, but that they are also over-represented in occupations requiring physical proximity. Combining these factors, the overall impact on women's and men's employment is similar, and hence qualitatively different from regular recessions when occupations with a high male employment share take a bigger hit. [Albanesi et al. \(2020\)](#) also examine the gender breakdown in employment between occupations that are high and low in personal contact, and find that high-contact occupations have a female employment share of 74 percent.

On the childcare dimension, [Dingel, Patterson, and Vavra \(2020\)](#) quantify the extent to which childcare obligations will hold back the recovery. Based on ACS data, they doc-

⁵The gap between women's and men's provision of childcare is even larger during regular working hours (8 a.m. to 6 p.m. on weekdays; see [Schoonbroodt 2018](#)).

⁶Women provide the majority of childcare in all industrialized countries, but there is also a lot of variation in the gap between women's and men's contributions ([Doepke and Kindermann 2019](#)).

ument that 32 percent of the US workforce have a child under the age of 14 in their household, and two-thirds of these households do not include an adult who is out of the labor force (e.g., a stay-at-home parent). For 30 percent of these households all children are under the age of 6, so that these households would be relieved of additional childcare needs when daycare centers reopen. These numbers underline that childcare obligations are a major driver of reduced employment during the recession, and that a strong recovery will not be possible until these obligations are met.

2.3 The Impact of the Covid-19 Recession on Women’s vs. Men’s Employment

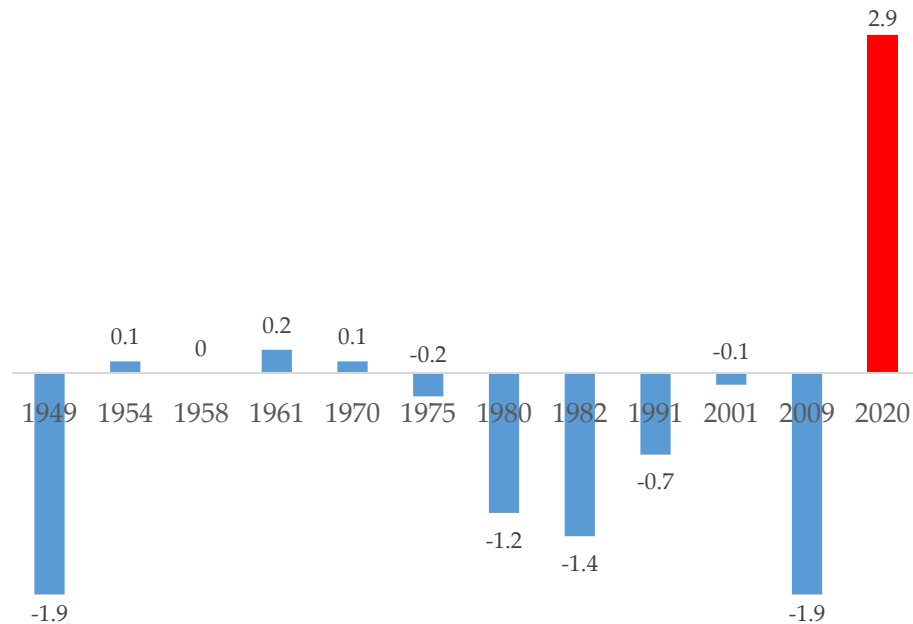
We now document how the actual impact of the current pandemic recession on women’s versus men’s employment differs from the typical pattern observed in earlier recessions. Consistent with an important role for the sector/occupation and childcare channels, we indeed find that unlike in a regular recession, women’s employment is more strongly affected than men’s employment.

Consider, first, the impact of recessions on unemployment. Figure 2 displays the difference between the rise in women’s and men’s unemployment in every recession in the United States since 1948. For pre-Covid-19 recessions, we use the difference in the seasonally adjusted unemployment rate between the first and the last month of each recession based on recession dates from the NBER Business Cycle Dating Committee. For the current recession, we use the difference between unemployment in February 2020 (the trough in unemployment before lockdown measures were taken) and April 2020 (the peak in unemployment so far). Considering the most recent figures instead gives similar results.

The figure shows that from the 1950s to the early 1970s (when married women’s labor supply was still relatively low), women’s and men’s labor supply changed by a similar amount during recessions, consistent with the notion that within-family insurance did not play a major role yet. Subsequently, all recessions from 1975 to 2009 display a larger rise in men’s unemployment versus women’s unemployment. The difference is quantitatively large in all recessions except 2001, when the overall increase in unemployment was small for both women and men. The 1949 recession also displayed a much larger rise in men’s unemployment.

Different from all previous recessions, the figure shows that in the current recession women’s unemployment rose much more than that of men—a 2.9 percentage points gap between February and April of 2020. Hence, the impact of the current recession

Figure 2: Difference between Rise in Women's and Men's Unemployment, US Recessions from 1948 to 2020



Notes: Data from Bureau of Labor Statistics. Each bar is the rise in the women's unemployment rate minus the rise in the men's unemployment rate from first to last month of each recession according to NBER business cycle dates. Underlying series are seasonally adjusted monthly unemployment rates by gender.

on unemployment by gender represents a sharp break with the typical characteristics of earlier economic downturns.

The disparate impact of the current recession on women versus men is also evident when we consider data on employment rather than unemployment. [Bick and Blandin \(2020\)](#) conduct an online survey to provide real-time evidence on the labor market impact of the current recession. The survey is designed to be comparable to the data usually provided by the Current Population Survey (CPS), and matches the CPS well for the period when the surveys overlap. Bick and Blandin show that women's employment rate (employed and at work) dropped by 17.8 percentage points from February to June 2020, compared to only 15.8 percentage points for men. The gender gap in hours worked is even larger; from February to May women's average hours fell by 27 percent, versus a drop of only 20 percent for men. [Cajner et al. \(2020\)](#) come to similar conclusions using data from a major payroll processing company: they find that from February to April 2020, women's employment dropped by 21.5 percent versus 17.8 percent for men. Other studies shed light on the role of the sector/occupation and childcare channels for

the employment impact of the recession. [Papanikolaou and Schmidt \(2020\)](#) examine whether the ability to telecommute based on ATUS data (as used by [Alon et al. 2020a](#)) indeed predicts employment losses during the current recession. Indeed, they find (using industry data from the Bureau of Labor Statistics) that sectors with a lower ability to telecommute experienced larger declines in employment. Moreover, the employment of women with young children was affected especially strongly, underlining the importance of the childcare channel. Similarly, [Collins et al. \(2020\)](#) examine changes in work hours from February to April 2020 in the CPS data, and find that mothers with young children reduced their labor supply four to five times as much as fathers.

The gendered impact of the Covid-19 pandemic can also be observed in other countries. Both [Adams-Prassl et al. \(2020b\)](#) and [Sevilla and Smith \(2020\)](#) conducted real time surveys in the UK and found that women were more likely to have reduced labor supply during the pandemic than men. The studies show that occupation plays an important role but cannot explain the entire gender gap in employment rates. Rather, the presence of children and the division of childcare in the household is crucial. [Farré et al. \(2020\)](#) document that in Spain women were more likely than men to lose their jobs during the pandemic. [Lemieux et al. \(2020\)](#) examine the labor market impact of the pandemic in Canada, and find that from February to April labor supply dropped by 30.1 percent for women compared to 27.7 percent for men. In Germany, the differential impact on women is small in comparison ([Adams-Prassl et al. 2020b](#)), which might be related to the policy instrument of “Kurzarbeit,” i.e., subsidized reduced employment without separating the employment relationship. However, even in Germany the increase in the unemployment rate from February to May has been higher for women (a 19 percent increase) than for men (14 percent).⁷

To summarize, the evidence from a number of countries confirms the prediction of [Alon et al. \(2020a\)](#) that a pandemic recession has a disproportionate impact on women’s employment. To assess the implications of this key distinction between regular and pandemic recessions for macroeconomic dynamics, gender inequality, and welfare, we now introduce our macroeconomic model.

3 A Dynamic Model of Work and Childcare

Our quantitative model focuses on the household side of an economy with search frictions. Macroeconomic shocks affect households primarily through changes in job-loss

⁷See Table 1.1 in [Bundesagentur für Arbeit \(2020\)](#).

and job-finding probabilities. In our analysis we take the impact of aggregate shocks on these labor-market variables as given, and focus on the question of how the household sector will respond in terms of labor supply, consumption demand, and the accumulation of skills.⁸

3.1 Demographics and State Variables

The economy is populated by a continuum of three types of households: single women, single men, and couples. Every period, a new cohort of singles and couples enters the economy. The household type is permanent. Singles and couples face a constant probability ω of death. Couples stay together and die together, and hence there are no widows, widowers, or divorcees in the economy.

The state variables of a household include assets/savings a and the labor market productivity h of each household member. Additional discrete state variables are kids $k \in \{0, s, b\}$ (no kids, small kid, big kid), employment of each member $e \in \{E, U\}$ (employed or unemployed), and the occupation of each household member $o \in \{TC, NT\}$ (can telecommute or cannot). The unemployed state $e = U$ in the model corresponds to both unemployment and being out of the labor force in the data. For couples, a final state variable is a social norm $m \in \{0, 1\}$ where $m = 0$ denotes a “traditional” social norm that values an within-household division of labor where the mother provides the majority of childcare, whereas a couple with $m = 1$ has the “modern” view that no childcare arrangement is inherently superior. The aggregate state variable for the economy is denoted by X , which captures whether the economy is currently in normal times or in a recession.

Newly born singles and couples start out with zero assets. The initial human capital levels for singles are drawn from gender-specific distributions $F^g(h)$ and for couples from the joint distribution $F(h^f, h^m)$. The initial probability of each occupation and each social norm is given by the stationary distribution over these states implied by the current aggregate state. Singles or couples may already have a small or large child when they enter the economy. The probabilities of having a job offer in the initial period are identical to the offer probabilities for an unemployed individual with the same occupation, marital status, and number of children.

⁸It would be conceptually straightforward to expand towards a full general equilibrium analysis by modeling job creation and destruction by firms in the usual way and, if desired, to add additional features such as nominal rigidities.

After the initial period, the level of assets is determined by a consumption-savings decision of households. Labor market productivity evolves as a function of shocks and labor supply. Employment status and occupation type evolves as a function of shocks—individuals can get laid off, and finding a job in a particular occupation is random. People can also decide to reject a job offer or quit a job. Labor supply (conditional on having a job) is either part-time or full-time, chosen by the worker.

For singles, the transition probabilities for kids are given by $\pi^g(k'|k)$, and for couples these probabilities are given by $\Pi(k'|k)$. The transition probabilities for employment are given by $\pi^g(e'|e, X)$ for singles and $\Pi^g(e'|e, X)$, where e' denotes the employment option at the beginning of the next period (job offer or not). Naturally, transition probabilities depend on the aggregate state X , which captures that it is easier to lose and harder to find a job in a recession. Job offers can be rejected, and e denote the employment state after this decision has been made. People also face constant probabilities of switching occupations and social norms, given by $\pi(o'|o, X) = \Pi(o'|o, X)$ and $\Pi(m'|m, X)$.

3.2 The Decision Problem for Singles

We use v to denote the value functions of singles, and V denotes the value functions of couples. Similarly, \tilde{v} and \tilde{V} denote the value functions at the beginning of the period before job offers are accepted or rejected. The value function for an employed single is given by:

$$v_E^g(a, h, k, o, X) = \max_{a', c, l, n, t} \{u^g(c, l) + \omega\beta E[w_{e'}^g(a', h', k', o', X')]\}.$$

Here β is the time discount factor, c denotes consumption, l denotes leisure, $n \in \{0, 0.5, 1\}$ is labor supply (part time or full time), and t is time spent on child care. The period utility function is given by:

$$u^g(c, l) = \log(c) + \alpha^g \log(l).$$

We allow leisure preference to depend on gender to facilitate matching labor supply to the data. The social norm does not apply to singles because it only affects the time allocation of couples. The constraints for employed singles are as follows:

$$\begin{aligned} c + a' &= w^g h n^\theta + (1 + r)a, \\ t + \phi(k) n I(o = TC) &\geq \gamma(k, X), \\ l + n + t &= T. \end{aligned}$$

The first constraint is the budget constraint. The parameter $\theta > 0$ allows for increasing or decreasing returns in labor supply; for example, part-time workers (who supply half as much labor as full-time workers) may be less than half as productive because of commuting time, or more than half as productive because workers get tired. The second constraint is the childcare constraint, which says that total childcare time has to be at least as large as the childcare need $\gamma(k, X)$, where $\gamma(s, X) > \gamma(b, X) > \gamma(0, X) = 0$. The term $\phi(k) nI(o = TC)$ reflects that in a telecommuting job ($o = TC$), fraction $\phi(k)$ of work time can be used to simultaneously provide childcare. Intuitively, workers with TC jobs can supervise a child at home while still getting some work done, and they do not have to take off an entire day of work if a child is sick at home. This turns out to matter a lot when childcare requirements rise during a pandemic recession. The ability of a worker in a TC occupation to work and provide childcare simultaneously depends on the age of the child; specifically, a young child requires more full-time attention than an older child. The remaining child care time is denoted as t . The last constraint is the time constraint, where T is the time endowment.

The value function and constraints for unemployed singles are:

$$v_U^g(a, h, k, o, X) = \max_{a', c, l, t} \{u^g(c, l) + \omega \beta E[w_e^g(a', h', k', o', X')]\}.$$

$$c + a' = zw^g h + (1 + r)a,$$

$$t = \gamma(k, X),$$

$$l + t = T.$$

Here z denotes the unemployment benefit replacement rate relative to potential productivity $w^g h$. Notice that even when unemployed, occupation o is defined, because the current occupation defines the probability distribution of receiving job offers in each possible occupation.

