

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. Yet, in the economic downturn caused by the Covid-19 pandemic, the opposite is true: women's employment declined much more than men's. Why does a pandemic recession have a disproportionate impact on women's employment, and what are the wider repercussions of this phenomenon? We argue that more women lost jobs because their employment is concentrated in contact-intensive sectors such as restaurants and because increased childcare needs during school and daycare closures prevented many from working. We analyze the macroeconomic implications of women's employment losses using a model that features heterogeneity in gender, marital status, childcare needs, and human capital. A pandemic recession is qualitatively different from a regular recession because women's labor supply behaves differently than men's. Specifically, our quantitative analysis shows that a pandemic recession features a stronger transmission from employment to aggregate demand and results in a persistent widening of the gender wage gap. Many of the negative repercussions of a pandemic recession can be averted by prioritizing opening schools and daycare centers during the recovery.

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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 ways it is unlike any other in recent history. Understanding the differences between regular and pandemic recessions is important both to further our understanding of what the recovery from the current downturn will look like, and to inform policy responses to possible pandemic recessions in the future.

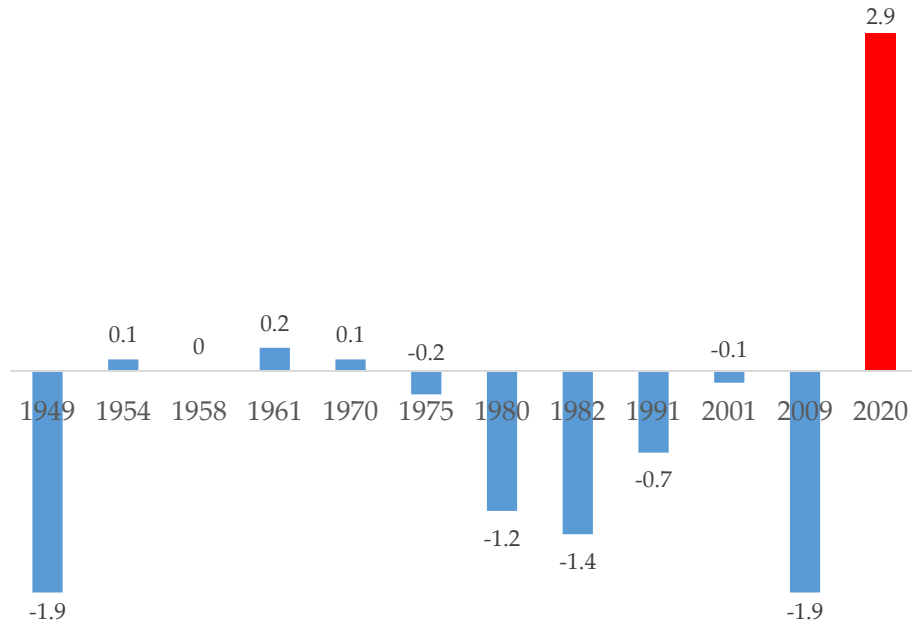
In this paper, we show that a crucial difference between regular recessions and the current downturn lies in the role of women’s employment. In recent recessions preceding the current crisis, men were more severely affected by employment losses. This disproportionate impact was particularly pronounced 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 have experienced larger employment losses and higher unemployment. Figure 1 displays the difference between the rise in women’s and men’s unemployment in every recession in the United States since 1948.¹ Unlike in all previous recessions, women’s unemployment has risen much more than that of men during the current recession—a 2.9 percentage point gap between February and April of 2020. Moreover, the gap in the rise in unemployment is also larger in absolute value than during any other recession; there never has been a recession that has affected workers of one gender so much more than the other.

Our analysis aims to answer two questions about the role of women’s employment in a pandemic recession. First, why is it that women’s employment has declined much more

¹For pre-Covid-19 recessions, we use the difference in the seasonally adjusted unemployment rate between the first and last months 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).

Figure 1: Difference between Rise in Women’s and Men’s Unemployment, US Reces-
sions 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 the first to the last month of each recession according to NBER business cycle dates. For the Covid-19 recession, change in unemployment from February to April 2020 is displayed. The underlying series are seasonally adjusted monthly unemployment rates by gender.

than men’s in the current downturn? Second, what are the wider repercussions of the fact that this pandemic recession is a “shecession” rather than a “mancession”?

Our answer to the first question builds on the observation that the current recession has in large part been triggered by “lockdowns,” i.e., the social distancing measures, business shutdowns, and stay-at-home orders implemented during the pandemic. The need for social distancing impacted different sectors of the economy than those usually hardest hit in recessions. Regular recessions lead to large employment losses especially in construction and manufacturing, both sectors with a high male employment share. In contrast, in the current recession employment losses have been greatest in high-contact service sectors such as restaurants, hospitality, and travel.² These are sectors where women represent a large share of the workforce.

²The largest increases in unemployment have been in the “personal care and service” as well as “food preparation and serving” occupations, with June unemployment rates close to 30 percent in both cases. See BLS Labor Force Statistics from the Current Population Survey, Table A-30.

Another set of social distancing measures consisted of closures of schools and daycare centers, usually for a much longer period than business shutdowns. With children at home, parents had to spend more time on childcare, which reduced time available for market work and led to additional employment losses beyond layoffs. As [Dingel, Patterson, and Vavra \(2020\)](#) show, a third of the US workforce has children aged 14 or younger in the household, implying that the employment effects from school and daycare closures are potentially large. We argue that women's employment is more strongly affected than men's by increased childcare needs. There are many more single mothers than single fathers. Among couples raising children together, before the crisis women spent a lot more time on childcare than men, even if both mother and father were working full time. Survey evidence shows that during the crisis this lopsided division of childcare was sustained, implying that more women than men have been unable to work because of childcare obligations.

Our second question regarding the wider repercussions of the impact of the pandemic recession on women's employment hinges on gender asymmetries. Is a shecession the same as mancession, just with signs reversed, or does it make a qualitative difference which gender is more affected by a downturn? We argue that a shecession is indeed qualitatively different from a mancession, because of the different roles women's and men's labor supply play in many families. In married couples, women are more likely than men to be the secondary earner, and their labor supply is more elastic than that of men. One consequence of married women's more elastic labor supply is that their earnings can serve as a shock absorber when men lose employment in a typical recession. When a husband becomes unemployed, married women become more attached to the labor force and may increase their labor supply on the intensive margin (see [Bardóczy 2020](#)). In a shecession, married men cannot provide the same kind of insurance for women's job losses, because most have little room to increase their labor supply. For this reason, the reaction of aggregate labor supply is qualitatively different depending on whether a negative shock to employment is initially concentrated on women or men.

Differences in women's and men's flexibility of labor supply also imply qualitatively different long-run repercussions of a recession. Women's labor supply is responsive to within-family relative wages. If women's future earnings prospects decline because of job loss in a recession, they become more likely to further specialize in non-market work, reducing future earnings even more. In contrast, when men become unemployed in a recession they usually continue to seek future full-time employment.

Building on these insights, we assess the repercussions of regular versus pandemic recessions with the help of a quantitative model of the household sector in the economy. The model features women and men, single and married households, households with and without kids, and workers who can telecommute and those who cannot. 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 must 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. The ability of workers to combine work with childcare responsibilities depends on their occupation: telecommuters 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 that prefer that childcare be provided by the mother rather than the father.

We calibrate this model to the pre-pandemic US economy. Among other statistics, the calibrated model matches observed labor market flows, married women’s labor supply, the division of childcare in dual-earner couples, estimates of returns to experience and skill loss in unemployment, and the gender wage gap. By reproducing how joint decision-making in families generates the different structure of women’s and men’s labor supply, the model captures the gender asymmetries that are the root cause of qualitative differences between recessions and mancessions.

We use the quantitative model to compare the repercussions of a regular recession and those of a pandemic recession. We model regular recessions as a temporary shift in job destruction rates and job finding probabilities, calibrated to capture the large impact of regular recessions on men’s employment. In contrast, a pandemic recession has an equally large direct impact on women’s and men’s employment, and also brings about an increase in parents’ childcare needs, which generates additional employment losses as some parents reduce labor supply to look after their children.

A first finding from the model is that due to endogenous decisions on the allocation of childcare within households, a pandemic recession lowers women’s employment much more than men’s employment. The pattern of household specialization persists in the recession, implying that mothers shoulder the majority of the increased childcare load and consequently bear more of the employment consequences.

A second finding is that the transmission of income shocks to consumption is qualitatively different in a pandemic versus a regular recession. A pandemic recession has a large impact on households with children, whose marginal propensities to consume (MPCs) differ from those of average households. Single parents are especially limited in their ability to offset income shocks, meaning that such shocks have a large impact on their consumption. Distinct macro implications of regular and pandemic recessions also arise from the role of within-family insurance among married couples. In a regular recession, many wives partially compensate for their husband's lost earnings by joining the labor force or working more. In aggregate terms, within-family insurance serves as a shock absorber that lowers the transmission of aggregate income shocks to aggregate consumption. In contrast, we find that within-family insurance is more limited during a pandemic recession. Men have a more limited ability to compensate for a job loss of their spouse because their attachment to the labor force is already high. Moreover, in families with children, increased childcare needs during the recession limit the ability of secondary earners to increase labor supply. The loss of within-family insurance together with the large impact on single-parent households with high MPCs imply a stronger transmission from income to consumption in a pandemic recession. To the extent that aggregate demand partly determines output, this finding results in a greater amplification of the initial shock and thus a deeper recession and a delayed recovery.³

The third finding from our quantitative analysis is that a pandemic recession has long-run repercussions for gender inequality in the labor market. Workers who lose employment lose skills. Given that regular recessions are mancessions, they primarily reduce men's skills and therefore moderately reduce the gender wage gap, consistent with the evidence in [Solon, Barsky, and Parker \(1994\)](#). In contrast, a pandemic recession depreciates the skills of women who reduce their hours or drop out of the labor force, leading to a substantial widening of the wage gap. A qualitative difference between regular and pandemic recessions is that the impact of a pandemic recession on the gender wage gap is much more persistent. Women who lose employment during a pandemic recession become more likely to leave the labor force permanently or to only seek part-time work. In contrast, most men who lose employment in a regular recession ultimately return to full-time work. In our baseline model, it takes almost twenty years until women's relative wages return to their previous level after a pandemic recession.

³In our analysis, we focus on the household sector and do not spell out such an aggregate demand channel explicitly. It would be straightforward to include such a channel by adding a production sector subject to nominal frictions, as in, e.g., [Hagedorn, Manovski, and Mitman \(2019\)](#).

We also account for forces that may ultimately reduce gender gaps in the labor market. Inspired by evidence that working from home is here to stay, we impose that the pandemic permanently increases the fraction of flexible jobs that allow telecommuting.⁴ We also allow the pandemic to have a persistent effect on social norms, based on evidence from “daddy months” showing that short-term changes in fathers’ involvement in childcare lead to a more equal division of childcare in the long-term.⁵ Our model indicates that fathers, even though they do less than mothers, still substantially increase the time they spend on childcare during a pandemic recession.⁶ We conjecture that this sudden change will gradually increase the share of “modern” couples with gender-equal social norms. In our baseline model, these changes generate a long-run rise in women’s labor force participation and a decline in the gender wage gap, with increased job flexibility and changing social norms each accounting for about half of the change. However, it does take a long time for these effects to dominate the direct impact on women’s skills: after the gender wage gap reaches its previous level after 20 years, it takes an additional 20 years for the the gender wage gap to shrink by two percentage points.

Our results on how a pandemic recession is different from a regular recession are important for guiding policy. Higher MPCs during a pandemic recession imply that fiscal policy will be more effective compared to a regular recession, especially if directed at families with children.⁷ We also show that school and daycare reopenings, if they can be safely done, can have a sizeable impact on the recovery. Interestingly, even though childcare needs are larger for small children, reopening schools has a larger effect on the economy than reopening daycare centers. The reason is that a larger percentage of the workforce has school-age children, and that these parents are more likely to work full time than those of smaller children.

Related Literature

Our work contributes to the 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 em-

⁴See [Barrero, Bloom, and Davis \(2020\)](#) and [Appendix C.1](#).

⁵See [Appendix C.2](#) for a description of the evidence.

⁶Quantitatively, we find as schools close, the fraction of fathers who do any childcare increases from 53 to 76 percent and that the number of married couples in which the husband is the primary childcare provider rises by 2 percentage points.