The value function at the beginning of the period for a single with a job offer is:

$$\tilde{v}_E^g(a, h, k, o, X) = \max \{v_E^g(a, h, k, o, X), v_U^g(a, h, k, o, X)\}.$$

Without a job offer there is no choice to be made, so we have:

$$\tilde{v}_U^g(a, h, k, o, X) = v_U^g(a, h, k, o, X).$$

3.3 The Decision Problem for Couples

We now move on to married households. The overall structure of the decision problem is the same as for singles. The spouses act cooperatively with bargaining weights λ for the wife and $1 - \lambda$ for the husband. The household decision problem also reflects the role of the social norm. If $m = 0$ (the traditional social norm applies), the household suffers a utility loss of ψ per unit of time if the father provides more childcare than the mother does, and a utility benefit if the mother does more. The value function for two working spouses is given by:

$$V_{EE}(a, h^f, h^m, k, o^f, o^m, m, X) = \max \left\{ \lambda u^f(c^f, l^f) + (1 - \lambda) u^m(c^m, l^m) \right. \\ \left. - (1 - m) \psi(t^m - t^f) + \omega \beta E \left[W_{(ef)', (em)'}(a', (h^f)', (h^m)', k, (o^f)', (o^m)', m', X') \right] \right\}.$$

The budget and time constraints are:

$$\begin{aligned} c^f + c^m + a' &= w^f h^f (n^f)^\theta + w^m h^m (n^m)^\theta + (1 + r)a, \\ t^f + t^m + \phi(k) \left(n^f I(o^f = TC) + n^m I(o^m = TC) \right) &= \gamma(k, X), \\ l^f + n^f + t^f &= T, \\ l^m + n^m + t^m &= T. \end{aligned}$$

If only she has a job, the decision problem is:

$$V_{EU}(a, h^f, h^m, k, o^f, o^m, m, X) = \max \left\{ \lambda u^f(c^f, l^f) + (1 - \lambda) u^m(c^m, l^m) \right. \\ \left. - (1 - m) \psi(t^m - t^f) + \omega \beta E \left[W_{(ef)', (em)'}(a', (h^f)', (h^m)', k, (o^f)', (o^m)', m', X') \right] \right\}$$

subject to:

$$\begin{aligned} c^f + c^m + a' &= w^f h^f (n^f)^\theta + z w^m h^m + (1 + r)a, \\ t^f + t^m + \phi(k) n^f I(o^f = TC) &\geq \gamma(k, X), \\ l^f + n^f + t^f &= T, \\ l^m + t^m &= T. \end{aligned}$$

The reverse case is analogous. If both are unemployed, the decision problem is:

$$V_{UU}(a, h^f, h^m, k, o^f, o^m, m, X) = \max \left\{ \lambda u^f(c^f, l^f) + (1 - \lambda) u^m(c^m, l^m) \right\}$$

$$- (1 - m)\psi(t^m - t^f) + \omega\beta E [W_{(ef)',(em)'}(a', (h^f)', (h^m)', k, (o^f)', (o^m)', m', X')] \}$$

subject to:

$$\begin{aligned} c^f + c^m + a' &= z(w^f h^f + w^m h^m) + (1 + r)a, \\ t^f + t^m &= \gamma(k, X), \\ l^f + n^f + t^f &= T, \\ l^m + n^m + t^m &= T. \end{aligned}$$

At the beginning of the period, if both spouses have a job offer, we get:

$$\begin{aligned} \tilde{V}_{EE}(a, h^f, h^m, k, o^f, o^m, m, X) &= \max \{ V_{EE}(a, h^f, h^m, k, o^f, o^m, m, X), \\ &\tilde{V}_{EU}(a, h^f, h^m, k, o^f, o^m, m, X), V_{UE}(a, h^f, h^m, k, o^f, o^m, m, X), \\ &V_{UU}(a, h^f, h^m, k, o^f, o^m, m, X) \}. \end{aligned}$$

The initial value functions for the other permutations are analogous.

3.4 The Stochastic Process for Labor Productivity

Human capital h evolves as a function of shocks and captures both random shocks to productivity and the returns to experience. There is a finite grid $h \in H = \{h_1, h_2, \dots, h_I\}$ of possible human capital levels, where the ratio of subsequent points is constant, i.e. $\log(h_{i+1}) - \log(h_i)$ is constant across i . The transition probabilities for human capital depend on current human capital h and on labor supply n . There are returns to experience to working full time, meaning that full-time workers upgrade to the next human capital level with a certain probability. Individuals who do not work face a possibility of skill depreciation. We impose that human capital is constant for part-time workers. We can then parameterize the skill process by a skill appreciation parameter η and a skill depreciation parameter δ :

$$\begin{aligned} \pi^g(h_i|h_i, 0.5) &= \Pi^g(h_i|h_i, 0.5) = 1, \\ \pi^g(h_{i+1}|h_i, 1) &= \Pi^g(h_{i+1}|h_i, 1) = \eta, \quad \pi^g(h_i|h_i, 1) = \Pi^g(h_i|h_i, 1) = 1 - \eta, \\ \pi^g(h_{i-1}|h_i, 0) &= \Pi^g(h_{i-1}|h_i, 0) = \delta, \quad \pi^g(h_i|h_i, 0) = \Pi^g(h_i|h_i, 0) = 1 - \delta. \end{aligned}$$

3.5 The Aggregate State

The aggregate state X takes four possible values: $X \in \{N, NN, R, P\}$. Here N denotes normal times, before a recession hits. R denotes a regular recession, modeled as a large fall in job finding probabilities and large rise in job loss probabilities for men and smaller changes in the same direction for women, with childcare requirements unchanged. P denotes a pandemic recession, which has large changes in labor market flows for both men and women, and also a large increase in childcare requirements. Finally, NN denotes the “new normal;” the state of the economy after a pandemic recession is over. This state allows us to model the consequences of permanent shifts brought about by a pandemic, such as a rise in the share of TC jobs and a shift in social norms.

The transition matrix between these four states is parameterized as follows:

$$\pi(S'|S) = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 1 - \rho_R & 0 & \rho_R & 0 \\ 0 & 1 - \rho_P & 0 & \rho_P \end{pmatrix}$$

Note that the N and NN states are absorbing; in either the normal or the new-normal state, people expect to stay in that state forever. Recessions therefore arise as unexpected “MIT shocks” (this could be easily generalized). Once in a regular R recession, the economy returns to normal N with probability $1 - \rho_R$. If in a pandemic P recession, the economy switches to the new normal with probability $1 - \rho_P$.

3.6 The Stochastic Processes for Occupation and Social Norm

The transition probabilities of occupation and the social norm depend only the state variable itself and on the aggregate state. Hence, the transition probabilities for occupation are given by numbers $\Pi(o'|o, X)$, and the transition probabilities for the social norm are denoted as $\Pi(m'|m, X)$. The dependence on the aggregate state captures the possibility that a pandemic recession can promote the spread of TC jobs and the modern social norm. The transition matrix for $o \in \{TC, NT\}$ is given by:

$$\Pi(o'|o, X) = \begin{pmatrix} \rho_{TC}(X) & 1 - \rho_{TC}(X) \\ 1 - \rho_{NT}(X) & \rho_{NT}(X) \end{pmatrix}$$

and similarly for the social norm $m \in \{0, 1\}$ we have:

$$\Pi(m'|m, X) = \begin{pmatrix} \rho_0(X) & 1 - \rho_0(X) \\ 1 - \rho_1(X) & \rho_1(X) \end{pmatrix}.$$

For both transition matrices, we assume that one set of coefficients applies to the aggregate states N and R (normal and regular recession), and a second set of coefficients applies to the states P and NN (pandemic recession and new normal).

4 Calibrating the Model to Normal Times and Recessions

We would like to use our model to quantify the impact of regular versus pandemic recessions on different households and on the aggregate behavior of the household sector. To this end, we first calibrate the normal state $X = N$ of the economy to match a number of characteristics of the US economy before the onset of the current recession. We then pin down the properties of regular versus pandemic recessions using data from earlier recessions and the current one. Finally, we calibrate the new normal that is reached after a pandemic recession based on changes in telecommuting during the crisis and evidence on the dynamics of social norms.

4.1 Externally Calibrated Parameters

The model economy operates at a quarterly frequency. Newly born people in the model correspond to singles and couples at age 25 in the data. A number of model parameters directly correspond to specific empirical observations and can be pinned down individually. These parameters are listed in Table 2. The survival probability ω determines life expectancy in the model. Given that we do not model retirement, we interpret the lifespan in the model as corresponding to active working life. Given that in the data an increasing number of people retire starting around age 60, we set ω to match a life expectancy of 60 years.⁹ We set the discount factor to $\beta = 0.98$ at a quarterly frequency. The discount factor primarily drives asset accumulation. In addition, because assets determine how financially constrained households are, the discount factor drives the distributions of marginal propensities to consume (MPCs) and save in the economy. Macroeconomic models have been typically calibrated to match overall asset accumulation in

⁹Modeling retirement explicitly would primarily affect asset-accumulation decisions in the model. However, given that death is modeled as a shock, people still accumulate a substantial amount of assets and leave accidental bequests.

the economy, but a recent literature has documented that such models imply counterfactually low MPCs (e.g., [Kaplan and Violante 2014](#)). We therefore choose a lower value than in typical macroeconomic calibrations, which raises the average MPC of single and married households in the economy to a more realistic value.¹⁰ The interest rate is set to $r = 0.02$, a relatively high value that offsets that households are not compensated for accidental bequests left at their death. The childcare parameters $\gamma(s, N)$ and $\gamma(b, N)$ are calibrated based on information on time spent on childcare in families with small and big children from the American Time Use Survey. The returns to experience parameter η is set to match to returns to labor market experience of 1.1 percent per quarter, which is computed using the NLSY97 data set. The skill-depreciation parameter δ matches a quarterly depreciation of skills of 2.5 percent, which matches observations by [Davis and von Wachter \(2011\)](#) on the earnings implications of job loss during recessions. Further details on the calibration and the underlying data sources are provided in [Appendix A](#).

Table 2: Externally Calibrated Parameters

| Parameter | Value | Interpretation |
|----------------|-------|---|
| ω | 0.99 | Expected retirement at age 60 |
| β | 0.98 | Discount factor |
| r | 0.02 | Interest rate |
| $\gamma(s, N)$ | 0.34 | Small kids require 13.7 hours of childcare per week |
| $\gamma(b, N)$ | 0.11 | Big kids require 4.2 hours of childcare per week |
| η | 0.03 | Return to labor market experience |
| δ | 0.06 | Skill depreciation in unemployment |

In addition to the parameters listed in [Table 2](#), we calibrate the initial distributions of human capital $F^g(h)$ and $F(h^f, h^m)$ to match evidence on the distribution of earnings of singles and couples at age 25, and the transition probabilities for children $\pi^g(k'|k)$ and $\Pi(k'|k)$ to match evidence on the distribution of different types of households across having small children, big children, or neither. We similarly initialize telecommuting status to match occupational patterns by gender and marital status observed in the data. Couples are initialized jointly to reflect the extent of occupational correlation between spouses (which according to [Malkov 2020](#) is quantitatively important for couple’s exposure to risk in the current pandemic). Transitions between telecommuting and non-

¹⁰[Kaplan and Violante \(2014\)](#) and [Auclert, Bardóczy, and Rognlie \(2020\)](#) report a quarterly MPC of about 0.25 for the US economy.

telecommuting jobs are then chosen so that the stationary equilibrium matches the prevailing level of telecommuters just before the pandemic, as documented in [Bick and Blandin \(2020\)](#).¹¹ These parameter values and details on the data sources are discussed in [Appendix A](#).

4.2 Jointly Calibrated Parameters

The remaining parameters are calibrated jointly to match a set of target moments that characterize the US economy before the onset of the current recession. [Table 3](#) displays the calibrated parameter values, and [Table 4](#) shows the model fit. While the parameters are chosen jointly, in most cases there is a fairly direct mapping from a particular parameter to a particular moment.

Table 3: Jointly Calibrated Parameters

| Description | Parameter | Value |
|---|-----------------|-------|
| Exogenous gender wage gap | w^f | 0.91 |
| Wife's bargaining power in married couples | λ | 0.40 |
| Diminishing returns to market work | θ | 0.55 |
| Women's leisure preference | α^f | 0.64 |
| Men's leisure preference | α^m | 0.43 |
| Telecommuters' childcare bonus for small children | $\phi(s)$ | 0.07 |
| Telecommuters' childcare bonus for big children | $\phi(b)$ | 0.14 |
| Job offer probability for employed women | $\pi^f(E E, N)$ | 0.93 |
| Job offer probability for non-employed women | $\pi^f(E U, N)$ | 0.40 |
| Job offer probability for employed men | $\pi^m(E E, N)$ | 0.93 |
| Job offer probability for non-employed men | $\pi^m(E U, N)$ | 0.40 |
| Utility cost of violating social norms | ψ | 0.23 |

We normalize men's wage per efficiency unit of labor to one, $w^m = 1$. We then choose the exogenous part of the gender wage gap (women's wage per efficiency unit of labor w^f) to match an overall gender wage gap of 0.81 (see [Appendix A](#) for details on how this target is computed). The resulting parameter is $w^f = 0.91$, implying that about half of the gender wage gap is due to this exogenous gap, with the remainder accounted for by differences in labor supply and the resulting differences in the accumulation of experience over the life cycle between women and men.

¹¹Specifically, we normalize the persistence of non-telecommuting jobs to 0.99 and choose the persistence of telecommuting jobs to match the target.

The parameters for leisure preference and for women’s bargaining power primarily determine the distribution of labor supply across women and men and within couples. The social-norm parameter also helps match labor supply, because this parameter specifically affects the labor supply of married women with children. Regarding the childcare bonus for telecommuters, we impose that the bonus is twice as large for big kids compared to small kids, based on the notion that bigger kids require less supervision at home and therefore interfere less with working from home. The level of the childcare bonus for telecommuters is then pinned down by the observation that in the ATUS data, men who telecommute do 50 percent more childcare than men who do not (conditional on being married to women who do not telecommute, see [Alon et al. 2020a](#)). The returns to scale parameter θ for market work helps pin down the breakdown between part-time and full-time work.

Turning to labor-market flows, we impose that job-offer probabilities are identical for women and men in normal times. This assumption makes our results easier to interpret, because it implies that differences in job flows in the model are entirely due to differences in behavior (i.e., job-acceptance decisions) rather than hard-wired differences. As Table 4 shows, this can be done while still matching observed job flows fairly well. The higher persistence in the model of non-employment for women compared to men arises because women reject more offers, primarily because of childcare obligations.

As Table 4 shows, the calibrated model matches the target moments well. Even though we use relatively few parameters to match these moments (nine degrees of freedom to match 14 moments), the model provides a good fit for the distribution of married women across employment states and for the impact of having children on women’s labor supply. Generally, as in the data, in the model women’s labor supply is more responsive to having children compared to men’s. Even though the social norm plays a role for traditional couples, the main force behind specialization in childcare is wage differences between wives and husbands (as in [Alon, Coskun, and Doepke 2020](#)). The exogenous part of the gender wage gap implies that in a majority of couples the wife is the secondary earner when the first child arrives, which makes it more likely that she will reduce employment to meet childcare needs. Because reducing employment implies forgoing returns to labor market experience and potentially suffering skill loss, the within-couple wage gap will tend to grow, leading to even more specialization in the future.

Table 4: Model Fit for Target Moments

| | Data | Model |
|---|------|-------|
| Gender wage gap | 0.81 | 0.81 |
| Childcare division, full-time couples, men-to-women | 0.65 | 0.66 |
| Men who telecommute do 50% more childcare | 1.50 | 1.48 |
| Relative labor supply, men-to-women | 1.19 | 1.17 |
| Labor supply of married women without kids | 0.72 | 0.73 |
| Labor supply of married women with small kids | 0.56 | 0.59 |
| Labor supply of married women with big kids | 0.64 | 0.70 |
| Share of married mothers not employed | 0.30 | 0.26 |
| Share of married mothers working part-time | 0.18 | 0.19 |
| Share of married mothers working full-time | 0.52 | 0.55 |
| Women’s Labor Market Flows: E-to-E | 0.91 | 0.92 |
| Women’s Labor Market Flows: U-to-U | 0.77 | 0.73 |
| Men’s Labor Market Flows: E-to-E | 0.93 | 0.92 |
| Men’s Labor Market Flows: U-to-U | 0.66 | 0.66 |

Notes: See Appendix A for further details. Labor market state U here refers, as in the model, to all individuals who are either unemployed or out of the labor force.

4.3 Fit for Non-Targeted Moments

Table 5 displays how well the model performs in terms of matching a larger set of moments that were not explicitly targeted in the calibration. In the calibration procedure, we focused on matching the overall ratio of women-to-men labor supply and the detailed patterns of labor supply for married women. Table 5 shows that the model nevertheless does fairly well at also matching the employment breakdown for men and single women (and remarkably well for single fathers). The model accounts for the observation that most married fathers work full time, and that single fathers are more likely to work than single mothers. Even though the model underpredicts the share of dual full-time earner couples with small kids, it captures the overall variation in this share with fertility and matches well the fraction of dual full-time earners among couples with big kids or without kids.

4.4 Modeling Regular versus Pandemic Recessions

The calibration described so far pins down the economy in the normal state $X = N$, before a recession takes place. We now turn to the parameters that characterize the ag-

Table 5: Model Fit for Non-Targeted Moments

| | Data | Model |
|--|------|-------|
| Composition of single fathers by employment state: | | |
| – not employed | 0.16 | 0.15 |
| – part-time | 0.07 | 0.08 |
| – full-time | 0.77 | 0.77 |
| Composition of married fathers by employment state: | | |
| – not employed | 0.07 | 0.19 |
| – part-time | 0.04 | 0.05 |
| – full-time | 0.89 | 0.75 |
| Composition of single mothers by employment state: | | |
| – not employed | 0.24 | 0.15 |
| – part-time | 0.17 | 0.37 |
| – full-time | 0.59 | 0.48 |
| Share of full-time dual earner couples by kids' age: | | |
| – no kids | 0.61 | 0.53 |
| – small kids | 0.43 | 0.21 |
| – big kids | 0.49 | 0.47 |

gregate changes in the economy when the economy enters a regular recession R or a pandemic recession P . To allow for a transparent comparison of the different types of recessions, we model these aggregate changes in a stylized way. Specifically, to capture the larger impact of regular recessions on men's employment, we impose that in a regular downtown the job-offer probabilities for men are reduced twice as much as those of women. This scaling allows for a simple decomposition of which employment changes are due to shocks (i.e., job loss) versus changes in behavior (i.e., probability of accepting job offers). In a pandemic recession, we impose that both women and men experience the same change in job offer probabilities as men do in a regular recession. Different impacts on women versus men are then primarily accounted for by changing childcare needs (which only take place in a pandemic recession) rather than hard-wired differences in job flows.

Table 6 summarizes all parameter values that differ across aggregate states. The pandemic recession brings about a substantial increase in childcare needs, from 13.7 hours per week to 42 hours per week for small kids, and from 4.2 hours per week to 26 hours

per week for big kids. The underlying assumption is that small children need near-constant supervision, so that the time cost of childcare is just as large as working full time. Older kids require less time, but there is still a large increase, in part because of the need to home-school children. These values can be compared to evidence from [Adams-Prassl et al. \(2020b\)](#), who show that US parents working from home spent roughly 22.5 hours (men) and 30 hours (women) doing childcare and homeschooling in a typical work week during the pandemic, for a total of 52.5 hours. Since there are also single parents and married couples where only one parent works from home, the childcare burden in the model for small kids roughly corresponds to the half-way point between the total childcare of 52.5 hours a couple provides and the 30 hours a mother provides on her own during the pandemic.

Table 6: Parameters Varying Across Aggregate States

| Parameter | Interpretation | Normal N | Recession R | Pandemic P | New Norm. NN |
|-----------------|-------------------------------|------------|---------------|--------------|----------------|
| $\gamma(s, X)$ | Childcare time, small kids | 0.34 | 0.34 | 1.05 | 0.34 |
| $\gamma(b, X)$ | Childcare time, big kids | 0.11 | 0.11 | 0.65 | 0.11 |
| $\rho_1(X)$ | Persistence modern norms | 0.99 | 0.99 | 0.99 | 0.99 |
| $\rho_0(X)$ | Persistence traditional norms | 0.98 | 0.98 | 0.94 | 0.94 |
| $\rho_{TC}(X)$ | Persistence TC occupations | 0.99 | 0.99 | 0.99 | 0.99 |
| $\rho_{NT}(X)$ | Persistence NT occupations | 0.999 | 0.999 | 0.996 | 0.996 |
| $\pi^m(E E, X)$ | Job offer, employed men | 0.93 | 0.91 | 0.91 | 0.93 |
| $\pi^m(E U, X)$ | Job offer, unemployed men | 0.40 | 0.38 | 0.38 | 0.40 |
| $\pi^f(E E, X)$ | Job offer, employed women | 0.93 | 0.92 | 0.91 | 0.93 |
| $\pi^f(E U, X)$ | Job offer, unemployed women | 0.40 | 0.39 | 0.38 | 0.40 |

The job offer probabilities during regular recessions are chosen to match employment flows during previous US recessions as described in Appendix A. Given that job flows are matched to regular recessions (for ease of comparing regular and pandemic recessions in the model), our model understates somewhat the direct employment impact of the current pandemic recession (e.g. [Kahn, Lange, and Wiczer 2020](#) report that vacancy postings in April 2020 were 30 percent lower than at the beginning of the year).

At the beginning of a pandemic recession we allow for a one-time jump in the share of telecommutable jobs, which captures the immediate rise in telecommuting at the beginning of the lockdown. Specifically, [Bick, Blandin, and Mertens \(2020\)](#) report that in May 2020 more than 30 percent of the labor force worked from home, up from less than 10 percent in February. To match this increase, at the beginning of the first period of a pandemic recession workers in NT occupations (who cannot telecommute) experience

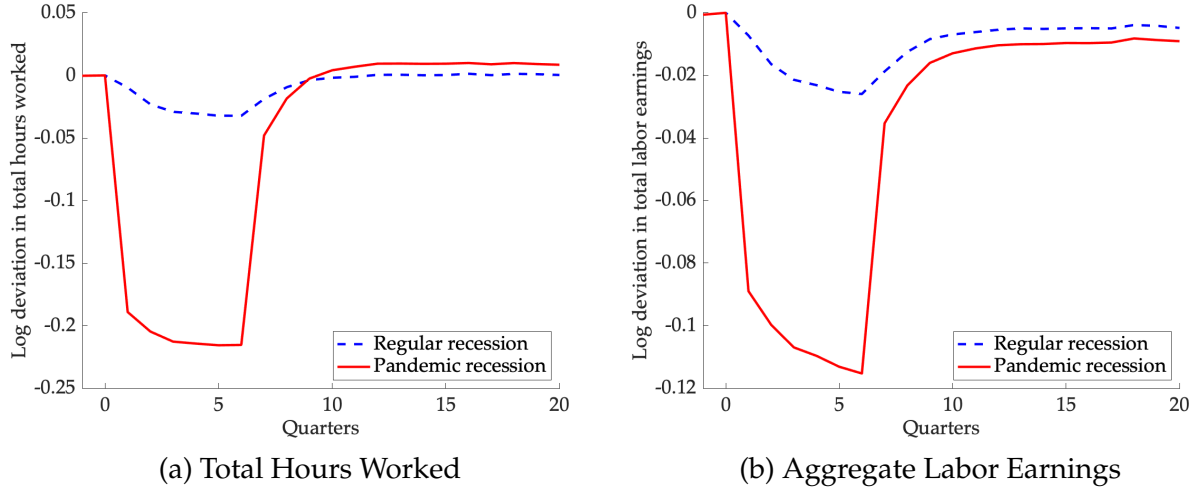
a one-time probability that their job switches to TC (telecommutable), where this probability is chosen to move the share of TC workers to 30 percent. After this one-time shock, the transition probabilities displayed in Table 6 apply. The transition probabilities are chosen so that the share of telecommuters remains at 30 percent during the pandemic.

Our model posits that after a pandemic recession, the economy no longer returns to its previous state, but approaches a new normal *NN* instead that reflects permanent changes brought about by a pandemic recession. We allow for such permanent effects in two dimensions: work organization and social norms. In terms of work organization, we impose that the occupational transition probabilities during the pandemic recession continue to apply during the new normal. This implies that the fraction of telecommutable jobs will stay elevated at about 30 percent. For the change in social norms, we conjecture that the share of traditional couples will ultimately decline by half from 30 to 15 percent.¹² The transition probabilities that apply both during the pandemic recession *P* and the new normal *NN* are chosen such that the modern state is highly persistent (0.99 probability of staying modern), and such that the persistence of the traditional state results in the desired long-run share of traditional couples of 15 percent. In addition, new cohorts also display these new long run shares of 85 percent modern and 15 percent traditional couples.

Clearly, the future evolution of social norms is difficult to calibrate. Here our calibration should be regarded less as an empirical estimate and more as an if-then scenario: our simulations answer the question of how the economy will evolve if the current pandemic does turn out to have a substantial impact on the evolution of gender norms. Below, we provide a decomposition analysis to also examine outcomes if social norms should fail to respond. Still, in the past gender norms have often evolved rapidly in response to economic changes, resulting in a large impact on economic outcomes (e.g., [Fernández 2013](#) and [Fogli and Veldkamp 2011](#)). The changes in social norms in our simulation are slower than those implied by the learning model of [Fernández \(2013\)](#) during the rise of female labor force participation in the United States from the 1960s to the 1980s. The data already show clearly that the Covid-19 recession led to a historically unprecedented increase in men's participation in childcare, and based on past experience we believe that such a change is bound to have a substantial impact on social norms. Hence, while our assumptions on shifting social norms are necessarily more speculative than other aspects of our analysis, we do regard a shift towards more gender-equal

¹²The initial share of traditional couples of 30 percent is chosen to match evidence from the General Social Survey; see Appendix 4.

Figure 3: Hours Worked and Aggregate Labor Earnings, Pandemic vs. Regular Recessions



norms as the most likely scenario.

5 Macroeconomic Consequences of Regular versus Pandemic Recessions

We now use our quantitative model to compare the consequences of regular versus pandemic recessions for macroeconomic aggregates and changes in gender inequality. In the model, either type of recession ends with a fixed probability of $\frac{1}{6}$ every period. For the quantitative analysis, we consider the case of recessions that lasts for six quarters, and then revert to the normal state N in the case of a regular recession or the new normal NN in the case of a pandemic recession.