⁷During the lockdown period consumption demand may be restricted for other reasons, such as the impossibility to travel or go to the mall. Higher MPCs will then emerge after the lockdown ends.

ployment. Yet, for a long time most business cycle models have been “unisex” models that do not allow for gender differences, while many macroeconomic studies of labor supply have been calibrated to data on men’s employment only. More recently, studies such as [Albanesi \(2020\)](#) and [Fukui, Nakamura, and Steinsson \(2019\)](#) argue 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 such as jobless recoveries, the productivity slowdown, and the great moderation. [Bardóczy \(2020\)](#) 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 [Greenwood, Seshadri, and Yorukoglu \(2005\)](#), [Ortigueira and Siassi \(2013\)](#), [Doepke and Tertilt \(2016\)](#), [Mankart and Oikonomou \(2017\)](#), [Borella, De Nardi, and Yang \(2018\)](#), [Mennuni \(2019\)](#), [Olsson \(2019\)](#), and [Wang \(2019\)](#).⁸ In addition, [Albanesi and Şahin \(2018\)](#) and [Coskun and Dalgic \(2020\)](#) note the impact that the gender breakdown of employment in various industries has on the contrasting cyclicity 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 the important role of 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 \(2020\)](#). Meanwhile [Guler, Guvenen, and Violante \(2012\)](#) and [Pilossoph and Wee \(2020\)](#) analyze the impact of within-family insurance on job searches. [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 analysis also contributes to a rapidly growing body of work on the macroeconomic consequences of the Covid-19 recession. Much of this literature combines epidemio-

⁸Macroeconomic 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 \(2019\)](#).

logical and economic modeling to examine how policy interventions and endogenous behavioral adjustments shape the evolution of the pandemic and its macroeconomic consequences (see [Eichenbaum, Rebelo, and Trabandt 2020](#), [Berger, Herkenhoff, and Mongey 2020](#), [Glover et al. 2020](#), and [Brotherhood et al. 2020](#), among others). Our paper departs from such studies as it does not model the pandemic explicitly, but rather focuses on the economic consequences of the employment losses and increased childcare needs brought about by the pandemic.⁹ In this regard, our approach is more similar to [Guerrieri 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 focus on different mechanisms than our study, namely the role of incomplete markets and liquidity constraints, employment stability, and the sectoral distribution of the downturn. Hence, our focus on the differential impacts on women and men provides a novel contribution to this literature.

2 Why the Role of Gender is Different in 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 discuss why this pandemic recession differs from earlier recessions in its implications for women’s versus men’s employment.

2.1 Gender Differences in Regular Recessions

In recent economic downturns preceding the current crisis, including the Great Recession of 2007–2009, men’s employment was affected more strongly than women’s. [Doepke and Tertilt \(2016\)](#) summarize the evidence on how employment varies over the business cycle for women and men. [Table 1](#) shows that women’s aggregate labor supply is less volatile overall than men’s, as measured by the percentage standard deviation of the Hodrick-Prescott 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. Over the period 1989–2014,

⁹The 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 than by Covid-19 itself.

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

	All			Married		Single	
	Total	Women	Men	Women	Men	Women	Men
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

Notes: All data from Current Population Survey, March and Annual Social and Economic Supplements, 1989 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.

men account for more than three quarters of overall cyclical fluctuations in employment, and women for less than one quarter.

One reason why women’s employment varies less over the cycle is insurance within the family, i.e., some married women increase their labor supply in a recession to compensate for their husband’s unemployment or higher unemployment risk.¹⁰ An indication of the importance of this channel is that the cyclical volatility of labor supply illustrated in Table 1 is much lower for married women (to whom the family insurance channel applies) than for single women.

Additional channels also contribute to differences in the volatility of women’s and men’s labor supply. This is apparent from the large volatility gap between single women and single men, to whom the within-family insurance channel does not apply. 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 more represented in sectors with relatively stable employment over the cycle. These facts are documented in a recent paper by [Coskun and Dalgic \(2020\)](#). The authors find that employment in the “Government” and “Education and Health Services” sectors 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

¹⁰See [Ellieroth \(2019\)](#) for a study documenting the quantitative importance of this mechanism.

of male employment but only 24 percent of female employment.

These two channels are neither exhaustive nor 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 women's.

2.2 Why a Pandemic Recession is Different

In [Alon et al. \(2020a\)](#), we predicted that unlike a regular recession, the current pandemic recession would reduce women's employment more than men's employment. This prediction, which has since been confirmed by the evidence, was based on two channels. The first consists of the impact of social distancing measures in a pandemic across sectors and occupations. To quantify this channel, in [Alon et al. \(2020a\)](#) we combine 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 document that women are underrepresented in the occupations with the highest ability to telecommute and in critical occupations, implying that women's employment has a stronger exposure to the pandemic recession shock.

The second channel is increased childcare needs due to closures of schools and daycare centers. This channel is further amplified by the reduced availability of other means of childcare provision, such as from relatives, neighbors, nannies, or babysitters, during a lockdown with minimal social contact. To quantify the childcare channel, in [Alon et al. \(2020a\)](#) we combine CPS and ATUS data to document that women provide a much larger share of overall childcare than men. There are many more single mothers than single fathers, 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.¹¹ Taken together, these observations suggest that women will end up shouldering most of the increased childcare needs during a pandemic recession, and thus face reduced opportunities for employment.¹²

¹¹The 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](#)).

¹²Women provide the majority of childcare in all industrialized countries, though there is considerable

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. In contrast to the time-use data used by [Alon et al. 2020a](#), they find 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 authors expect the overall impact on women’s and men’s employment to be similar, and hence qualitatively different from regular recessions in which the most adversely affected occupations have a higher share of male employment. [Albanesi et al. \(2020\)](#) also examine the gender breakdown in employment between occupations that are high and low in personal contact, and find that women account for 74 percent of employment in high-contact occupations.

[Dingel, Patterson, and Vavra \(2020\)](#) quantify the extent to which childcare obligations will hold back the recovery. Based on ACS data, they document that 32 percent of the US workforce has a child under the age of 14 in their household, and that two-thirds of these households do not include an adult who is out of the labor force (e.g., a stay-at-home parent). In 30 percent of households with children, all offspring are under the age of 6, meaning that these households will be relieved of additional childcare needs when daycare centers reopen. These numbers underscore that childcare obligations have been a major driver of reduced employment during the recession, and that a strong recovery will not be possible until these needs are met.

To assess the implications of this key distinction between regular and pandemic recessions for macroeconomic dynamics, gender inequality, and welfare, we now turn to our macroeconomic model.

3 A Model to Assess the Wider Repercussions of a Pandemic Recession

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

variation between countries in the gap between women’s and men’s contributions ([Doepke and Kindermann 2019](#)).

sector will respond in terms of labor supply, consumption demand, and the accumulation of skills.¹³

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 (adult) 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 a within-household division of labor in which the mother provides the majority of childcare, whereas a couple with $m = 1$ has the “modern” view that no childcare arrangement is inherently superior.¹⁴ The aggregate state variable for the economy is denoted by X , which captures whether the economy is or is not currently in a recession.

New 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 of the same gender.

After the initial period, the level of assets is determined by a household’s consumption-savings decision. Labor market productivity evolves as a function of shocks and la-

¹³It 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, adding additional features such as nominal rigidities.

¹⁴One indication for the relevance of social norms is that men raising children in same-sex couples provide more childcare than men in different-sex couples do (Prickett, Martin-Storey, and Crosnoe 2015).

bor supply. Employment status and occupation type evolve 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 $\pi^g(e'|e, X)$. Naturally, employment transition probabilities depend on the aggregate state X , which captures that in a recession jobs are easier to lose and harder to find. The transition probabilities also depend on the current employment state e and gender g . The employment state e' at the beginning of the next period denotes whether the worker receives a job offer. If a job offer is received, the worker can still decide whether to accept the offer and, if so, whether to work full-time or part-time. The transition probabilities for human capital $\pi(h'|h, n)$ are independent of gender and only depend on current human capital h and labor supply n . People also face constant probabilities of switching occupations and social norms, given by $\pi(o'|o, X)$ and $\pi(m'|m, X)$.

3.2 The Decision Problem for Singles

We use v to denote the value functions of singles, while 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:

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

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 childcare. 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:

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

$$l + n + t = T.$$

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 the fact 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 an entire day off of work if a child is sick at home. This matters a lot when childcare requirements rise during a pandemic recession. The ability of a worker in a TC occupation to simultaneously work and provide childcare depends on the age of the child. Specifically, a younger child requires more full-time attention than does an older child. The remaining childcare time is denoted as t . The final constraint is the time constraint, where T is the time endowment.

The value function and constraints for unemployed singles are:

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

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

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

$$l + t = T.$$

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 turn 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. Here, 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, and a utility benefit if she does more. The value function for two working spouses is given by:

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

The budget and time constraints are:

$$c^f + c^m + a' = w^f h^f (n^f)^\theta + w^m h^m (n^m)^\theta + (1 + r)a,$$

$$t^f + t^m + \phi(k) (n^f I(o^f = TC) + n^m I(o^m = TC)) = \gamma(k, X),$$

$$l^f + n^f + t^f = T, \tag{1}$$

$$l^m + n^m + t^m = T. \tag{2}$$

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

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

subject to (1) and:

$$c^f + c^m + a' = w^f h^f (n^f)^\theta + z w^m h^m + (1 + r)a,$$

$$t^f + t^m + \phi(k) n^f I(o^f = TC) \geq \gamma(k, X),$$

$$l^m + t^m = T.$$

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

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

subject to (1), (2), and:

$$c^f + c^m + a' = z(w^f h^f + w^m h^m) + (1 + r)a, \\ t^f + t^m = \gamma(k, X).$$

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

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

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 . There are returns to experience to working full time, meaning that full-time workers upgrade to the next human capital level with a fixed probability η :

$$\pi(h_{i+1}|h_i, 1) = \eta, \quad \pi(h_i|h_i, 1) = 1 - \eta.$$

Individuals who do not work face possible skill depreciation with probability δ :

$$\pi(h_{i-1}|h_i, 0) = \delta, \quad \pi(h_i|h_i, 0) = 1 - \delta.$$

The human capital of part-time workers is constant: $\pi(h_i|h_i, 0.5) = 1$.

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 decline in job-finding probabilities and large rise in job-loss probabilities for men and smaller changes in the same direction for women, with unchanged childcare requirements. P denotes a pandemic recession, where there are considerable changes in labor market flows for both men and women, as well as a large increase in childcare requirements. Finally, NN denotes the “new normal,” or the state of the economy after a pandemic recession is over. This state allows us to model the consequences of permanent transformations 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, then 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 on the state variable itself and on the aggregate state. Hence, the transition probabilities for occupation are given by numbers $\pi(o'|o, X)$, while 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 aim 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 pandemic recession. We then pin down the properties of regular versus pandemic recessions using data on earlier recessions and on the current one. Finally, we calibrate the new normal 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. As an increasing number of people retire starting around age 55 in the data, we set ω to match a life expectancy of 55 years.¹⁵ 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

¹⁵Explicitly modeling retirement 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.

models have typically been calibrated to match overall asset accumulation in the economy, but a recent literature documents 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 in turn raises the average MPC of single and married households in the economy to a more realistic value.¹⁶ The interest rate is set to $r = 0.02$, a relatively high value allowing for the fact that households are not compensated for accidental bequests left at their death. We normalize the time endowment to $T = 1.5$. Since we interpret a labor supply of $n = 1$ as a full-time job of 40 hours, this corresponds to a time endowment of 60 hours per week.¹⁷ The childcare parameters $\gamma(s, N)$ and $\gamma(b, N)$ are calibrated based on information on time spent on childcare in families with younger and older children from the American Time Use Survey. The returns to experience parameter η is set to match a return 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
T	1.5	Time endowment
$\gamma(s, N)$	0.34	Younger kids require 13.7 hours of childcare per week
$\gamma(b, N)$	0.11	Older kids require 4.2 hours of childcare per week
η	0.03	Return to labor market experience
δ	0.06	Skill depreciation in unemployment
ρ_{NT}	0.999	8.2% of pre-pandemic jobs are telecommuting

Notes: Hours are converted into fractions based on our assumptions that one unit of time corresponds to 40 hours per week.

In addition to the parameters listed in [Table 2](#), we calibrate the initial distributions of

¹⁶[Kaplan and Violante \(2014\)](#) and [Auclert, Bardóczy, and Rognlie \(2020\)](#) report a quarterly MPC of about 0.25 for the US economy.

¹⁷We interpret our model as allocating fungible time during a typical weekday. Thus, we subtract sleep and personal care time and weekends to arrive at a time endowment of 60 hours per week.

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 (see Appendix A.4). We match the transition probabilities for children $\pi^g(k'|k)$ and $\Pi(k'|k)$ with evidence on the distribution of different types of households (having younger children, older children, or neither; see Appendix A.3). The calibration yields a stationary distribution in which 59 percent of households are married, 51 percent are parents, 7 percent of households are single mothers, and 3 percent are single fathers. Among households with children, 45 percent have young kids under the age of six. Similarly, we initialize telecommuting status to match occupational patterns by gender and marital status observed in the data. Couples are jointly initialized so as to reflect the extent of occupational correlation between spouses (which, according to Malkov 2020, is quantitatively important for couples' exposure to risk in the current pandemic). Transitions between telecommuting and non-telecommuting jobs are then chosen such that the stationary equilibrium matches the prevailing level of telecommuters just before the pandemic, as documented in Bick and Blandin (2020).¹⁸ The resulting fraction of telecommuters in the labor force is 12.9 percent. The share of telecommuters is substantially higher among married than single workers. Finally, we set the pre-pandemic share of married couples with traditional social norms to 30 percent, to match evidence from the General Social Survey. Appendix A provides additional details on these parameter values and the data sources.

4.2 Jointly Calibrated Parameters

The remaining parameters are jointly calibrated 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. Though the parameters are jointly chosen, in most cases there is a fairly direct mapping from a particular parameter to a particular moment.

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.2 for details on how we compute this target). 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 in the accumulation of experience over the life cycle between women and men.

¹⁸Specifically, we normalize the persistence of telecommuting jobs to 0.99, and choose the persistence of non-telecommuting jobs to match the target.

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 younger children	$\phi(s)$	0.07
Telecommuters’ childcare bonus for older 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

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, as this parameter specifically affects the labor supply of married women with children. With regard to the childcare bonus for telecommuters, we impose that the bonus is twice as large for older compared to younger kids, based on the notion that older children require less supervision and therefore interfere less with working from home. The level of the childcare bonus for telecommuters is pinned down based on the observation that, in the ATUS data, men who telecommute do 50 percent more childcare than those who do not work from home (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 to match the breakdown between part-time and full-time work.

For 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, in that it implies that gender differences in job flows in the model are entirely due to endogenous behavior (i.e., job-acceptance decisions) rather than hard-wired differences. Furthermore, as [Table 4](#) shows, the observed job flows are still matched fairly well. The higher persistence in the model of non-employment for women compared to men arises because women reject more offers, primarily due to childcare obligations.

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 younger kids	0.56	0.59
Labor supply of married women with older 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 and data sources. Labor market state U here refers, as in the model, to all individuals who are either unemployed or out of the labor force. 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 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, women’s labor supply in the model is more responsive to having children than is that of men. While the social norm does matter for traditional couples, the main driver 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 among a majority of couples, the wife is the secondary earner when the first child arrives, making it more likely that she will reduce her employment to meet childcare needs. As reducing employment means forgoing returns to labor market experience and potentially suffering skill loss, the within-couple wage gap will tend to grow, leading to even more childcare specialization as time passes.

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
– younger kids	0.43	0.21
– older kids	0.49	0.47

Notes: See Appendix A for further details and data sources for the data moments.

4.3 Fit for Non-Targeted Moments

Table 5 shows how well the model performs in terms of matching a larger set of moments that were not explicitly targeted in the calibration. While we focused on matching the overall women-to-men labor supply ratio and specific patterns of married women's labor supply in the calibration procedure, Table 5 shows that the model nevertheless matches the employment breakdown for men and single women fairly well (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 children, it does capture the overall variation in this share with fertility, and matches well the fraction of dual full-time earners among couples with either older kids or without kids.

4.4 Modeling Regular versus Pandemic Recessions

The calibration described thus 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 aggregate changes when the economy enters a regular recession R or a pandemic recession P . We impose that regular and pandemic recessions have the same expected duration of six quarters, i.e., $\rho_R = \rho_P = \frac{5}{6}$. We model the aggregate changes during recessions in a stylized way so as to allow for a transparent comparison of the different types of recessions. Specifically, to capture the larger impact of regular recessions on men’s employment, we impose that in a regular downturn the job-offer probabilities for men are reduced twice as much as those for 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 instead impose that both women and men experience the same change in job offer probabilities as men in a regular recession. The different impacts on women versus men are thus primarily accounted for by changing childcare obligations (which only occur in a pandemic recession) rather than hard-wired differences in job flows.

Table 6 summarizes all the parameter values that differ across aggregate states. The pandemic recession leads to a substantial increase in childcare obligations, from 13.7 to 42 hours per week for younger kids, and from 4.2 to 26 hours per week for older kids. The underlying assumption is that small children need near-constant supervision, meaning that the time cost of childcare is just as large as working full time. While older kids require less time, there is still a large increase, in part due to the need to homeschool them. These values can be compared to the findings of [Adams-Prassl et al. \(2020b\)](#), who show that in a typical work week during the pandemic, US parents working from home spent roughly 22.5 (men) and 30 (women) hours doing childcare and homeschooling, for a total of 52.5 hours. Given that there are also single parents and married couples where only one parent works from home, the childcare burden in the model for younger kids roughly corresponds to the half-way point between the total childcare burden of 52.5 hours provided by a couple and the 30 hours a mother provides on her own during the pandemic.

The job offer probabilities during regular recessions were chosen to match employment flows during previous US recessions, as described in Appendix A.2 (see Table 8). While this facilitates comparisons of regular and pandemic recessions in the model, it also means that our model somewhat understates the direct employment impact of the cur-

Table 6: Parameters Varying across Aggregate States

Parameter	Interpretation	Normal N	Recession R	Pandemic P	New Norm. NN
$\gamma(s, X)$	Childcare time, younger kids	0.34	0.34	1.05	0.34
$\gamma(b, X)$	Childcare time, older 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

rent pandemic recession (e.g., [Kahn, Lange, and Wiczer 2020](#) report that there were 30 percent fewer vacancy postings in April 2020 than at the beginning of the year).

We allow for a one-time jump in the share of telecommutable jobs at the beginning of a pandemic recession, which captures the immediate rise in telecommuting at the beginning of the lockdown. [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 start 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, and the share of telecommuters remains at 30 percent throughout the pandemic.

Our model assumes that after a pandemic recession, rather than returning to its previous state, the economy approaches a new normal NN due to permanent changes brought about by the pandemic. We allow for such permanent effects along two dimensions: work organization and social norms. There is ample evidence by now that the “working-from-home experiment” caused by the pandemic has led to permanent changes in the organization of work. We therefore expect telecommuting to stay elevated in a post-Covid world. We summarize the existing evidence in Appendix C.1. We thus 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.

With regard to social norms, we conjecture that the share of traditional couples will ul-

timately decline by half, from 30 to 15 percent. This is motivated by empirical evidence that short temporary changes in the division of labor in the household have lasting effects – not only on the families themselves but also on peers.¹⁹ The transition probabilities that apply both during the pandemic recession P and the new normal NN were 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 predict. Our calibration here should be regarded less as an empirical estimate and more as an “if-then” scenario. In other words, our simulations answer the question of how the economy will evolve if the current pandemic ends up having a substantial impact on the evolution of gender norms. Below, we also provide a decomposition analysis that examines different outcomes where social norms fail to respond. Still, in the past, gender norms have often evolved rapidly in response to economic changes (e.g., [Fernández 2013](#) and [Fogli and Veldkamp 2011](#)). In our simulation, the change in social norms is slower than that 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 plainly show that the Covid-19 recession has led to a historically unprecedented increase in men’s participation in childcare. Based on past experiences, we believe that such transformations are 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 believe a shift towards more gender-equal norms is the most likely scenario.

5 Regular versus Pandemic Recessions in the Quantitative Model

We now use our quantitative model to compare the consequences of regular versus pandemic recessions for macroeconomic aggregates and changes in gender inequality. We display outcomes for recessions that last for six quarters (the expected duration of a recession given $\rho_R = \rho_P = \frac{5}{6}$), 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. A duration of six quarters places the end of the Covid-19 recession in the third quarter of 2021,

¹⁹See in particular [Dahl, Loken, and Mogstad \(2014\)](#) exploiting a paternity leave reform in Norway in 1993. Further evidence is summarized in [Appendix C.2](#).

which lines up with the expected wide availability of vaccines by the summer of 2021.²⁰ We start with an analysis of the division of childcare before studying the impact of the recession on labor supply and earnings.

5.1 Division of Childcare and Leisure during the Pandemic Recession

We find that mothers are more affected than fathers by the large increase in childcare needs during a pandemic recession. This can be seen in Figure 2, which compares 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 increases 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. This difference is due to endogenous decisions on the allocation of childcare within households, and is a crucial driver of the large impact of a pandemic recession on women’s employment in the model. The model implications align well with empirical findings that both women and men are spending more time on childcare during the crisis, but that this increase is much larger for women (see, e.g., [Adams-Prassl et al. 2020b](#) for evidence on the US, UK, and Germany).²¹

The increase in childcare comes partly at the expense of reduced leisure. Among married couples, the reduction in leisure is larger for women than for men (see Figure 14 in Appendix B.2). The reduction in leisure implies that women experience a larger welfare loss during the pandemic than men do (see Figure 15 in Appendix B.3). This finding may help explain the observed increase in the gender gap in mental health during the pandemic.²² Yet, reductions in leisure are only part of parents’ reaction to the sudden increase in childcare needs. We also find large reductions in parents’ labor supply: many women switch from full-time to part-time work or drop out of the labor force entirely to meet the extra childcare needs. We will discuss these findings in detail in the next section.

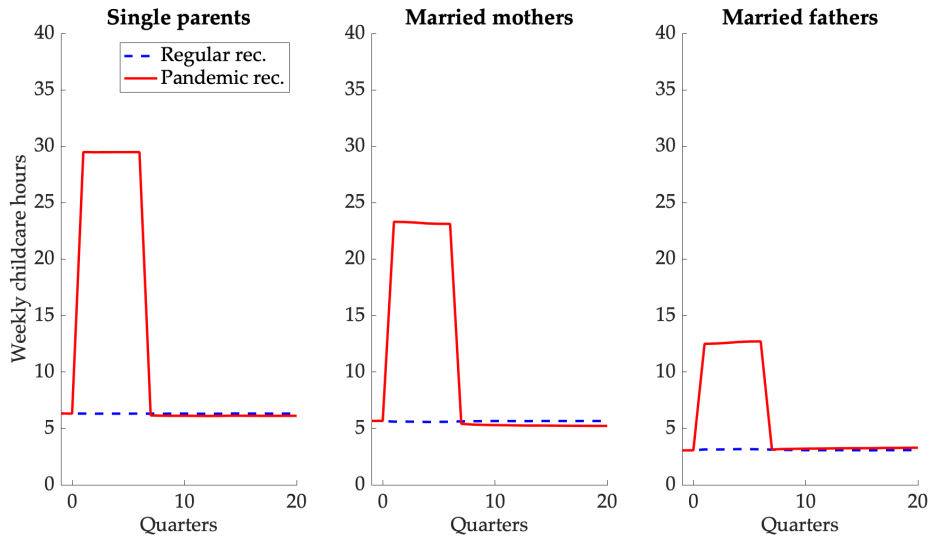
While Figure 2 clearly shows that women are taking over the majority of the increase in

²⁰In some countries schools reopened in the fall of 2020, but in the United States many schools are likely to remain closed for the school year given persistently high infection rates.

²¹Researchers have documented that women are taking over the majority of increased childcare needs in a wide range of countries; see, e.g., [Costoya et al. \(2020\)](#) for evidence on Argentina.

²²See [Adams-Prassl et al. \(2020a\)](#) for the United States and [Oreffice and Quintana-Domeque \(2020\)](#) for the UK. In addition, [Biroli et al. \(2020\)](#) document an increase in reported tensions in families in Italy, the UK, and the US. See also [Wozniak \(2020\)](#), who reports that households with school-age children indicated a greater decline in well-being during the shutdown than other households.

Figure 2: 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.

childcare hours, the impact is large for men as well. In fact, in relative terms (compared to childcare during normal times) the increase in childcare is slightly larger for married fathers than for married mothers (see Figure 2). In some families, this leads to a substantial change in the division of childcare time. In our quantitative model, the fraction of couples in which both parents do at least ten percent of childcare increases from 31 percent in normal times to 43 percent in the first period of the pandemic. Similarly, the fraction of fathers who do any childcare at all rises from 53 percent to 76 percent.