5.1 The Anatomy of Regular and Pandemic Recessions

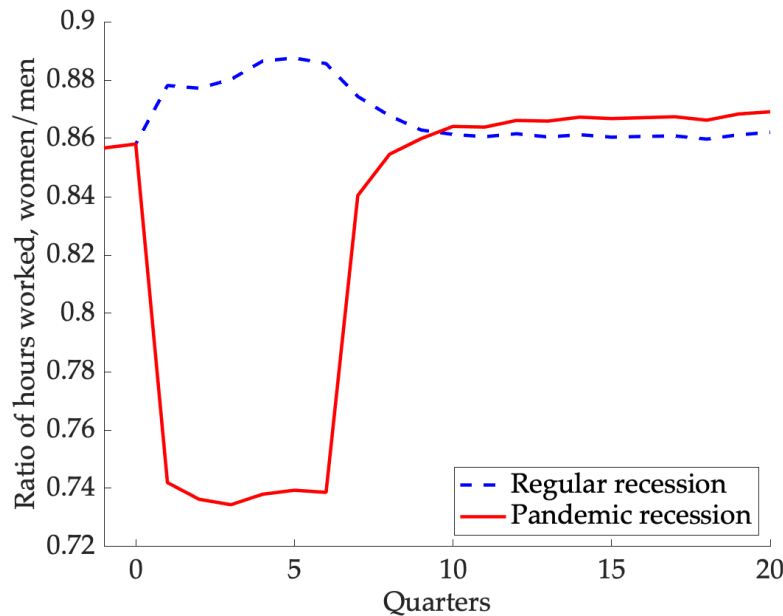
Figures 3a and 3b compare the impact of regular and pandemic recessions on total labor supply and on total labor earnings in the economy. Labor supply declines by more than 20 percent in the pandemic recession, versus less than 3.3 percent in the regular recession. At the trough of the recession, the decline in labor supply in the model roughly matches the 24 percent decline in hours reported by Bick and Blandin (2020) for the US economy from February to the average of May to June 2020.

The decline in total labor earnings (which measures the decline in labor supply in efficiency units) is only about half as large as the decline in hours in the pandemic recession.

sion, reflecting that the workers who drop out of employment or reduce hours during the recession tend to have low earnings to begin with. Given that job separation and job finding probabilities do not depend on earnings, this selection effect is entirely due to endogenous decisions on accepting or rejecting job offers. Selection on earnings is less pronounced in a regular recession.

During the recovery after a recession ends after six quarters labor supply quickly recovers. However, total labor earnings remain lower than before the recession, particularly so after a pandemic recession. The persistent decline in total labor earnings reflects the depreciation of human capital suffered by many workers who lose employment during the recession.

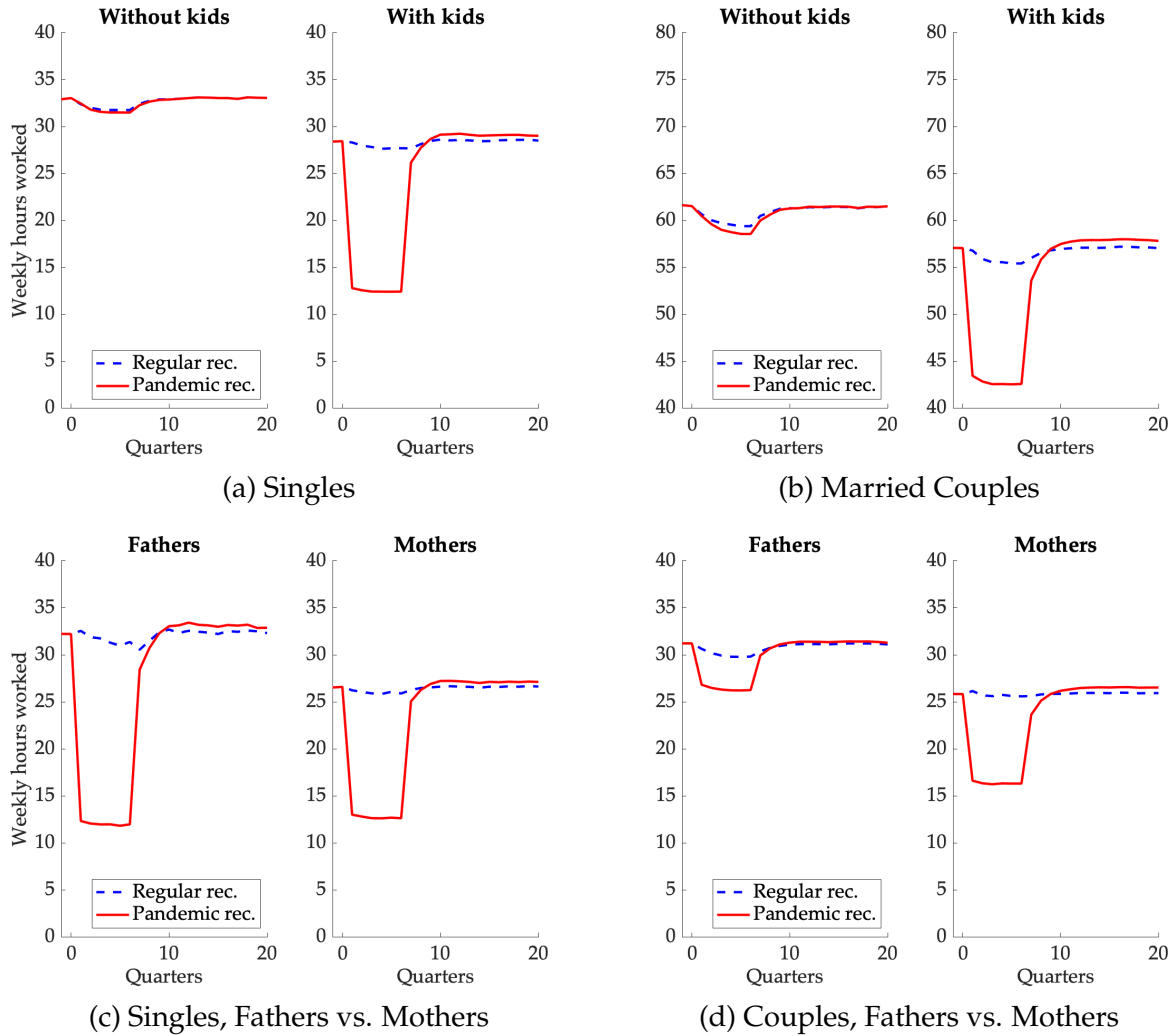
Figure 4: Women's vs. Men's Labor Supply, Pandemic vs. Regular Recessions



Turning to implications for women versus men, Figure 4 shows that in regular recessions, the ratio of women's to men's labor supply increases, reflecting greater job losses for men and to a lesser extent within-family insurance, i.e., married women increasing labor supply in response to job loss of their husbands. In contrast, consistent with the evidence presented in Section 2, in a pandemic recession women's labor supply declines sharply relative to men. This drop in women's relative labor supply primarily reflects the uneven burden of childcare across genders.

Figure 5 breaks down the changes in employment during and after recessions by marital

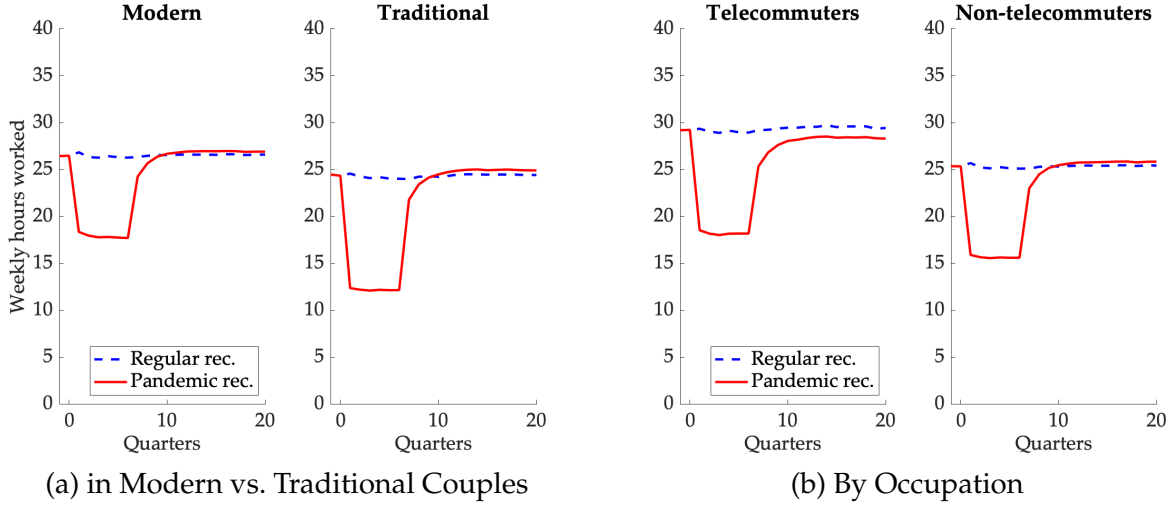
Figure 5: Labor Supply by Types of Families



status, gender, and fertility. These figures are scaled so that 40 hours corresponds to full-time employment of a single worker (80 hours for a couple of two full-time workers). The left panels in Figures 5a and 5b show that for both singles and couples without kids, the impact of regular versus pandemic recessions is similar, whereas if kids are present (right panels) the pandemic recession leads to a much larger reduction in labor supply. The increased childcare requirement due to school closures affects all parents' ability to work during the pandemic. The impact on single parents is particularly large, because they lack some margins of adjustment that couples benefit from (i.e., couples where both parents can telecommute or where one was not working before the pandemic).

Within couples, we see that mothers are reducing hours a lot more than fathers (Fig-

Figure 6: Mothers' Labor Supply by Social Norm and Occupation



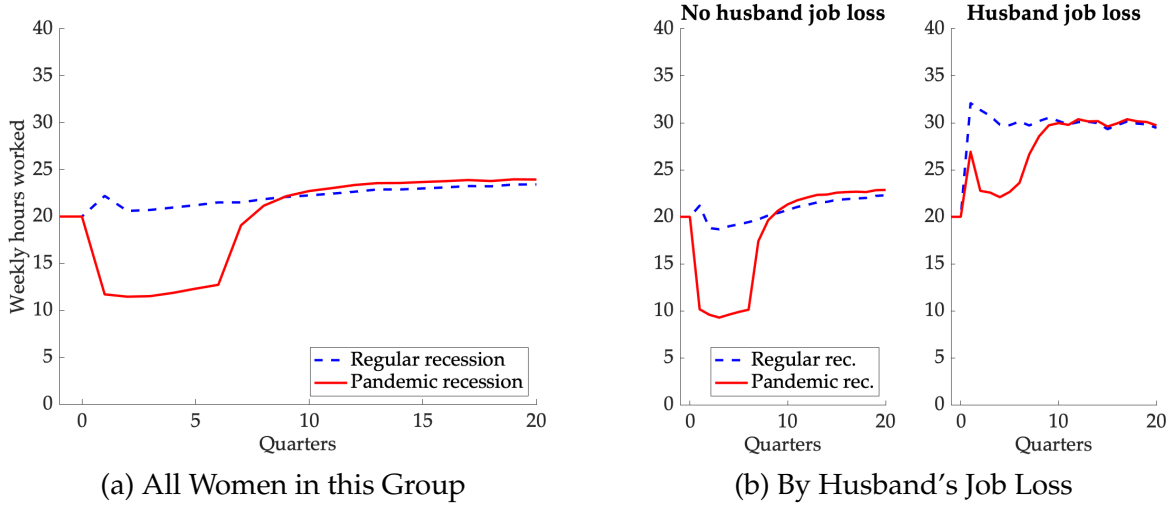
ure 5d), which again matches the empirical observations discussed in Section 2. Among single parents, single fathers' labor supply drops by more than that of single mothers. This difference primarily reflect that single fathers (who are a small share of the population) start out with higher labor supply. For single parents of either gender with small kids, it is infeasible to work full time on a job that does not allow telecommuting during the pandemic, necessitating a large drop in labor supply.

Figure 6a highlights the role of traditional versus modern social norms for the labor supply of couples. In regular times, the labor supply of traditional mothers is only slightly lower than that of modern mothers—with the relatively low childcare requirements in normal times, many traditional mothers are able to both work and provide the majority of childcare in the family. In a pandemic recession, in contrast, the traditional division of labor is reinforced, and traditional mothers reduce their labor supply by more than modern mothers.

Figure 6b shows that occupation (TC vs NT) has primarily a level effect on labor supply. Being able to telecommute leads mothers to supply more labor both in regular times and during a recession. The reduction in labor supply in a pandemic recession is similar across occupations.

Another notable observation in both panels of Figure 6 is that during a normal recession, average hours worked by mothers are roughly constant. While some mothers lose their jobs, others are entering the labor force as their husbands lose their jobs. We will examine this family insurance effect in more detail in the next section.

Figure 7: Spousal Insurance: Hours Worked for Married Women Who Worked Part-Time Before Recession While Husband Worked Full-Time



5.2 Family Insurance

Families play an important role as an insurance mechanism for shocks to earnings and employment (see [Attanasio, Low, and Sánchez-Marcos 2005](#); [Blundell, Pistaferri, and Saporta-Eksten 2016, 2018](#); [Ellieroth 2019](#)). If a primary earner faces wage cuts or unemployment, the secondary earner in the family can either enter the labor force or increase hours to make up for the decrease in family income. This insurance mechanism is particularly relevant during regular recessions, when many men (who are often primary earners) lose jobs, whereas women's employment prospects are less affected. [Doepke and Tertilt \(2016\)](#) argue that family insurance is a primary reason behind the low cyclical volatility of married women's labor supply (as documented in Section 2), which obtains even though married women's labor supply is highly elastic at the micro level.

The family insurance mechanism is quantitatively important in our model. Figure 7 shows how labor supply evolves over recessions for married women who worked part time just before the recession while their husbands worked full time. This group of households generally displays the most family insurance, because the secondary earner is able to increase hours while already being in the labor force. The left panel of the figure shows that women in this group increase their labor supply during a regular recession. In the right panel, we further decompose labor supply in this group between women whose husband lost a job (i.e., is not working in the current period, even though he was working full time before the recession) versus those whose husband is still work-

ing. The figure shows that the increase in hours in a regular recession is indeed driven by women whose husbands lost a job, as suggested by the family insurance mechanism. The effect is quantitatively large: conditional on the husband's job loss, labor supply in the recession increases by more than 50 percent for this group of women.