Some families even experience a complete reversal. We find that a pandemic recession increases the share of couples in which 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 toward a division of labor that makes mothers the main provider of childcare. Although these factors remain present during a pandemic recession, the parents' occupations begin to play a major role—specifically, whether or not they can be carried out remotely. When a husband can telecommute while his wife cannot, the husband often becomes the primary childcare provider, since he can more easily combine childcare with work.²³ In the model, as the fraction of telecommutable jobs increases during the

²³One example of such a couple would be a wife who is a doctor or nurse working in a hospital married

pandemic recession, the fraction of men who are main childcare providers immediately rises from 24 to 26 percent.²⁴

The model predictions of a rise in shared childcare and a rise in men who are primary childcare providers are consistent with the evidence. [Carlson, Petts, and Pepin \(2020\)](#) find that in the United States 28 percent of women reported sharing childcare equally prior to the pandemic, which increased to 34 percent during the pandemic. This increase was even larger for families with older children: from 29 to 42 percent. [Biroli et al. \(2020\)](#) find that the proportion of families that divide childcare responsibilities equally increased by 8 percentage points in the UK and 17 percentage points in Italy.²⁵ For Germany, [Möhring et al. \(2020\)](#) report that in April 2020 fathers were the main childcare provider in over 20 percent of families. [von Gaudecker et al. \(2020\)](#) find that in 30 percent of Dutch couples where the mother works in a critical occupation fathers were the sole childcare provider in April. The central role of telecommuting in driving these changes is supported by the findings of [Adams-Prassl et al. \(2020b\)](#), who observe that fathers working from home in the United States in April 2020 spent 4.8 hours per day on childcare and homeschooling, while fathers who could not work from home but still had a job spent less than half as much (2.3 hours).

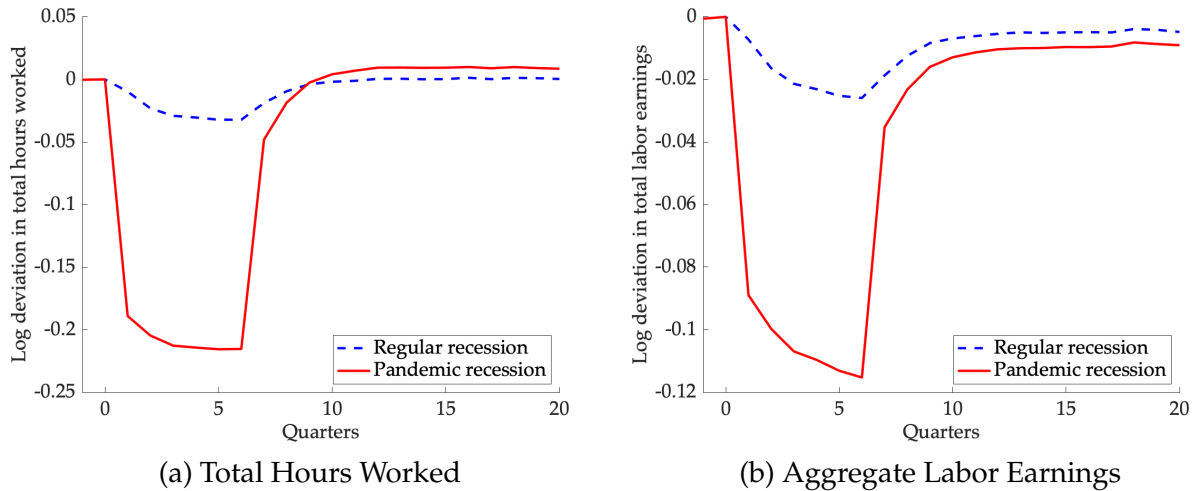
We expect that this increase in fathers' involvement during the pandemic will ultimately lead to more gender-equal norms in terms of the division of childcare, in spite of the overall gender gap we observe. Arguably, having to do a lot of childcare is a bigger shock for most men than for most women. Many men learn for the first time how much work childcare entails and the full range of tasks that it involves. Men's increased awareness of the challenges of combining childcare and work may erode gender norms that work against men contributing equally to childcare. To be sure, this may not apply to every individual case. Indeed, some men may be even more hesitant to provide childcare after their pandemic experience. However, existing evidence from policy-induced increases in father's contributions to childcare (e.g., through paternity leave) does suggest that the rise in men's engagement during the crisis will result in a higher involvement of fathers in childcare in the future, and a corresponding greater ability of mothers to

to an office worker who can work from home during the crisis. [Alon et al. \(2020a\)](#) document that there are millions of such couples in the United States (about 12 percent of married couples with children).

²⁴In a regular recession, there is also a rise in the number of men who are the main childcare providers as more men lose their jobs and take on childcare responsibilities, but this increase is smaller and disappears in the recovery.

²⁵[Del Boca et al. \(2020\)](#) also documents that many Italian men report an increase in childcare responsibilities during April, especially if they were working from home or not working at all due to the crisis.

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



pursue their careers (see, e.g., [Farré and González 2019](#) for evidence from Spain, [Tamm 2019](#) for evidence from Germany, and [Appendix C.2](#) for further evidence). Furthermore, fathers who are the main providers of childcare can be role models and thus affect social norms in other families as well. Such peer effects among fathers have been documented in the context of paternity leave taking (see [Dahl, Loken, and Mogstad 2014](#)). We explore the implications of such potential shifts in social norms in [Section 7](#).

5.2 Labor Supply During Pandemic Recessions

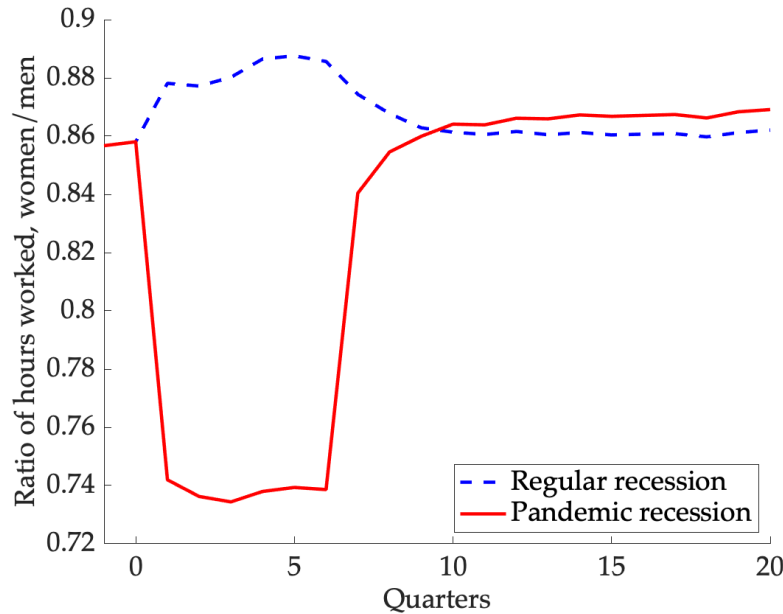
Figures [3a](#) and [3b](#) compare the impact of regular and pandemic recessions on total labor supply and on total labor earnings in the economy. Hours worked decline by more than 20 percent in the pandemic recession, versus less than 3.3 percent in the regular recession.

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. This reflects the fact that the workers who drop out of employment or reduce their 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.

In our model, labor supply quickly rebounds during the recovery following the end of

the recession. However, total labor earnings remain lower than before the recession, and 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



When considering the different implications for women versus men, we observe (Figure 4) that in regular recessions, the ratio of women’s to men’s labor supply increases. This dynamic reflects the greater job losses for men and, to a lesser extent, within-family insurance, i.e., married women increasing labor supply in response to their husband’s job loss. In contrast, consistent with the evidence, in a pandemic recession women’s labor supply declines sharply relative to men. This drop in women’s relative labor supply is largely the flip side of the uneven burden of childcare across genders discussed in the previous section.

Table 7 breaks down changes in employment from pre-pandemic times to the second quarter of the recession by marital status, gender, and presence of children.²⁶ The table shows that during a pandemic recession parents reduce labor supply by much more than people without children, women more than men, and that the age of the children

²⁶In Figure 12 in Appendix B.1 we contrast these results to a regular recession and we depict the evolution over time.

Table 7: Percent Decline in Hours Worked in Model, Q2 in Pandemic Recession relative to Normal.

	Decline in Hours Worked (%)
Men	12.82
Women	25.20
Fathers	20.07
Mothers	39.64
Single mothers	51.89
Married mothers	36.76
Mothers of small kids	47.34
Mothers of big kids	35.35
Fathers of small kids	21.86
Fathers of big kids	18.80
Parents of small kids	33.10
Parents of big kids	27.10
Non-parents	3.40
TC parents	29.26
non-TC parents	30.95

plays a large role, especially for mothers. Not surprisingly, employment declines for single mothers are by far the largest. These model implications can be easily tested once enough data is available and to a large extent have already been confirmed.

Our results also indicate that the ability to telecommute cushions the employment decline only by a small amount. The ability to telecommute primarily has a level effect on labor supply (see Figure 13b in Appendix B): being able to telecommute leads mothers to supply more labor both in regular times and during a recession.

Whether a woman is part of a modern or traditional couple also plays an important role. In regular times, the labor supply of traditional mothers is only slightly lower than that of modern mothers (see Figure 13a in Appendix B). Indeed, with the relatively low childcare requirements in normal times, many traditional mothers are able to both work and provide the majority of childcare within the family. In a pandemic recession, in contrast, the traditional division of labor is reinforced, and traditional mothers reduce their labor supply more than modern mothers.

The available evidence to date lines up well with the evolution of labor supply in the

model.²⁷ [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 typically provided by the Current Population Survey (CPS), and matches the CPS well for the period when the surveys overlap. At the trough of the recession, the decline in labor supply generated by the model roughly matches the 24 percent decline in hours reported by Bick and Blandin for the US economy from February 2020 to the May to June average. Moreover, 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: between February and May, women’s average hours fell by 27 percent, versus a drop of only 20 percent for men.²⁸

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](#)), actually predicts employment losses during the current recession. They find (using industry data from the Bureau of Labor Statistics) that, indeed, sectors with a lower ability to telecommute experienced larger declines in employment. Moreover, the employment of women with young children was particularly affected, 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 by four to five times as much as fathers.

Evidence on the impact of the Covid-19 recession on employment in other countries comes to similar conclusions. Both [Adams-Prassl et al. \(2020b\)](#) and [Sevilla and Smith \(2020\)](#) conducted real-time surveys in the UK and find that women were more likely to have reduced their 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 have been more likely than men to lose their jobs during the pandemic. Meanwhile, [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

²⁷See Appendix C.3 for further evidence.

²⁸[Cajner et al. \(2020\)](#) come to similar conclusions using data from a major payroll processing company, which show a 21.5 percent decrease in women’s employment from February to April 2020, compared to a 17.8 percent decrease for men.

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 terminating the employment relationship. However, even in Germany, the increase in the unemployment rate from February to May has been higher for women (a rise of 19 percent) than for men (14 percent).²⁹

6 The Transmission from Income to Consumption in Regular and Pandemic Recessions

So far, we have established that our model can explain the distinct impact of a pandemic recession on women's versus men's employment, as well as the central role that childcare obligations play in generating this outcome. The next question to address is whether the different impact of regular versus pandemic recessions on women and men matters at the aggregate level and for the effects of possible policy interventions. In other words, is a pandemic recession just like a regular recession with the roles of women and men reversed, or are there important qualitative differences between these two types of economic downturns? We argue that a pandemic recession is indeed qualitatively different, primarily because women's and men's labor supply respond differently to shocks.

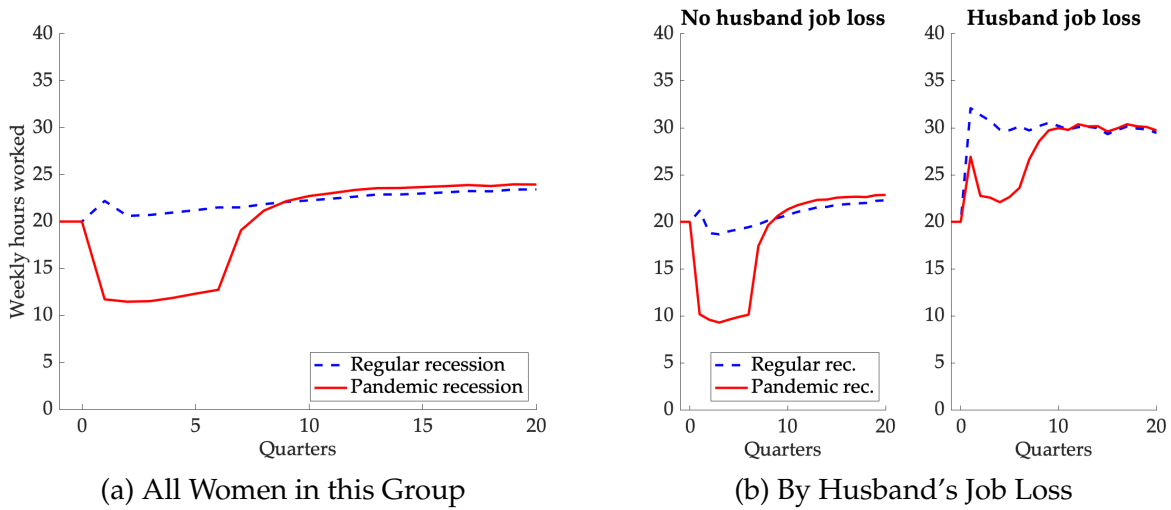
6.1 Family Insurance

Family members provide one another with an important insurance mechanism against 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 family's secondary earner can either enter the labor force or increase their hours to make up for the reduction in the family's income. This insurance mechanism is particularly relevant during regular recessions, when many men (who are often primary earners) lose their jobs, while 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).

The family insurance mechanism is quantitatively important in our model. Figure 5 shows how labor supply changes over the course of recessions for married women who

²⁹See Table 1.1 in Bundesagentur für Arbeit (2020).

Figure 5: Spousal Insurance: Hours Worked for Married Women Who Worked Part-Time Before Recession while Husband Worked Full-Time



worked part time just before the recession while their husbands worked full time. This group of households generally displays the highest levels of family insurance because the secondary earner is already in the labor force, and is thus able to increase hours. 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 to compare women whose husband loses his job (i.e., is not working in the current period, even though he was working full time before the recession) versus those whose husband remains employed. We observe 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 during the recession increases by more than 50 percent for this group of women.

Figure 5 displays labor supply for these same groups during a pandemic recession. The left panel shows that the family insurance mechanism is no longer present in terms of total labor supply, which drops throughout the entire recession for this group of women. Again, the right panel decomposes the overall change in labor supply between women whose husbands lost their jobs and those whose husbands are still employed. Women whose husbands become unemployed still increase their labor supply in the initial period of the recession, though only by half as much as in a regular recession. However, this insurance effect becomes smaller in subsequent periods. As the pandemic regres-

sion 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. Family insurance continues to exist in the sense that women whose husbands are unemployed work more than others, but this 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 for most couples during a pandemic recession.

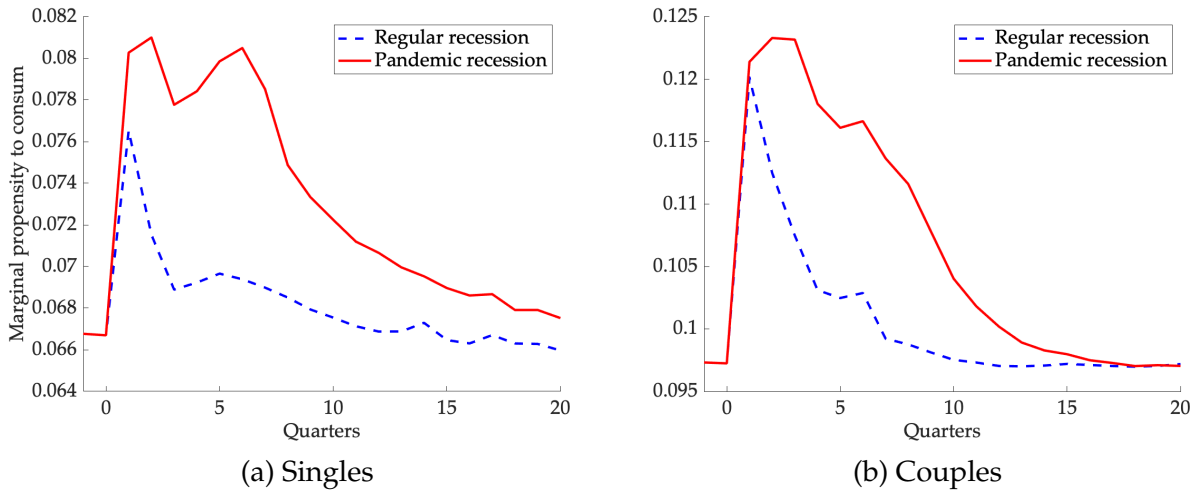
6.2 Marginal Propensities to Consume

In addition to driving the labor supply response to a pandemic, family insurance plays a role in the transmission of income shocks to household spending and consumption. Households that lose access to insurance mechanisms are less able to compensate for income losses, resulting in a strong transmission from income shocks to reduced consumption. These changes are reflected in the distribution of marginal propensities to consume (MPCs) throughout the economy.

A recent body of macroeconomic work demonstrates the central role of MPC distributions for the transmission of macroeconomics shocks (e.g., [Berger et al. 2017](#), [Auclert 2019](#), [Patterson 2019](#), [Auclert, Bardóczy, and Rognlie 2020](#)). If the average MPC is high, a 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 results in deeper recessions for a given initial shock. Thus, understanding the ways in which MPCs change over time during a pandemic recession is crucial to ascertain 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. [Figure 6](#) addresses this question by illustrating how the average MPC evolves in the economy during both types of recessions.

Two important differences between regular and pandemic recessions stand out. First, on impact the pandemic recession raises MPCs by a greater amount than a regular recession, especially for single households. This initial 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 than 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 whom drop

Figure 6: Average Marginal Propensities to Consume



out of the labor force for the entire pandemic recession. This persistent earnings loss drives assets down and leaves little room for self-insurance, even during the early years of the recovery. The same factor is at play for married households, but these households also suffer from the loss of family insurance as shown above. The loss of family insurance implies that married households are less able to compensate for earnings losses; they consequently draw down their assets and ultimately end up with a high MPC.

The persistent rise in MPCs during a pandemic recession and the subsequent recovery implies that the downturn can be amplified and the recovery delayed through demand-driven channels. Conversely, high MPCs also imply that economic stimulus measures are likely to be highly effective. Overall, these results highlight the important role of the dynamics of female labor supply and family decision-making in shaping the macroeconomic properties of recessions.

7 Implications for Gender Inequality

We now move on from the macroeconomic implications to focus on 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's, and that mothers' childcare responsibilities play an important role in this reduction. These shifts in labor supply have direct implications for gender inequality in the labor market through the accumulation of experience while working and skill loss while not employed. Regular recessions primarily lower men's employment and therefore re-

sult in a corresponding reduction in men’s labor market experience that contributes 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. Gender inequality in the labor markets of advanced economies is linked, in large part, to childbearing and the unequal division of 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: along with mothers, many fathers have also increased the time they spend caring for their children during the crisis, while numerous employers have reorganized work to enable their staff to continue working while caring for children at home. We argue that some of these changes are likely to persist, leading to long-term changes in gender inequality in the labor market.

7.1 The Evolution of the Gender Wage Gap During the Recovery

The link between job losses and persistent losses in earnings is well-documented in the literature (e.g., Stevens 1997), as is the fact that such losses are especially severe for layoffs that occur in 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 limited to workers who lose their jobs, but also affect those about to enter the labor market for the first time.³⁰

We have documented that both in the data and in our model recessions affect women’s and men’s employment in different ways. These differences have consequences for the evolution of gender inequality in the labor market during and after recessions. Figure 7a shows that gender inequality shrinks during a regular recession, with women’s wages increasing by close to two percent relative to those of 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

³⁰See, for example, Altonji, Kahn, and Speer (2016), Oreopoulos, von Wachter, and Heisz (2012), and Schwandt and von Wachter (2019).

Figure 7: Gender Inequality in the Labor Market during Recessions



pandemic recession leads to a widening of the gender gap by five percentage points, as it hits women’s employment harder than men’s.³¹ Changes in relative wages during recessions do revert to some extent during the recovery, but the gap is persistent: even five years after a recession, the gender wage gap is smaller after a regular recession compared to a pandemic recession.

The changes in the observed gender wage gap are due both to skill accumulation and loss, and to selection effects. Figure 7b isolates the contribution of relative skill levels by displaying how the ratio of human capital (i.e., efficiency units of labor) between women and men changes during a recession. As expected, in regular recessions (when men face high unemployment) women’s skills increase relative to men’s, 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 how some workers who face skill loss stop working permanently, and therefore no longer affect the measured gender gap among those in the labor force.³² Figures 7a and 7b show that the initial changes in the gender wage gap during a recession are primarily due to selection, but the importance of skill accumulation increases over time.

³¹We abstract from general equilibrium effects that could arise from limited substitutability between women’s and men’s labor. Such general equilibrium effects would dampen the increase in the gender wage gap during the pandemic but not after, because women’s relative labor supply actually increases in the recovery from the pandemic.

³²These effects on the relative skills of women and men are similar to the finding by [Heathcote, Perri, and Violante \(2020\)](#) that if less-skilled workers lose their jobs in a recession, their attachment to the labor force tends to decrease.

A qualitative difference between a pandemic and a regular recession is that the movement in the the gender wage gap is more persistent after a pandemic recession. Most men who lose employment in a regular recession ultimately return to full-time work and gradually regain labor market experience. In contrast, women’s long-run labor supply is more responsive to lost human capital. Some women who worked full time before the pandemic but then lost employment either drop out of the labor force permanently or return only to part-time work, because the increased wage gap within the family (relative to the husband) induces more specialization.

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

The coronavirus pandemic has resulted in a historically unprecedented increase in the provision of childcare by working mothers and fathers, with many fathers becoming 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 this new reality of pervasive remote work.³³

Experience shows that such a temporary but profound shift in the division of labor between genders and the reorganization of the workplace can lead to permanent shifts in gender norms and economic outcomes. One example is the entry of millions of married women into 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 that favored the single-earner model and formal restrictions such as bans on the participation of married women in many occupations. The unparalleled rise in women’s wartime labor force participation had a large and persistent effect on female employment.³⁴ The long-term impact of World War II on women’s labor market participation was attributable in part to shifting social norms.³⁵ Similarly, [Fernández \(2013\)](#) and [Fogli and Veldkamp \(2011\)](#) argue that in the 1960s and 1970s observing working women in

³³See Appendix C.1 for evidence supporting our assumption that the ability to work from home has increased permanently.

³⁴See [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.

³⁵[Fernández, Fogli, and Olivetti \(2004\)](#) show that boys who grow up with a working mother are more likely to marry women who likewise continue to work when married. The example provided by their own parents arguably created a preference among these boys for a more equal division of labor in the family that was then reflected in their own choices as husbands and fathers. See [Grosjean and Khattar \(2018\)](#) for evidence on the persistence of gender norms over even longer periods.

their families and neighborhoods created an awareness of the costs and benefits of employment and was a major engine behind the secular rise in married women’s labor force participation from the 1950s to the 1990s.³⁶ This implies that temporary shocks can accelerate social change, in this case by providing additional learning opportunities.

Our model of a pandemic recession and the subsequent new normal incorporates the expectation that the substantial changes in childcare responsibilities and work organization during the crisis will have long-term effects. In particular, the pandemic recession has been marked from the outset by more couples switching from traditional to modern family roles, with modern couples especially prevalent among younger cohorts. 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 major increase in childcare responsibilities, and by the role model effect produced by the increasing share of fathers who are the primary providers of childcare during the crisis.³⁷

We also expect that the increased work flexibility that arises at the beginning of the pandemic, with a larger fraction of jobs done by telecommuting, 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. Furthermore, it is consistent with numerous news reports of employers planning to keep work-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 the childcare responsibilities of men who find telecommutable jobs. The notion that low workplace flexibility is a barrier for women’s careers has been advanced by [Goldin and Katz \(2011\)](#), [Goldin \(2014\)](#), and [Erosa et al. \(2017\)](#), among others.³⁸

The changing gender roles in the model can be seen in [Figure 8](#), which shows that the fraction of couples where the father is the main childcare provider slowly increases to almost 30 percent. The initial jump from 24 to 26 percent is primarily due to telecommuting fathers. Later on, the gradual increase in the share of modern couples (i.e., a change in social norms) also plays a role.