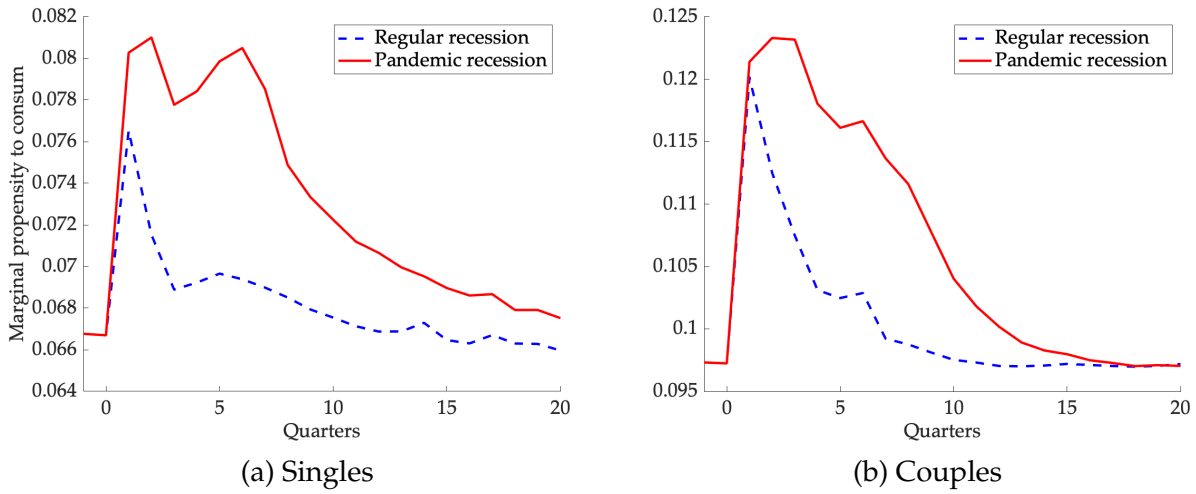
The figure also shows the same outcomes during a pandemic recession. The left panel shows that in terms of total labor supply, the family insurance mechanism is no longer present: labor supply drops throughout the whole recession for this group of women. The right panel again decomposes the overall change in labor supply between women whose husbands lost a job and those whose husbands are still employed. In the first period of the recession, there is still a sizeable increase in labor supply for women whose husbands become unemployed, albeit only half as large compared to a regular recession. However, in subsequent periods this insurance effect becomes smaller. As the pandemic regression progresses, many of the women who initially worked part time drop out of the labor force to meet childcare needs, which makes it more difficult to find a job and expand employment later on. There is still some family insurance in the sense that women whose husbands are unemployed work more than others, but this insurance takes the form of not cutting hours rather than increasing hours. Families are able to soften the blow of falling earnings, but truly compensating for income losses by working more is not feasible in the pandemic recession for most couples.

5.3 Marginal Propensities to Consume

In addition to driving the labor supply response to a pandemic, family insurance also matters for the transmission of income shocks to household spending and consumption. Households who lose access to insurance mechanisms are less able to compensate for income losses, resulting in a strong transmission from income shocks to reduced consumption. At the economywide level, these changes are reflected in the distribution of marginal propensities to consume (MPCs).

A recent macroeconomic literature points out the central role of MPC distributions for the transmission of macroeconomics shocks (e.g., [Berger et al. 2017](#), [Auclert 2019](#), [Auclert, Bardóczy, and Rognlie 2020](#), [Patterson 2019](#)). If average MPC is high, a given negative shock to household income will result in a larger reduction in consumption demand. In models where demand shocks affect output (e.g., because of nominal frictions), a higher average MPC therefore results in deeper recessions for a given initial shock.

Figure 8: Average Marginal Propensities to Consume



For these reasons, to assess how the shock of a pandemic recession is transmitted throughout the economy and to assess the possibility of a highly persistent downturn driven in part by demand channels, it is crucial to ascertain how MPCs evolve in pandemic compared to regular recessions. This question is answered by Figure 8, which displays how the average MPC evolves in our economy in both types of recessions.

Two important differences between regular and pandemic recessions stand out. First, on impact the pandemic recession raises MPCs by more than a regular recession, especially for single households. This initial level difference arises primarily because a pandemic recession causes a bigger drop in earnings, which pushes households closer to financial constraints. Second, the rise in MPCs is more persistent during a pandemic recession compared to a regular recession, for both single and married households. Two different mechanisms contribute to this persistence. For single households, the persistent increase in MPCs is primarily driven by single parents. A large number of single parents drop out of the labor force during the entire pandemic recession. This persistent earnings loss drives down assets and leaves little room for self-insurance even during the early years of the recovery. For married households, the same factor is in play, but in addition these households suffer from the loss of family insurance as documented above. The loss of family insurance implies that married households are less able to compensate for earnings losses, which makes them draw down their assets and ultimately end up with a high MPC.

These results show that in an pandemic recession and even during the recovery from a

pandemic recession, MPCs are elevated compared to regular recessions, implying that the aggregate transmission from income shocks to aggregate demand is high. This fact can amplify the downturn through demand-driven channels. Conversely, high MPCs also imply that economic stimulus measures are likely to be highly effective. Overall, these results underline the important role of the dynamics of female labor supply and family decision making in shaping the macroeconomic properties of recessions.

6 Medium and Long Run Implications for Gender Inequality

We now turn from macroeconomic implications to the repercussions of regular and pandemic recessions for gender inequality. We have already shown that unlike regular recessions, pandemic recessions reduce women's labor supply relative to men, and that mothers' childcare responsibilities play an important role in this. Changes in women and men's relative labor supply have direct implications for gender inequality in the labor market through the accumulation of experience when working and skill loss when not employed. Regular recessions primarily lower men's employment and therefore reduce men's labor market experience relatively more, contributing to a narrowing of the gender wage gap. Conversely, a pandemic recession puts many women out of work and, at least initially, lowers women's relative wages.

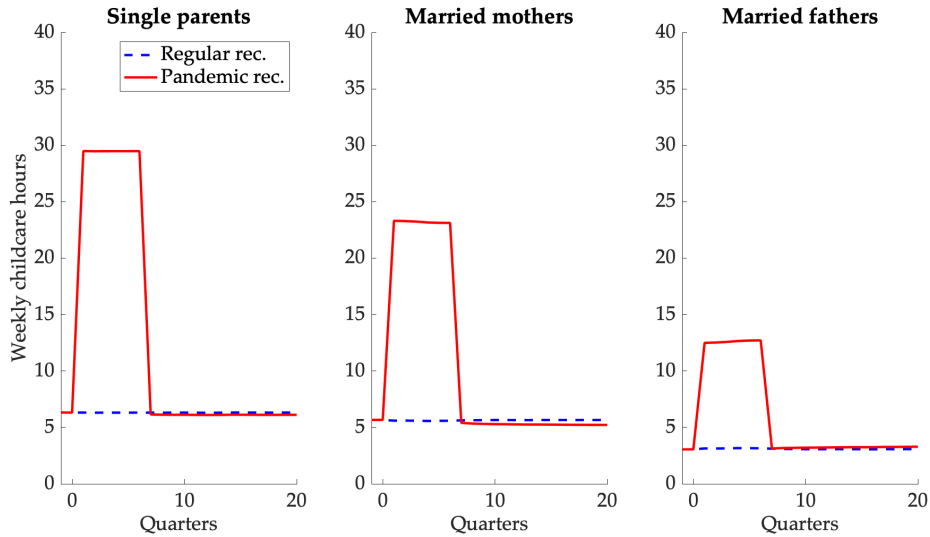
We also consider the possibility that the experience of a pandemic recession can lead to changes in gender inequality that long outlast the pandemic itself. A large part of gender inequality in the labor markets of advanced economies is linked to childbearing and unequal childcare responsibilities between women and men (Miller 2011; Adda, Dustmann, and Stevens 2017; Kleven, Landais, and Sogaard 2019; Kleven et al. 2019; Gallen 2018; Hannusch 2019; Xiao 2020). As we have documented, the current pandemic recession has led to massive changes in how families organize childcare; not just mothers but also many fathers spend much more time caring for their children during the crisis, and many employers have reorganized work to enable workers to continue their job while also caring for children at home. We argue that some of these changes are likely to persist, leading to changes in gender inequality in the labor market in the long term.

Given that we interpret these long-term changes as responses to changes in the division of childcare during the pandemic, we start by taking a closer look how regular and pandemic recessions affect the division of childcare within families in our model. We then continue to our analysis of short-, medium-, and long-run implications of recessions for gender inequality.

6.1 Division of Childcare and Leisure during the Pandemic Recession

Our results for labor supply already suggest that women are more affected than men by the large increase in childcare needs during a pandemic recession. This is confirmed by Figure 9 where we compare the increase in childcare time during the pandemic for mothers and fathers. Naturally, the increase in childcare is largest for single parents, whose weekly time spent on childcare increase by about 23 hours. Single mothers and fathers react in a similar way. Among married couples, the increase in childcare hours is much larger for women than for men. These model implications line up well with empirical findings that both women and men increased time spent on childcare during the crisis, but that the increase was much larger for women (see, e.g., [Adams-Prassl et al. 2020b](#) for evidence on the US, UK, and Germany).

Figure 9: Childcare Provided by Single and Married Parents

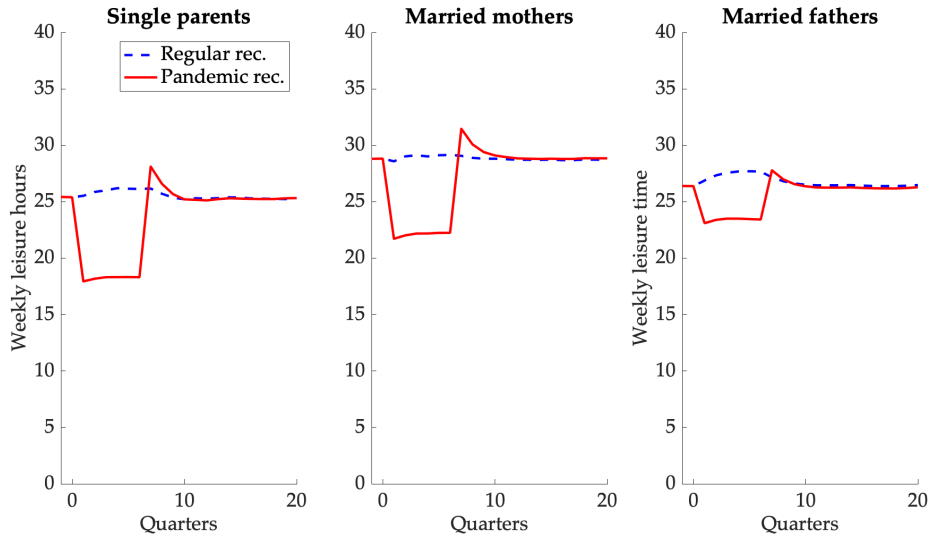


Notes: For telecommuters, childcare time in the model is computed as $t^g + 0.5\phi(k)n^g$, that is, time that is spend on childcare and work simultaneously is counted as 50 percent childcare. Counting all of the combined time as childcare leads to similar results.

As shown above, the increase in childcare comes partly at the expense of labor supply: many women are switching from full-time to part-time work or dropping out of the labor force entirely to compensate for the extra childcare needs. Another sizeable fraction of the extra childcare needs is met by reducing leisure. Among married couples, the reduction in leisure is larger for women than for men (see Figure 10). On average, married women had more leisure than married men before the pandemic, but during the pandemic married women's leisure drops below that of men. The leisure of single parents

(most of whom are women) is even lower than that of married mothers. The reduction in leisure implies that women experience a larger welfare loss during the pandemic than men do. This finding may contribute to explaining the observed increase in the gender gap in mental health during the pandemic.¹³ The large impact of having children on leisure is also consistent with the empirical evidence in [Wozniak \(2020\)](#), who shows that households with school-age children reported a greater decline in well-being during the shutdown compared to other households.

Figure 10: Leisure for Single and Married Parents

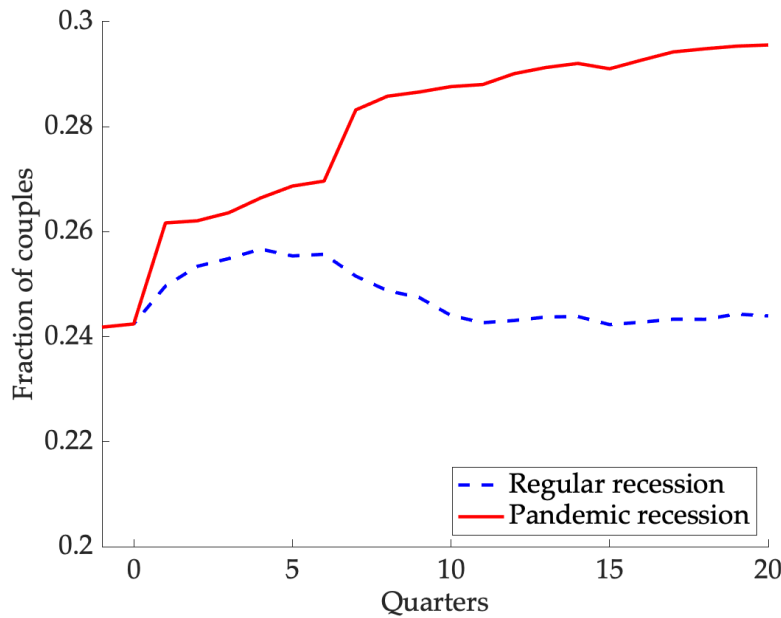


Despite the gender gap in childcare, in our view the evidence supports the expectation that the large increase in childcare needs during the pandemic will ultimately lead to more gender-equal norms in terms of the division of childcare. There are two observations supporting this claim. First, while women continue to do the majority of childcare during the crisis, in relative terms the increase in childcare is actually slightly larger for married fathers compared to married mothers. Arguably, having to do a lot of childcare is a bigger shock for most men compared to most women. Many men learn for the first time how much work childcare entails and the full range of tasks that it involves. The resulting learning-by-doing and better understanding of the challenges of combining childcare and work could be expected to erode gender norms that work against men contributing equally to childcare.