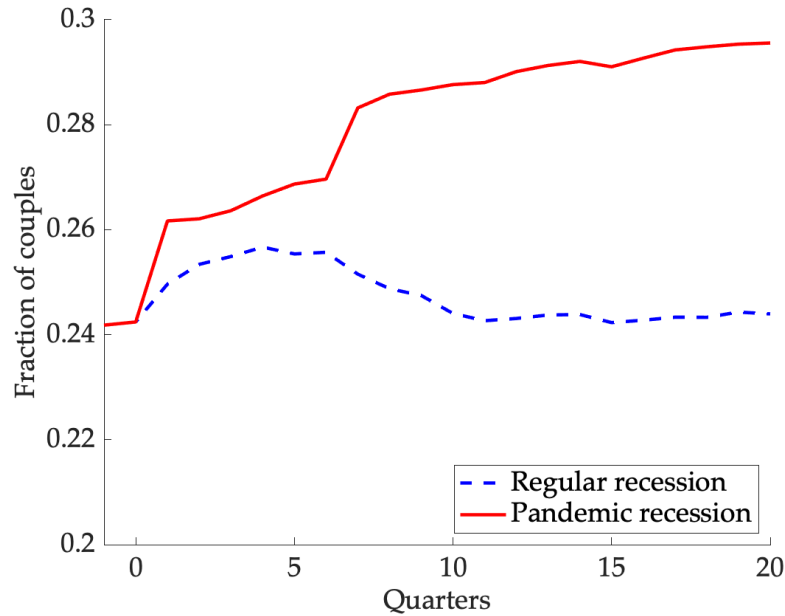
Given these driving forces of long-run changes, [Figure 9a](#) shows how women’s relative labor supply changes over the long term (40 years) in pandemic versus regular reces-

³⁶Along similar lines, [Olivetti, Patacchini, and Zenou \(2020\)](#), show that girls who are exposed to their peers’ working mothers during their teenage years are more likely to end up working themselves.

³⁷See [Appendix C.2](#) for evidence from the context of parental leave policies that short term changes in the division of labor in the family can have lasting effects.

³⁸See also [Cubas, Juhn, and Silos \(2019\)](#) and [Iacopo and Moser \(2020\)](#).

Figure 8: Fraction of Married Couples with Children in which the Father is the Main Childcare Provider

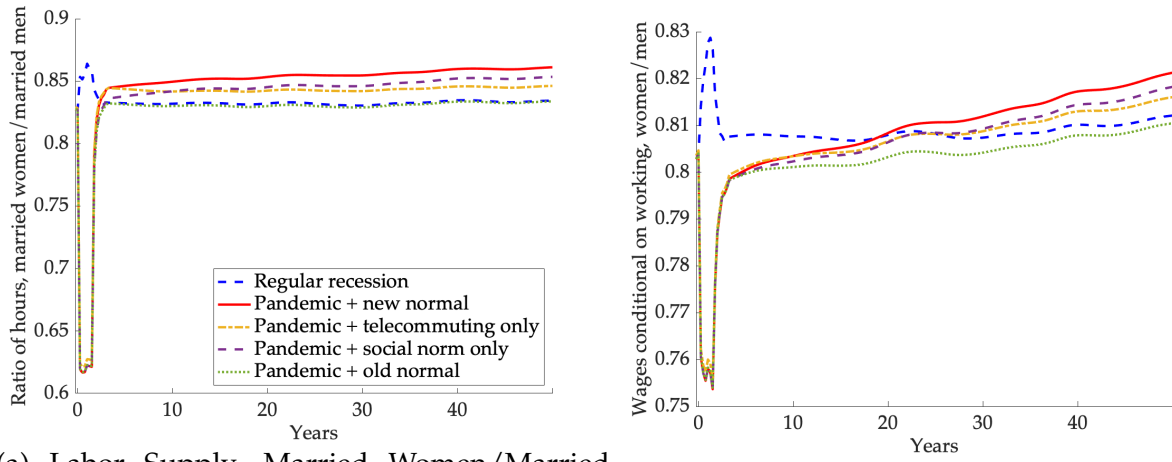


Notes: For telecommuters, childcare time in the model is computed as $t^g + 0.5\phi(k)n^g$, that is, time that is spent on childcare and work simultaneously is counted as 50 percent childcare. Counting all of the combined time as childcare leads to similar results.

sions. Despite the losses in employment and job skills that women face during a pandemic recession (see Figure 7b), female labor supply rises above its original level early in the recovery. Figure 9a also provides a decomposition that shows how the two long-run forces (changes in social norms and increase in TC jobs) contribute to this outcome. We observe that if, counterfactually, both social norms and the share of telecommutable jobs 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 over the long term. Both long-run forces are crucial for raising women’s labor supply.

Figure 9b shows the impact of this change in women’s labor supply on the gender wage gap. As shown in Figure 7a, a pandemic recession increases the gender wage gap in the medium term 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 continues to close in response to women’s higher labor

Figure 9: Gender Inequality in the Long Run with Decomposition of Channels



(a) Labor Supply, Married Women/ Married Men

(b) Gender Wage Gap

supply. The decomposition in Figure 9b shows that both the change in social norms and the increase in job flexibility play a quantitatively important role in narrowing the gender gap.

Two decades is a long time, and our long-run results do not contradict our basic finding 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 a family-friendly organization of the workplace. Through these channels, the pandemic can contribute to reducing gender inequality over the long run.

8 Policy Implications for Pandemic Recessions

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.

8.1 Fiscal Policy

Our findings on family insurance and MPCs suggest that fiscal policy, such as extended unemployment insurance and transfer payments to affected families, can be disproportionately effective during a pandemic recession in terms of stimulating aggregate demand. Our model focuses on the household sector of the economy and does not spell

out an aggregate demand channel explicitly; however, it would be straightforward to add this along the lines of, e.g., [Hagedorn, Manovski, and Mitman \(2019\)](#). In such a model, fiscal policy would be unusually powerful as long as MPCs are elevated, and our model suggests that a pandemic recession is characterized by high MPCs that persist for about two years during the recovery (see [Figure 6](#)). Additional transfer payments during this phase would accelerate the recovery, especially so if the payments are targeted to households such as single parents and, more generally, to households with children.

For a full analysis of fiscal policy during a pandemic recession, additional channels that are not modeled here also need to be taken into account. In terms of the optimal provision of unemployment insurance, [Mitman and Rabinovich \(2020\)](#) argue that unemployment benefits should be higher as long as job finding rates are low during a lockdown, which adds another argument in favor of higher transfer payments. An argument against high transfer payments at the height of the pandemic is that during strict lockdowns consumption possibilities are reduced; for example, travel, indoor dining, and many entertainment options become unavailable, and shopping at physical stores is either impossible or comes with additional risks. In such a period, there may be less need for transfer payments. The evidence suggests so far that the lockdown-induced reduction in demand was relatively short-lived. At any rate, the force in favor of higher transfer payments spelled out in our analysis is likely to be especially relevant later during the recession and the recovery when the direct effect of lockdowns loses force.

8.2 School Openings

The policy issue most directly linked to our analysis is the role that 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, an issue that we abstract from here.³⁹ Our analysis can, however, 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

³⁹A cautionary note is provided by [Alon et al. \(2020b\)](#), who argue that schools can be a major vector of disease transmission, particularly 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. [Baqae et al. \(2020\)](#) emphasize that measures such as reintroducing restrictions on social gatherings, wearing masks, and increasing testing and quarantine are necessary before wider re-openings are feasible. The effect of school closures on the US healthcare workforce specifically is analyzed in [Bayham and Fenichel \(2020\)](#).

labor supply of women and men who are currently not working because they need to look after and homeschool their children. Empirical estimates show that this effect may be especially important. [Dingel, Patterson, and Vavra \(2020\)](#) show that 32 percent of the US workforce has 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, while this share is as high as 41 percent in other European countries.

Figure 10: Hours Worked and Aggregate Labor Earnings under School Reopenings

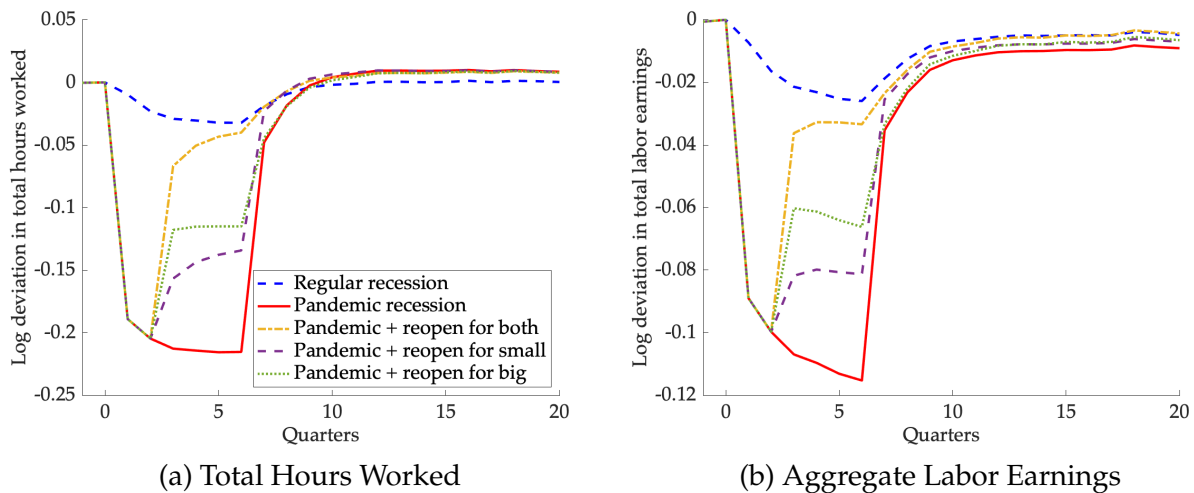


Figure 10 shows how aggregate hours worked would change over time in a pandemic recession if schools were to reopen two quarters into the recession, rather than staying shut for the entire pandemic. Formally, opening schools would mean that childcare requirements return to the pre-recession level after two quarters, while job separation probabilities would continue to be elevated and the other aspects of the pandemic recession (changes to telecommuting and social norms) would remain in place. The figure also illustrates the results of returning only young children to school (i.e., by opening daycare centers and preschools) or only older children (opening K-12 schools). We observe that opening schools would immediately mitigate the economic impact of the pandemic by reversing more than half of the decline in labor supply brought 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 underscores the key role of increased childcare requirements for the drop in economic activity during the pandemic, and shows that reopening schools is much more effective, in economic terms,

than reopening specific sectors with small shares of aggregate employment shares (such as gyms, bars, and restaurants).

Figure 11: The Impact of School Reopenings on Gender Inequality

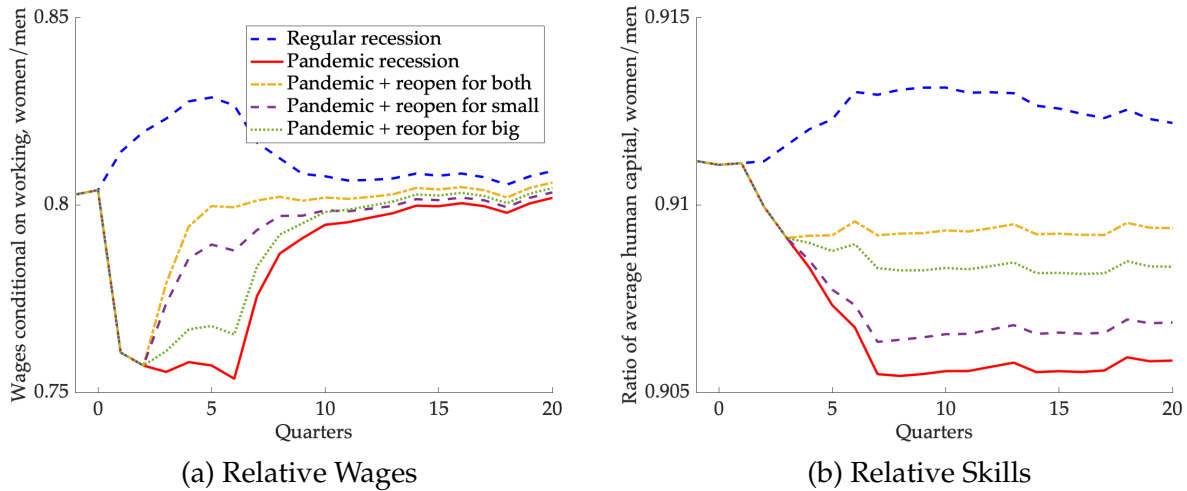


Figure 11 shows how opening schools early affects gender inequality in the labor market in terms of women’s relative wages and relative skills. Since women bear the largest part of the extra childcare burden during the pandemic, relieving this burden will disproportionately benefit women. Opening schools early immediately reduces the gender wage gap, and avoids about half of women’s recession-induced relative skill losses. Sending younger kids back to school does the most to reduce the gender wage gap. This result is primarily driven by a composition effect, with high-skill women more likely to return to work when childcare becomes available. As Panel (b) in Figure 11 shows, opening schools early for older kids reduces the widening skill gap by more than opening day-care centers for younger kids. In part, this is because there are more families with older than with younger kids, so more households are affected by opening schools. In addition, many women with young kids work part-time or not at all even in normal times, leaving a bit more room for dealing with extra childcare needs during the pandemic. Women also benefit disproportionately from school openings in terms of welfare (see Figure 15 in Appendix B.3).