¹³See [Adams-Prassl et al. \(2020a\)](#) for the United states, and [Oreffice and Quintana-Domeque \(2020\)](#) for the UK. Further, [Biroli et al. \(2020\)](#) document an increase in reported tensions in families in Italy, the UK and the US.

To be sure, this may not be true in every individual case—some men may be even more hesitant to provide childcare after their pandemic experience. But existing evidence from policy-induced increases in father’s contributions to childcare (through paternity leave) does suggest that the increase in men’s contributions during the crisis will also lead to higher involvement of fathers in childcare in the future, and correspondingly a higher ability of mothers to engage in careers (see., e.g., [Farré and González 2019](#) for evidence from Spain and [Tamm 2019](#) for evidence from Germany).

Figure 11: Fraction of Married Couples with Children with Fathers as Main Childcare Provider



Notes: For telecommuters, childcare time in the model is computed as $t^g + 0.5\phi(k)n^g$, that is, time that is spent on childcare and work simultaneously is counted as 50 percent childcare. Counting all of the combined time as childcare leads to similar results.

A second factor, arguably even more important, is that a pandemic recession actually increases the share of couples where the husband is the main provider of childcare. In normal times, specialization in the household is primarily driven by the within-couple gender wage gap and, for traditional couples, by gender-unequal social norms. Both factors push towards a division of labor that makes mothers the main provider of childcare. In the pandemic recession, these same factors are still present, but the parents’ occupations (telecommutable or not) also start to play a major role. In many couples where the husband can telecommute while the wife cannot, the husband (who can more eas-

ily combine childcare with work) becomes the primary childcare provider. An example of such a couple would be a wife who is a doctor or nurse working the hospital married to an office worker who can work from home during the crisis; [Alon et al. \(2020a\)](#) document that there are millions such couples in the United States (about 12 percent of married couples with children). Because the fraction of telecommutable jobs further increases in the pandemic recession and remains high in the new normal, the result is a sustained rise in the fraction of men who are main childcare providers. Figure 11 shows that the fraction of men who are primary childcare providers in the model jumps immediately at the beginning of a pandemic recession, and continues to rise throughout the pandemic and the subsequent recovery. In a regular recession there is also a rise in the number of men who are main childcare providers (because more men lose jobs and then specialize in childcare), but the rise is smaller and disappears in the recovery.

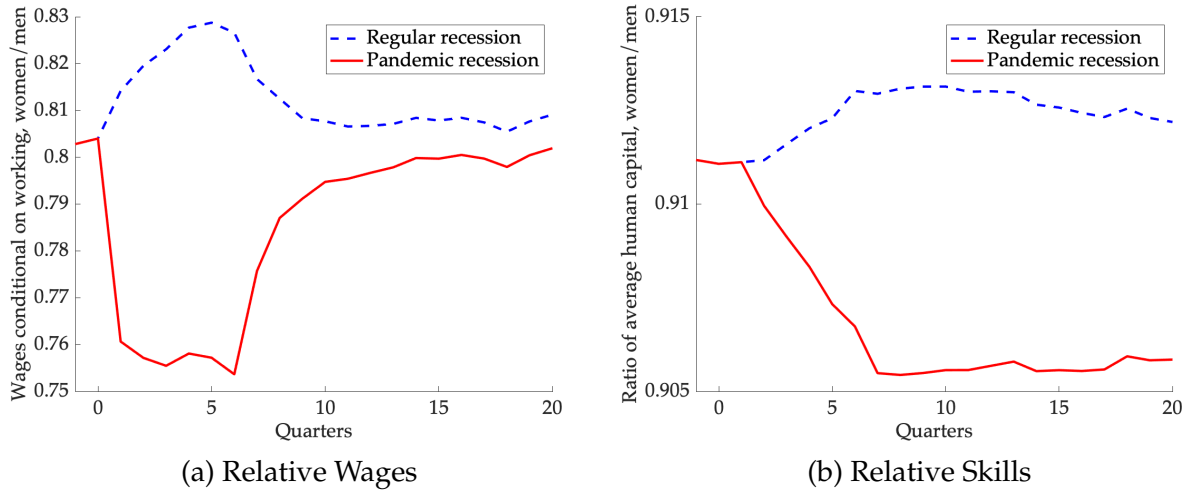
The model prediction of a rising number of men who are primary childcare providers lines up well with the evidence: several empirical studies find that the fraction of families where childcare is shared equally or the father is the main childcare provider has increased substantially. [Carlson, Petts, and Pepin \(2020\)](#) finds for the US, prior to the pandemic 28 percent of women report sharing childcare equally, which increased to 34 percent during the pandemic. For older children the increase was even larger: from 29 to 42 percent. Similar observations are made in other countries, see [von Gaudecker et al. \(2020\)](#) for the Netherlands, [Möhring et al. \(2020\)](#) for Germany, and [Del Boca et al. \(2020\)](#) for Italy. Further, [Biroli et al. \(2020\)](#) find that the proportion of families that share childcare equally increased by 8 percentage points in the UK and 17 percentage in Italy. The central role of the ability to telecommute for these changes is backed up by the findings of [Adams-Prassl et al. \(2020b\)](#), who find that in the United States in April 2020 fathers working from home spent 4.8 hours per day on childcare and home schooling, while fathers who could not work from home but still had a job spend only 2.3 hours, i.e., less than half as much.

Fathers who are main providers of childcare can be role models whose example pushes against existing gender-unequal norms for the division of childcare. We will explore the implications of potential shifts in social norms brought about by their example below.

6.2 The Evolution of the Gender Wage Gap During the Recovery

A sizeable literature documents that job losses lead to persistent earnings losses ([Stevens 1997](#)), and that these losses are especially severe for layoffs that occur in recessions

Figure 12: Gender Inequality in the Labor Market During Recessions



(Davis and von Wachter 2011). Laid-off workers forgo returns to experience, may face difficulty finding a new job in the same occupation or with the same level of responsibility, and are less likely to have secure employment in the future (Jarosch 2015). These consequences are not just limited to workers who lose jobs, but also affect those about to enter the labor market for the first time.¹⁴

We have documented that both in the data and in our model recessions affect women’s and men’s employment in different ways, and these differences have consequences for how gender inequality in the labor market evolves during and after recessions. Figure 12a shows that in a regular recession, gender inequality narrows, with women’s wages increasing by close to two percent relative to men. This matches empirical evidence that gender wage gaps usually narrow during recessions (Solon, Barsky, and Parker 1994), an effect that was particularly pronounced in the Great Recession of 2007–2009 (Marchand and Olfert 2013; Chen and Kelly 2019). In contrast, we find that a pandemic recession, which hits women’s employment harder than men’s, leads to a substantial widening of the gender gap. Relative-wage changes in recessions revert to some extent during the recovery, but the gap is persistent: the gender wage gap is lower even five years after the onset of a regular recession compared to a pandemic recession.

The changes in the observed gender wage gap are in part due to skill accumulation and skill loss, and in part due to selection effects. Figure 12b isolates the contribution of

¹⁴See, for example, Altonji, Kahn, and Speer (2016), Oreopoulos, von Wachter, and Heisz (2012), and Schwandt and von Wachter (2019).

relative skills by displaying how the ratio of human capital (i.e., efficiency units of labor) between women and men evolves in recessions. As expected, in regular recessions (when men face high unemployment) women's skills increase relative to men, whereas in a pandemic recession (when many women stop working) women's relative skills drop sharply. Changes in skills are more persistent than changes in the wage gap, reflecting that some workers who face skill loss stop working permanently and therefore no longer affect the measured gender gap among those in the labor force.¹⁵ Comparing Figures 12a and 12b, we can see that the initial changes in the gender wage gap in a recession are primarily due to selection, but over time skill accumulation gains in importance.

6.3 The Long-Run Impact on the Gender Gap: Work Organization and Social Norms

The coronavirus pandemic has resulted in a historically unprecedented jump in working mothers' and fathers' provision of childcare, with many fathers turning into primary providers of childcare for the first time. The pandemic has also led to an equally unprecedented reorganization of the workplace, with a large fraction of the labor force working from home during the crisis and employers quickly adjusting to the new reality of pervasive remote work.

Experience shows that such a temporary but profound shift in division of labor across genders and the organization of the workplace can lead to permanent shifts in gender norms and economic outcomes. The closest historical analogue is arguably the entry of millions of married women to the US labor force during World War II. Before the war, most women would stop working once they got married, a convention that was supported by social norms in favor of the single-earner model and formal restrictions such as the marriage bars that applied in many occupations. The large rise in women's war-time labor force participation had a large and persistent effect on female employment.¹⁶

World War II raised women's labor market participation not just through the direct impact on the working women (many dropped out of the labor force, at least temporarily, at the end of the war), but also by shifting social norms. For example, [Fernández, Fogli, and Olivetti \(2004\)](#) show that boys who grow up with a working mom are more likely

¹⁵These effects on the relative skills of women and men are similar to what [Heathcote, Perri, and Violante \(2020\)](#) observe about less-skilled workers in recessions, who if they lose a job in recessions tend to lower their attachment to the labor force.

¹⁶See for example [Acemoglu, Autor, and Lyle \(2004\)](#) and [Goldin and Olivetti \(2013\)](#). [Doepke, Hazan, and Maoz \(2015\)](#) argue that the persistent impact of World War II on the female labor market was also one of the root causes of the post-war baby boom.

to marry women who also continue working when married.¹⁷ Arguably, the example provided by their own parents created a preference in these boys for a more equal division of labor in the family that was then reflected in their own choices as husbands and fathers.¹⁸ Going beyond World War II, [Fernández \(2013\)](#) and [Fogli and Veldkamp \(2011\)](#) argue that gradual learning about the true costs and benefits of being employed by observing other working women in their families and neighborhoods was a major engine powering the secular rise in married women's labor force participation from the 1950s to 1990s.¹⁹ The learning mechanism, too, implies that temporary shocks can accelerate social change, in this case by providing additional learning opportunities.

Our model of a pandemic recession and of the new normal reached after such a recession incorporates the expectation that, like World War II, the substantial changes in childcare responsibilities and work organization during the crisis will have long term effects. In particular, from the onset of the pandemic recession onward, more couples switch from traditional to modern role models, and new cohorts include a higher fraction of modern couples as well. While we do not model the exact nature of the adjustment process, we view this transformation as being driven by learning-by-doing as many fathers experience a large rise in childcare responsibilities, and by the role model provided by the increasing share of fathers who are the primary providers of childcare during the crisis.

We also impose that the increased work flexibility that arises at the beginning of the pandemic (a larger fraction of telecommutable jobs) will persist in the new normal. This change can once again be justified with learning-by-doing, in this case by both employers and employees, and is consistent with many news reports of employers planning to keep working-from-home arrangements in place after the pandemic. More flexible work arrangement can benefit women by lowering the overall burden of childcare and by increasing men's childcare responsibilities once they find telecommutable jobs. The notion that lacking workplace flexibility is a barrier for women's careers has been advanced by [Goldin and Katz \(2011\)](#) and [Erosa et al. \(2017\)](#), among others.²⁰

Given these driving forces of long-run changes, Figure [13a](#) shows how women's relative labor supply evolves over the long term (40 years) in pandemic versus regular

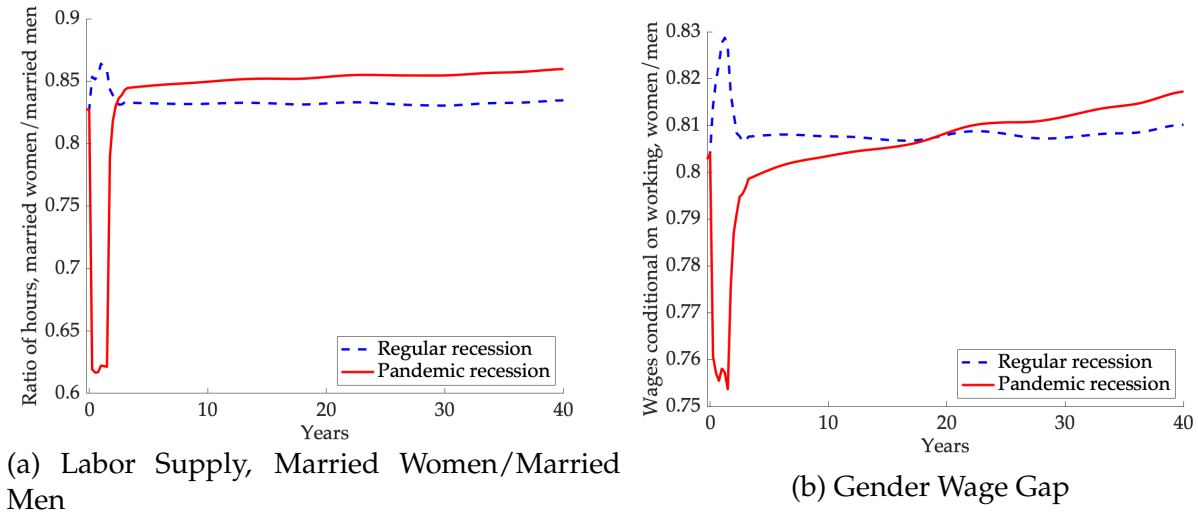
¹⁷[Fernández, Fogli, and Olivetti \(2004\)](#) use the World-War-II shock to generate exogenous variation that can identify a causal effect.

¹⁸See [Grosjean and Khattar \(2018\)](#) for evidence of persistence in gender norms over even longer periods.

¹⁹Along similar lines, [Olivetti, Patacchini, and Zenou \(2020\)](#), show that being exposed to working moms among peers in teenage years makes girls more likely to work later on themselves.

²⁰For a related perspective on the micro sources of the aggregate gender wage gap and its relation to the availability of parental leave and workplace flexibility see [Iacopo and Moser \(2020\)](#).

Figure 13: Gender Inequality in the Long Run

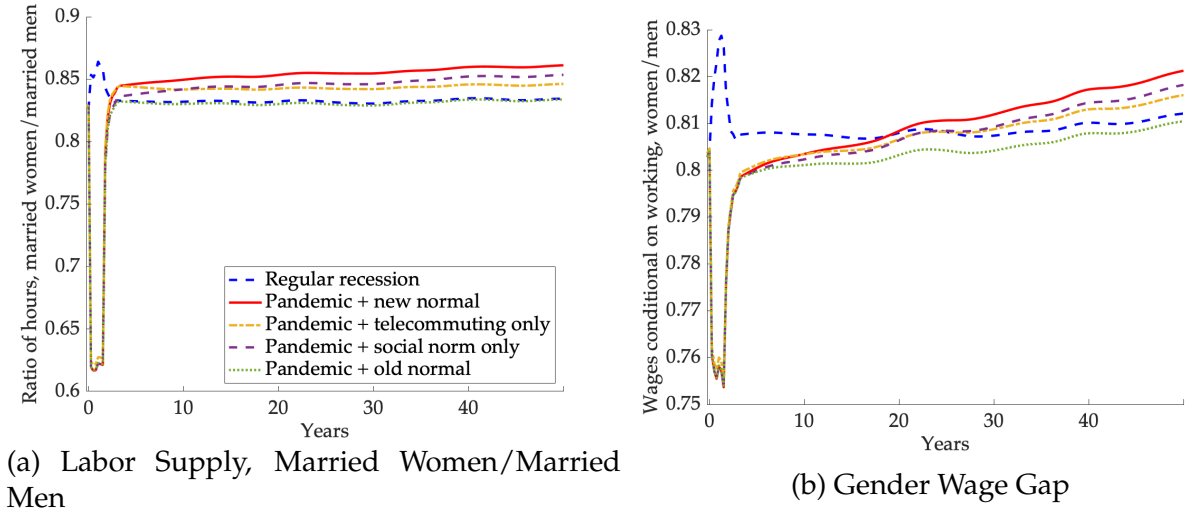


recessions. Even though women face low employment and lose skills during a pandemic recession (see Figure 12b), female labor supply rises above its original level (and above the labor supply following a regular recession) right from the start of the recovery. Figure 14a provides a decomposition that shows how the two long-run forces (changes in social norms and increase in TC jobs) contribute to this outcome. The decomposition shows if, counterfactually, both social norms and the share of TC reverted to the pre-pandemic levels at the beginning of the recovery, women's labor supply would continue to be depressed, and remain slightly below the level observed in the aftermath of a regular recession throughout. Thus, the two long-run forces are crucial for raising women's labor supply, with the contributions from each being similar in magnitude.

Figure 13b shows what this change in women's labor supply implies for the gender wage gap. As already shown in Figure 12a, in the medium term a pandemic recession increases the gender wage gap, through the depreciation of women's skills during the pandemic. However, the subsequent rise in female labor supply accelerates the accumulation of skills and gradually raises women's relative wages. After about 20 years, the gender wage gap returns to its original level, and then continues closing in response to women's higher labor supply. The decomposition in Figure 14b shows that both the change in social norms and the increase in job flexibility play a quantitatively important role in driving the closing of the gender gap.

Two decades is a long time, and our long-run results do not overturn our basic finding

Figure 14: Gender Inequality in the Long Run: Decomposition of Channels



that a pandemic recession is a setback for women's equality in the workplace. Nevertheless, the long-run results do provide a silver lining. A pandemic recession has the potential to be a watershed moment in terms of the division of labor in the family and in terms of family-friendly organization of the workplace. Through these channels, over the long term the pandemic can contribute to reducing gender inequality.

6.4 The Impact of School Closures on Gender Inequality

The severe impact of the current downturn on employment, earnings, and ultimately welfare raises the question of what public policy can do to offset some of the economic consequences of the pandemic. Our economic model can help inform this debate. For example, our results on family insurance and MPCs suggest that fiscal policy, such as extended unemployment insurance and transfer payments to affected families, can be unusually effective in a pandemic recession in terms of stimulating aggregate demand.

The policy issue most directly linked to our analysis is the role school openings can play in accelerating the recovery from the crisis. A full analysis of this question would require an assessment of the health consequences of opening schools and daycare centers while the pandemic is still ongoing, which is an issue that we abstract from here.²¹ Still, our

²¹ A cautionary note is provided by [Alon et al. \(2020b\)](#), who argue that schools can be a major vector of disease transmission, particularly so in developing countries due the high prevalence of multi-generation households, a feature that [Bayer and Kuhn \(2020\)](#) argue can contribute to high case-fatality rates. [Baqaee et al. \(2011\)](#) emphasize that measures such as reintroducing restrictions on social gatherings, wearing

analysis is well suited to shed light on the repercussions of school openings for the labor market and the evolution of gender inequality during the recession and recovery.

In our setting, the primary effect of opening schools and daycare centers is to free up the labor supply of women and men who are currently not working because they need to look after and home school their children. Empirical estimates show that this effect is potentially important. [Dingel, Patterson, and Vavra \(2020\)](#) show that 32 percent of the US workforce have a child under the age of 14 in their household. [Fuchs-Schündeln, Kuhn, and Tertilt \(2020\)](#) report that the same is true for 26 percent of the workforce in low-fertility Germany; in other European countries, this share is as high as 41 percent.

Figure 15: Hours Worked and Aggregate Labor Earnings under School Reopenings

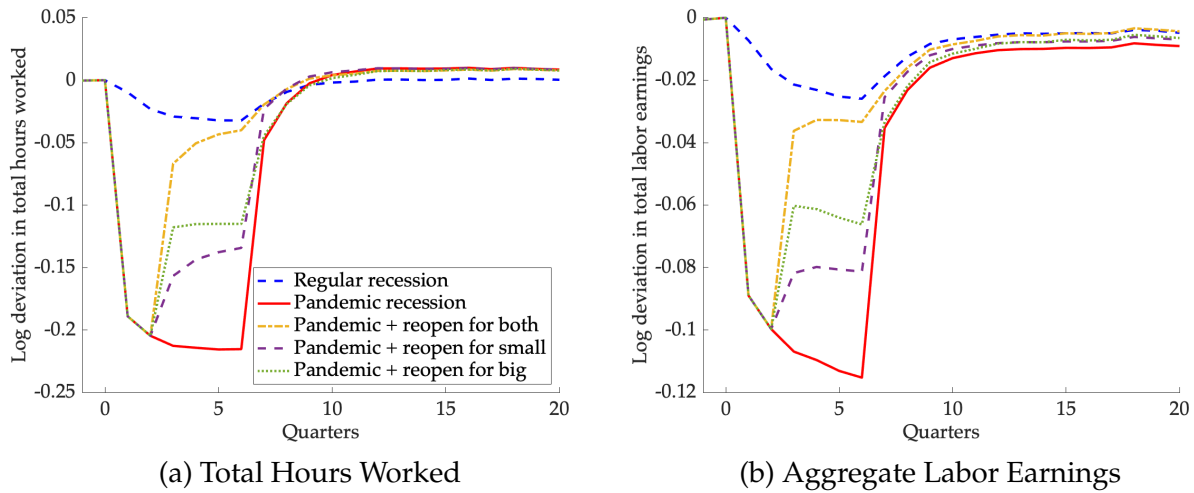


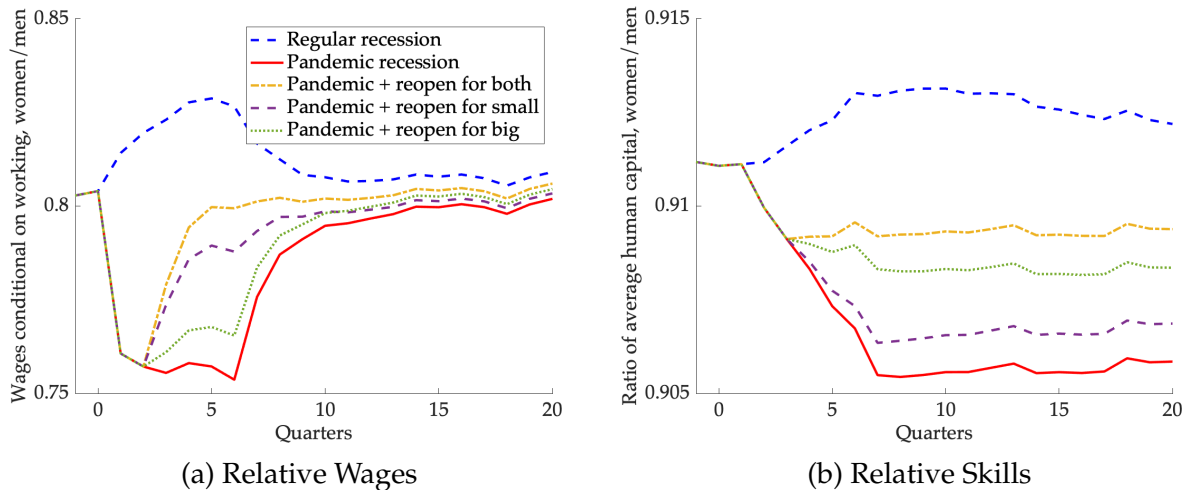
Figure 15 shows how aggregate hours labor supply would evolve in a pandemic recession if schools were to reopen two quarters into the recession, rather than staying shut for the entire pandemic. Formally, opening schools means that childcare requirements return the pre-recession level after two quarters, while job separation probabilities continue to be elevated and the other aspects of the pandemic recession remain in place. The figure also provides separate results that return either only young children to school (i.e., opening daycare centers and preschools) or only older children (opening K-12 schools). The figure shows that opening schools would immediately mitigate the economic impact of the pandemic by reversing more than half of the decline in labor supply brought

masks, and increasing testing and quarantine are necessary before wider re-openings are feasible. The effect of school closures specifically on the US health-care workforce is analyzed in [Bayham and Fenichel \(2020\)](#).

about by the recession. The impact on labor earnings is even larger: losses in labor earnings are reduced by about two-thirds. This large economic impact underlines the key role of high childcare requirements for the drop in economic activity during the pandemic, and shows that in economic terms reopening schools is much more effective than reopening specific sectors with small aggregate employment shares (such as gyms, bars, and restaurants).

Figure 16 shows how opening schools early affects gender inequality in the labor market in terms of women's relative wages and relative skills. Given that women carry the larger part of the extra burden of childcare during the pandemic, relieving this burden is a disproportional benefit to women. The gender wage gap is immediately reduced, and opening schools early avoids about half of the recession-induced relative skill loss of women. For reducing the gender wage gap, sending small kids back to school (who have the highest childcare requirement, and caring for whom is hard to combine with work even at home) has the larger impact. Women also benefit disproportionately from school openings in terms of welfare (see Figure 17 in Appendix B).

Figure 16: The Impact of School Reopenings on Gender Inequality



These results suggest that prioritizing school openings (relative to, say, opening bars and restaurants) can be an effective strategy for mitigating the economic impact of a pandemic recession. Of course, this policy implication comes with the caveat that the health consequences of open schools also have to be taken into account; such a policy is only a realistic option if the pandemic is sufficiently controlled such that opening schools will not reignite or amplify the pandemic itself.

7 Conclusions

As a result of the Covid-19 pandemic, the United States along with other countries has entered the sharpest economic downturn since the Great Depression. In this paper, we argue that other than being more severe, the central economic distinction between this downturn and other recent recessions lies in the impact on and the role of women's employment.

The lockdown measures implemented in a pandemic recession have a large impact on high-contact sectors such as hotels and restaurants, which have high shares of female employment. Hence, different from a regular recession, more women than men are directly affected by layoffs. In addition, the closures of daycare centers and schools during the pandemic result in a large increase in childcare needs. Women shoulder the majority of this additional responsibility, lowering their ability to work even further.

We develop a macroeconomic model that can account for the distinct features of regular and pandemic recessions. We use the model to examine the wider economic repercussions of the large impact of a pandemic recession on working women. In terms of macroeconomic implications, we find that the large impact of a pandemic recession on women's employment reduces the role of families as a shock absorber. Very few married workers are able to increase employment to make up for lost earnings of their spouse. As a result of this loss of insurance, earnings losses are translated strongly to lower consumption demand, and marginal propensities to consume rise more than in regular recessions.

We also find that a pandemic recession has sizeable repercussions for gender inequality. In the short and medium term, a pandemic recession erodes women's position in the labor market, first through direct employment losses, and later on through the loss in labor market experience brought about by low employment during the recession. These forces lead to a widening of the gender wage gap during a pandemic recession and in its immediate aftermath.

Nevertheless, we also argue that over a longer term a pandemic recession can trigger changes that ultimately reduce gender inequality. Specifically, the rise in work flexibility during a pandemic recession is likely to be persistent, and has a disproportionate benefit for women who carry major childcare responsibilities. We also point out the possibility of shifting social norms towards more equal sharing of childcare responsibilities between mothers and fathers, triggered by an increase in men's childcare provision and

a rising fraction of men who are the main provider of childcare in their family. In our quantitative analysis, these changes imply that a pandemic recession ultimately reduces the gender wage gap, although it takes many years for women's initial skill losses to be fully made up.