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 opening schools must also be taken into account. Such a policy is a real-

istic option only if the pandemic is sufficiently controlled such that opening schools will not reignite or amplify the pandemic itself. Even when large-scale school re-openings are not feasible, our analysis suggests that similar policies which provide targeted childcare assistance can be helpful. Such limited policies have already been implemented by several countries, including Germany which provided emergency childcare assistance to single parents. These provisions allows those with large MPCs, namely single parents, to continue working, while minimizing the impact of infections.

9 Conclusions

As a result of the Covid-19 pandemic, countries around the world, including the United States, have entered the sharpest economic downturn since the Great Depression. In this paper, we argue that the central economic distinction between this downturn and other recent recessions, aside from its severity, lies in its impact on women's employment.

The lockdown measures accompanying a pandemic recession have a large effect on high-contact sectors such as hotels and restaurants, which have large shares of female employment. Thus, unlike in a regular recession, more women than men are directly affected by layoffs. In addition, daycare and school closures during the pandemic result in considerably higher childcare obligations. Women shoulder the majority of this additional responsibility, further decreasing their ability to work.

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 disproportionate impact of a pandemic recession on working women. In terms of macroeconomic implications, we find that the outsized 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 their spouse's lost earnings. As a result of this loss of insurance, earnings losses are strongly translated to lower consumption demand, and marginal propensities to consume increase by a greater amount than in regular recessions.

These findings have important policy implications. First, we show that reopening schools and daycare centers, if it can be safely done, have a first order effect on the speed of recovery. If policy-makers have to choose between reopening one or the other, we find that in terms of total economic impact, reopening schools is more important. The main reason is that there are more employees with school age children and they are more likely to

work full time than those with smaller children. Second, our analysis suggests that fiscal policy is more effective during a pandemic than in usual recessions. The reason is that due to reduced possibilities for family insurance, marginal propensities to consume are higher than in normal recessions, and particularly high for single parents. Third, going forward, our framework could be used for studying alternative policies such as emergency childcare for singles, or paid parental leave for school closures, including specific leave days ear-marked for fathers.

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 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 a pandemic recession can trigger changes that ultimately reduce gender inequality over the longer term. Specifically, the rise in work flexibility during a pandemic recession is likely to be persistent, and disproportionately benefits women who have major childcare responsibilities. We also note the possibility of shifting social norms towards a more equal division of childcare obligations 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 to fully make up for women's initial skill losses.

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, factors that all 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 work could be extended to consider the impact of the Covid-19 crisis on additional dimensions of gender equality, such as the rise in domestic violence that appears to have occurred during the crisis (see [Leslie and Wilson 2020](#), [Bullinger, Carr, and Packham 2020](#), and [Rivera et al. 2020](#)) or the impact on fertility ([Wilde, Chen, and Lohmann \(2020\)](#)). Moreover, our analysis has focused on advanced economies that are 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 and 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. Yet, the pandemic is a global phenomenon, and policy measures such as school closings are being implemented 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 suggest 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 Leave Module of the American Time Use Survey (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 likewise 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, younger, older), employment status (not employed, part-time, full-time), and occupation type (telecommuting, non-telecommuting).

Child groups correspond to the age of the parents' youngest child in a household, with younger kids corresponding to ages 0–5 and older 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 who are employed and usually work fewer than 35 hours per week, and full-time includes all those who usually work more than 35 hours per 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 during the period immediately 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 8: 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 to 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 8 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 across 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. The procedure yields a 30 percent share of couples with traditional social norms.

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

Table 9: 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 older-to-younger 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 older-to-younger 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 older-to-younger children	1.17	1.18
$\Pi(0 b)$	0.04167	Couples, avg. duration of child-rearing in quarters	88.89	82.59

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 younger children (after age 25), the aging of younger children into older children, and the aging of older children into adults are chosen to jointly match (1) the share of households with children, (2) the ratio of older to younger children, and (3) the average duration of child-rearing. Targets (1) and (2) are calculated from our primary CPS dataset so as to be consistent with our other targets. The average duration of child rearing is calculated by summing the duration of childhood in quarters (16×4) with the median inter-pregnancy interval (measured in quarters) multiplied by the average number of children minus one. 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 9.

A.4 Calibrating Skill Formation

The human capital grid consists of five 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 aged 25 to 30.⁴⁰ Specifically, we assign to the first

⁴⁰Couples are included in the sample based on the age of the husband.

Table 10: 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	

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 10 summarizes the initial distribution of human capital for single men, single women, and the joint distribution for couples.

The parameters that 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 that we estimate from 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 lost earnings 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 Additional Model Results

B.1 Labor Supply by Types of Families

Figures 12 and 13 show the evolution of labor supply by types of families. We scale these figures so that 40 hours corresponds to the full-time employment of a single worker (80 hours for a couple in which both work full time). The left panels in Figures 12a and 12b show that for both singles and couples without children, the impact of a regular versus a pandemic recession is similar, whereas if kids are present (right panels) a pandemic recession leads to a much larger reduction in labor supply. Increased childcare obligations due to school closures affects all parents' ability to work during the pandemic. The impact on single parents is particularly large, because they lack certain margins of adjustment from which couples instead may benefit (i.e., couples where both parents can telecommute or where one was not working before the pandemic).

Within couples, mothers reduce working hours considerably more than fathers (Figure 12d), which again coincides with the empirical observations discussed in Section 2. Among single parents, fathers' labor supply drops more than that of mothers. This difference is primarily due to the fact that single fathers (who make up a small share of the population) start out with a higher labor supply. For single parents of either gender with small children, working full time at a job that does not allow telecommuting is infeasible during the pandemic, necessitating a large drop in labor supply.

Figure 13a highlights the role of traditional versus modern social norms for couples' labor supply. In regular times, the labor supply of traditional mothers is only slightly lower than that of modern mothers. Indeed, with the relatively low childcare requirements in normal times, many traditional mothers are able to both work and provide the majority of childcare within the family. In a pandemic recession, in contrast, the traditional division of labor is reinforced, and traditional mothers reduce their labor supply more than modern mothers.

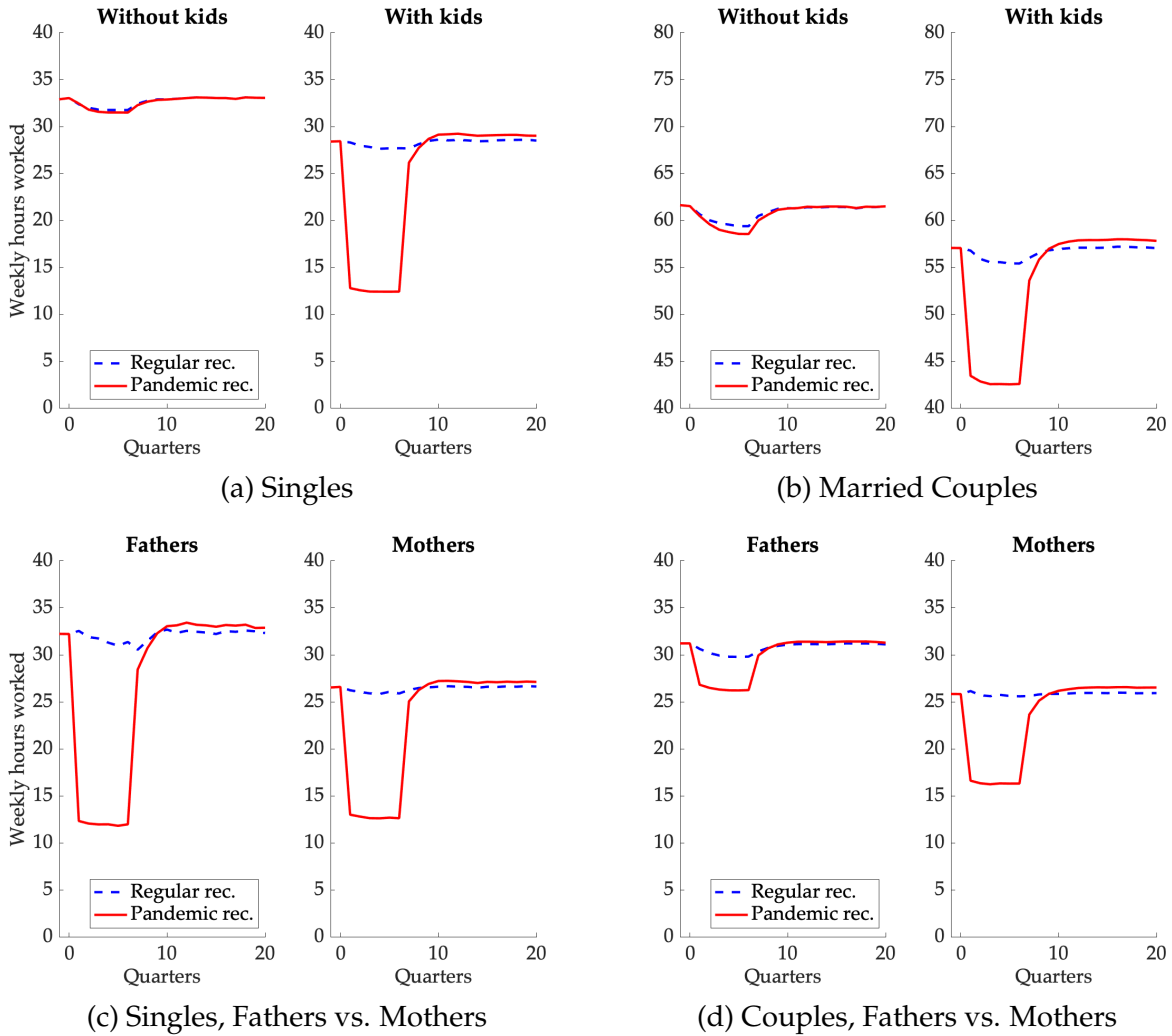
Figure 13b shows that occupation (TC vs NT) primarily has a level effect on labor supply. Being able to telecommute leads mothers to supply more labor both in regular times and during a recession. The reduction in labor supply in a pandemic recession is similar across occupations.

Another notable finding depicted in both panels of Figure 13 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 just as their husbands lose their jobs.

B.2 Leisure

Figure 14 displays changes in leisure for single and married parents.

Figure 12: Labor Supply by Types of Family



B.3 Welfare Implications of School Openings

Figure 15 provides details on how welfare changes over time 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).