A more general lesson from our analysis is that accounting for family behavior and gender differences should be a central element of research on economic fluctuations. Authors such as [Albanesi \(2020\)](#), [Doepke and Tertilt \(2016\)](#), and [Fukui, Nakamura, and Steinsson \(2019\)](#) have already shown that the secular rise in female labor force participation in the twentieth century has changed the nature of aggregate labor supply and is the underlying cause behind recent changes in the nature of economic fluctuations. Our study adds to these arguments by accounting for the macroeconomic consequences of childcare responsibilities, skill accumulation, and work organization, all of which are features that play a central role in the current pandemic recession. A traditional, single-gender macroeconomic model would be unable to capture some of the most distinct characteristics of the economic environment brought about by the coronavirus pandemic.

Our analysis has focused on advanced economies characterized by high income levels and high participation of women, including many mothers, in the formal labor market. As we have documented, the current pandemic recession has similar features in terms of the relative economic impact on women versus men across countries in this group. An urgent challenge for future research is to assess the impact of pandemic recessions in middle-income and developing countries. The existing work on this issue (e.g., [Alon et al. 2020b](#)) has generally focused on issues other than gender or women's labor force participation. The pandemic is a global phenomenon, and policy measures such as school closings are implemented all around the world. At the same time, different economic conditions in terms of income levels, women's labor force participation, and the ability to work remotely suggests that the impacts of the pandemic recession and the resulting policy tradeoffs may be substantially different in developing economies. Given the severity of the ongoing health and economic crisis, research on the impact of the coronavirus epidemic on women's work and gender inequality in a wider range of countries is urgently needed.

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A Additional Tables and Details on the Calibration

A.1 Overview of Calibration Data Sources

The calibration targets draw on data from several different sources. Data on childcare hours by gender and marital status come from the American Time Use Survey (ATUS). The telecommuting status of different occupations is derived from the American Time Use Survey's Leave Module (2017-2018) and is then merged into the Current Population Survey (CPS) to calculate the aggregate occupation shares. All data on employment status, household composition, and the presence of children is similarly taken from the CPS or related Census data sources. Labor market flows are calculated using the CPS matched basic monthly files from 2000–2020. Data on the share of households with traditional or modern social views is derived from questions in the General Social Survey (GSS). Finally, auxiliary data used to calculate average child rearing duration comes from the National Survey of Family Growth (NSFG) and data on the returns to (broad) labor market experience is estimated using the National Longitudinal Survey of Youth 1997 (NLSY97).

A.2 Further Details on the Calibration Procedure

Moments on the gender wage gap, labor supply, and labor market flows are calculated from the Current Population Survey. The primary sample includes all households ages 25 to 55 with non-missing entries for marital status, gender, and employment status. The age limit of 55 is chosen to be consistent with our focus on prime-age workers below an age when early retirement becomes common. Unless otherwise stated, the sample period spans the years 2017 to 2018. Individuals are grouped by gender (male, female), marital status (single, married), type of children (none, small, big), employment status (not employed, part-time, full-time), and occupation type (telecommuting, non-telecommuting). Child groups correspond to the age of the youngest own child in a household, with small kids corresponding to ages 0–5 and big kids corresponding to ages 6–16. Employment groups are identified using labor force status and usual hours worked. The non-employed includes those who are either unemployed or not in the labor force; part-time includes all those employed usually working less than 35 hours a week; and full-time includes all those usually working more than 35 hours a week. Telecommuting status is assigned using Census occupational codes following the classification procedure in [Alon et al. \(2020a\)](#). Subsequent labor market flows between telecommuting and non-telecommuting jobs are calculated to match the employment shares of each type just preceding and during the pandemic, as documented in [Bick and Blandin \(2020\)](#). The gender wage gap is calculated as the average hourly wage of employed women relative to employed men, where wages are derived from CPS data on total annual income, weeks worked, and usual weekly hours.

Table 7: Job Flows during Regular Recessions, by Gender and Employment Status

| Recession Labor Market Flows | Data | Model |
|------------------------------|------|-------|
| men E-to-E | 0.93 | 0.91 |
| men U-to-U | 0.64 | 0.67 |
| women E-to-E | 0.91 | 0.91 |
| women U-to-U | 0.76 | 0.72 |

Moments on labor market flows by gender, marital status, employment status, and aggregate state of the economy are calculated using the matched CPS Basic Monthly Files from 2000 to 2020. Recessions are identified using the NBER’s business cycle dates. Monthly flows are then converted to the quarterly frequency so as to conform with the timing convention in our model. The flows during normal times are included as targets in the model’s joint internal calibration. Flow parameters during recessions are fit separately in an auxiliary calibration to reflect their typical cyclical variation. Table 7 summarizes the data and model fit for labor market flows during recessions; flow targets for normal times are included in Table 3 of the main text.

Data on childcare requirements by gender, telecommuting status, and age of child are calculated using the American Time Use Survey. Childcare time includes all time diary entries related to (1) caring for and helping household children [030100], (2) activities related to household children’s education [030200], and (3) activities related to household children’s health [030300]. Time use variables are converted to average weekly levels by collapsing over household types using the ATUS supplied weights. The resulting childcare variables are then re-normalized to be consistent with the time endowment of the model, which sets full-time work equal to unity.

The initial shares of households with traditional versus modern social norms are derived from the General Social Survey. Specifically, we consider the survey question “Preschool kids suffer if their mothers work (agree/disagree)” and calculate the share of modern married couples as the fraction answering either disagree or strongly disagree in the 2018 wave of the GSS.

A.3 Calibrating Child Dynamics

The parameters governing the arrival and aging of children are set to jointly match targets on the life cycle of child-rearing, by gender and marital status. The share of households initialized with children ($\bar{\pi}$) is calculated to match the share of each gender and marital status group with children by age 25, the model’s first period. These shares are taken from Table 1 in the 2018 Census Fertility Report and Table 2 in the Census Fatherhood Report. The remaining moments governing the arrival rate of small children (after age 25), the aging of small children into big children, and the aging of big children into adults are chosen to jointly match (1) the share of

Table 8: Parameters Governing Child-Rearing Dynamics

| Parameter | Value | Target | Data | Model |
|---------------|---------|---|-------|-------|
| $\bar{\pi}_f$ | 0.1500 | Share single females have first child by age 25 | 0.15 | 0.15 |
| $\pi^f(s 0)$ | 0.00467 | Single women, share with children | 0.35 | 0.35 |
| $\pi^f(b s)$ | 0.02604 | Single moms, ratio big-to-small children | 1.67 | 1.67 |
| $\pi^f(0 b)$ | 0.00002 | Single moms, avg. duration of child-rearing in quarters | 88.61 | 81.36 |
| $\bar{\pi}_m$ | 0.0850 | Share single men have first child by age 25 | 0.085 | 0.085 |
| $\pi^m(s 0)$ | 0.00133 | Single men, share with children | 0.15 | 0.15 |
| $\pi^m(b s)$ | 0.02083 | Single dads, ratio big-to-small children | 1.30 | 1.32 |
| $\pi^m(0 b)$ | 0.00003 | Single dads, avg. duration of child-rearing in quarters | 83.23 | 83.92 |
| $\bar{\pi}_c$ | 0.5280 | Share married couples have first child before age 25 | 0.528 | 0.528 |
| $\Pi(s 0)$ | 0.05429 | Couples, share with children | 0.69 | 0.69 |
| $\Pi(b s)$ | 0.05952 | Couples, ratio big-to-small children | 1.17 | 1.18 |
| $\Pi(0 b)$ | 0.04167 | Couples, avg. duration of child-rearing in quarters | 88.89 | 82.59 |

households with children, (2) the ratio of big-to-small children, and (3) the average duration of child-rearing. Targets (1) and (2) are calculated from our primary CPS data set so as to be consistent with our other targets. The average duration of child rearing is calculated by multiplying the average number of children by 16×4 (the number of quarters childhood) plus the median inter-pregnancy interval (measured in quarters), adjusted by the number of children. The inter-pregnancy interval value is taken from the National Survey of Family Growth. The resulting parameters, data targets, and model fit are summarized in Table 8.

A.4 Calibrating Skill Formation

The human capital grid consists of 5 grid points with a constant ratio of 1.4 between adjacent points (i.e., moving one step up the ladder increases full-time earnings by 40 percent). The constant ratio of grid points implies that returns to experience and the impact of skill loss are equalized along the grid. We identify the initial position of individuals in the human capital grid using their hourly wage in the CPS. The grid values are initialized so that the boundary between the first and second skill regions equals the average wage of the employed population. The initial distribution of individuals on the grid is chosen to match the (joint) distribution of wages by gender and marital status for those ages 25 to 30.²² Specifically, we assign to the first grid point the share of people with incomes below the first grid point, to the second grid point we assign the share of all those between the first and second grid points, and so on. Couples are initialized on a two-dimensional grid to capture the assortativeness of marriage markets. Table 9 summarizes the initial distribution of human capital for single men, single women, and the joint

²²Couples are included in the sample based on the age of the husband.

Table 9: Initial Distribution of Human Capital by Gender and Marital Status

| Couples | | | | | | |
|----------------|-------|-------|-------|-------|-------|--|
| Husband \ Wife | (1) | (2) | (3) | (4) | (5) | |
| (1) | 0.652 | 0.094 | 0.003 | 0.000 | 0.000 | |
| (2) | 0.155 | 0.089 | 0.002 | 0.000 | 0.000 | |
| (3) | 0.003 | 0.002 | 0.000 | 0.000 | 0.000 | |
| (4) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| (5) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | |
| Singles | | | | | | |
| Men | 0.825 | 0.170 | 0.005 | 0.000 | 0.000 | |
| Women | 0.856 | 0.140 | 0.004 | 0.000 | 0.000 | |

distribution for couples.

The parameters which govern human capital dynamics on the grid are δ and η . Both parameters map analytically into observable data moments. Specifically, the expected wage growth amongst employed individuals will equal ηh_{step} . We therefore set η to match a 1.1 percent average quarterly return to labor market experience which we estimate from a longitudinal micro-data in the NLSY97 controlling for individual and year fixed effects. Similarly, the expected wage loss from a quarter of unemployment is equal to δh_{step} . We therefore choose δ to match an average quarterly wage loss of 2.5 percent during non-employment, consistent with the annual estimates of earnings loss one year after job displacement in [Davis and von Wachter \(2011\)](#).

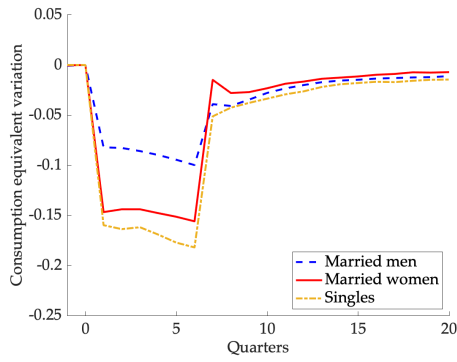
A.5 Details on Computing the Model

The model is solved via value function iteration with discrete grids for all state variables. The grid for human capital is described above. The asset grid has 25 equally spaced grid points from 0 to 2.5 times maximum individual earnings. This maximum asset level is set such that very few households have maximum assets in steady state. Dynamic simulations are carried out by simulating 250,000 individuals over many periods, so that an initial N steady state is reached before the recession shock takes place. For both regular recessions R and pandemic recessions P , the probability that the recession will end in every period is set to $1/6$, that is, $\rho_R = \rho_P = 5/6$.

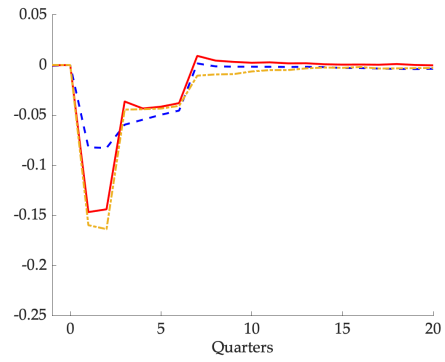
B Welfare Implications of School Openings

Figure 17 provides details on how welfare evolves for singles, married women, and married men under different policy scenarios for school openings. School openings occur either after the recession (quarter 6, panel a) or after two quarters of recession (in quarter 3, panels b–d).

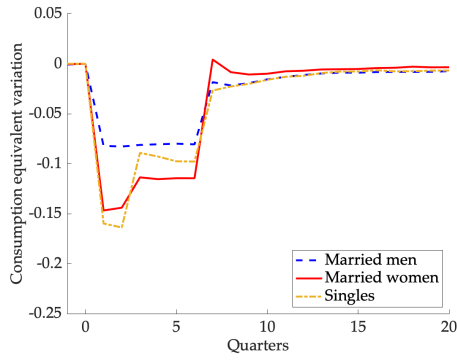
Figure 17: Welfare Implications of School Reopenings



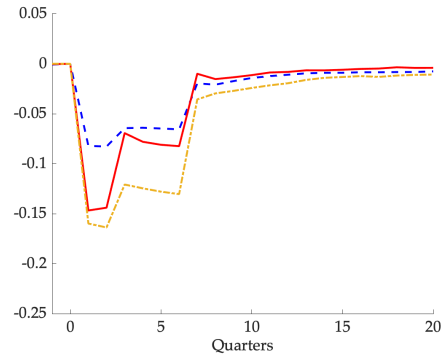
(a) Welfare during the pandemic



(b) Welfare with school reopenings



(c) Welfare with school reopening, big kids only



(d) Welfare with school reopening, small kids only