C Additional Evidence

C.1 Evidence of a Permanent Shift in Telecommuting

There is much discussion in the media that working from home (WFH) is here to stay. Twitter famously announced that all employees could work from home permanently and Facebook CEO

Figure 13: Mothers' Labor Supply by Social Norm and Occupation

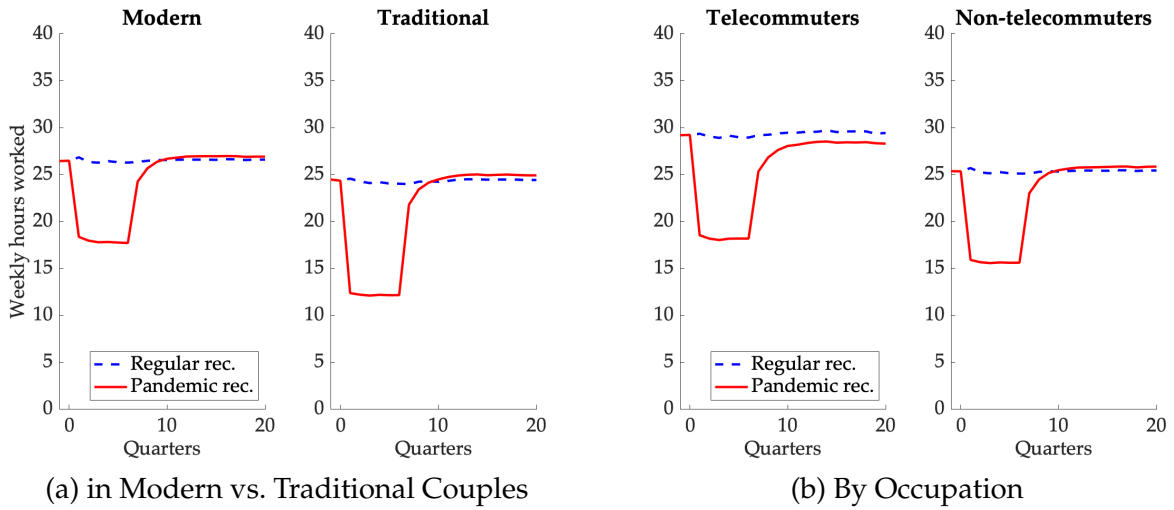


Figure 14: Leisure for Single and Married Parents

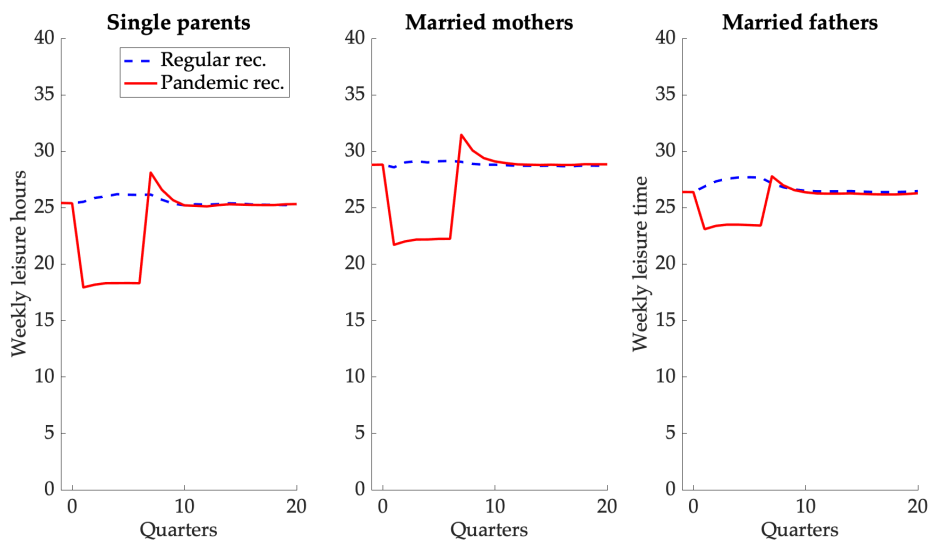
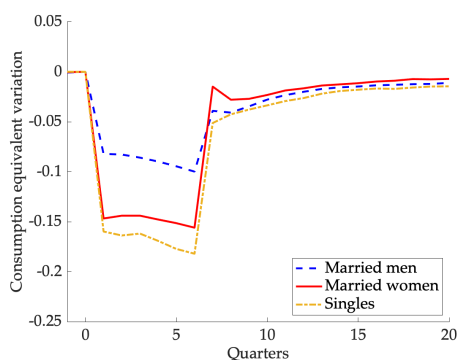
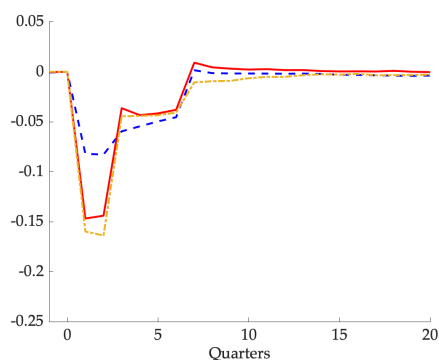


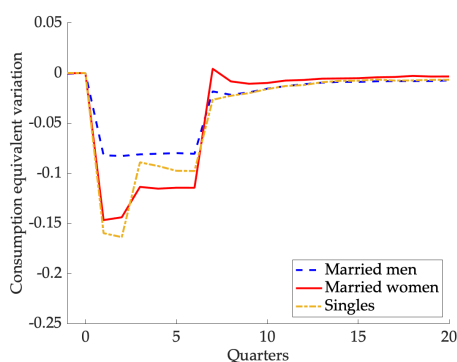
Figure 15: Welfare Implications of School Reopenings



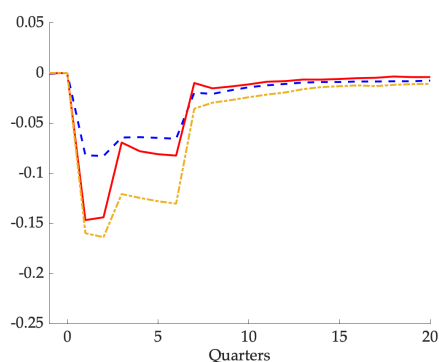
(a) Welfare during the pandemic



(b) Welfare with school reopenings



(c) Welfare with school reopening, big kids only



(d) Welfare with school reopening, small kids only

Mark Zuckerberg said that he expects as much as 50 percent of the company’s workforce to work remotely in the long run.⁴¹ The media is full of reports that demand for office space has plummeted. For example new lease signings in the first eight months of 2020 in New York City were only half of those in 2019.⁴² This decline in demand has already led to falling rental prices of commercial property.⁴³ Since these commercial property leases are typically long-term contracts, these changes likely signal employer expectations of lasting changes in remote working

Are these newspaper reports exceptions hyped in the media or is there real evidence that something in the organization of work has permanently changed? And if so, what is the magnitude? There is some evidence by now from employee and firm surveys that point to a sizeable shift towards more WFH in the post-COVID world. [Barrero, Bloom, and Davis \(2020\)](#) conducted a

⁴¹“Coronavirus: Twitter allows staff to work from home ‘forever’” BBC News, May 13, 2020 and “Half Of Facebook’s Employees May Permanently Work From Home By 2030, Zuckerberg Says,” Forbes, May 21, 2020.

⁴²“Manhattan’s Office Buildings Are Empty. But for How Long?,” New York Times, September 8, 2020.

⁴³“San Francisco Office Rents Tumble and Show No Sign of Bottoming,” WSJ, October 6, 2020.

survey of 12,500 US workers over the summer (May through September) asking about employee desires to work from home and about their employer planned post-COVID WFH days. They estimate that 20 percent of all full work days will be supplied from home after the pandemic ends, compared to just 5 percent before, i.e. a quadrupling. This aligns well with evidence from two surveys (of small business owners and managers of large companies) conducted in March and April by [Bartik et al. \(2020\)](#) – where a large share of employers expects a sizeable increase in remote working after the Covid-19 crisis has passed.

Similar evidence is found in other countries. For example [Baert et al. \(2020\)](#) conducted a web survey among Flemish employees and find that the majority of surveyed employees believe that teleworking and digital conferencing is here to stay – 85 percent of respondents stated that they believe in overall more teleworking in the country in the future and 81 percent believe in more digital meetings in the country in the future. More than 50 percent of German firms indicated an increased importance of WFH after the crisis in the ifo business survey (IBS) conducted in May ([Alipour, Falck, and Schüller \(2020\)](#)). Similarly an employer survey conducted in June by the ZEW found that more than half of large manufacturing companies expect a permanent increase in remote work, which increases to three quarters for companies in the information industry ([Erdsiek 2020](#)).

[Barrero, Bloom, and Davis \(2020\)](#) lay out several mechanisms for why WFH will stay and provide some evidence for each channel: WFH stigma has diminished, WFH productivity is higher than was previously thought, large investments enabling WFH have been made (both in equipment but also time learning to use new technology), and finally because people expect the need for social distancing to stay for a long time even beyond when a vaccine is available.

C.2 Evidence from Paternity Leave Reforms

[Rege and Solli \(2013\)](#) use a paternity leave reform in Norway in 1993 to estimate the lasting effect of a short-term change in the division of labor in the household. The reform increased the length of subsidized parental leave by a month conditional on fathers taking at least one month. The paper finds a significant negative effect on fathers' earnings (1-3 percent lower for those treated with the reform), which persisted up to the last point of observation when the child is 5 years old. [Kotsadam and Finseraas \(2011\)](#) analyze the impact of the same reform of the division of household labor. They find that couples with children born after the reform have fewer conflicts about household work and that they share household tasks more equally 13 years later. [Kotsadam and Finseraas \(2013\)](#) find that the effect extends to the next generation – when fathers do more adolescent girls (not boys) do less domestic chores. Thus, gender norms seem to be permanently changed. [Dahl, Loken, and Mogstad \(2014\)](#) document sizeable peer effects (in coworkers and brothers) in the uptake of paternity leave in the context of the same

Norwegian reform. The estimated effect snowballs over time, leading to a long-run uptake rate that is substantially higher than without the peer effects. They provide some suggestive evidence that the mechanism is likely related to information transmission about the costs and benefits of taking paternity leave.

[Patnaik \(2019\)](#) analyzes a reform in Quebec from 2006 and combines it with time diary data. Fathers exposed to the reform spend more time on housework and childcare activities and mothers spend more time working in the market even four years after the reform. Similar evidence is found in [Tamm \(2019\)](#) for Germany and [Farré and González \(2019\)](#) for Spain.

C.3 Evidence on Employment Effects of COVID-19 so far

Since we hypothesized likely effects based on pre-COVID data in March ([Alon et al. 2020a](#)), a sizeable literature has documented the actual effects since the beginning of the pandemic across the world. By and large, in most countries, female employment is suffering more than male employment. We briefly review the existing literature to date here.

[Dias, Chance, and Buchanan \(2020\)](#) use CPS data between December 2019 and May 2020 to assess the employment impact of the COVID-19 crisis by gender and household composition in the United States. The main finding is that employment was reduced much more for mothers than fathers. Interestingly, there is a fatherhood premium in the layoff rate – between March and April the layoff rate increased by 10.1 percentage points for mothers, by even more for non-parents, but only 6.8 percent for fathers. Similarly, [Cowan \(2020\)](#) finds a large gender gap in the employment declines in CPS data between February and April, especially when children are present. Controlling for many observables (such as age, race, education and industry/occupation), being female with children has a significant impact on the transition from at work to unemployment and a significant impact in the transition from full-time to part-time work. [Montenovo et al. \(2020\)](#) extend the analysis into May and also look at singles specifically. They find that women were substantially more likely to transition into unemployment between February and May as well and that women with young children experience higher rates of absence from work. They further find that single parents were particularly likely to have lost their jobs. [Heggeness \(2020\)](#) uses the differential timing of school closures across states to assess the impact on parental employment. Employees living in early closure states were 20 percent more likely to take temporary leave. This effect is almost entirely driven by women, who were 32 percent more likely to stop working. Even mothers who maintained their jobs in early closure states were 53 percent more likely to not be at work, compared to mothers in late closure states.

[Andrew et al. \(2020\)](#) provide evidence from the UK. They analyze the labor market outcomes for mothers and fathers in two-parent families based on an online survey during the first half of May. The decline in hours of paid work between February and May was dramatic in the UK.

Proportionally, hours of paid work have shrunk more for mothers than fathers. To gain insights into productivity of parents during the pandemic, they also used a measure of uninterrupted work. While prior to the crisis, fathers and mothers used to be interrupted both proportionally to their work hours, now mothers are interrupted about 50 percent more often. This may have implication for human capital accumulation on the job and future career prospects. The paper also documents large gender differences in domestic work, with mothers doing about 4 hours more per day. Large gender differences remain even when conditioning on parental work status. Their empirical findings cannot be explained by comparative advantage alone and thus seem to suggest that social norms play a role. At the same time, the average time fathers are involved in childcare doubled compared to pre-pandemic levels. Large gender differences in the provision of childcare in the UK are also documented in [Hupkau and Petrongolo \(2020\)](#). Interestingly, they do not confirm the gendered employment impact. Using the official UK labor market survey, they find evidence that men and women were equally impacted on the extensive margin and that at the intensive margin, women's hours fell by slightly less (comparing January/February with data from late April and May). At the same time, the reduction in hours was larger for parents with small children. The result that parents were impacted, but not specifically mothers, might be related to a sizeable fraction of fathers becoming the main childcare provider. In fact, the paper finds that the absolute and proportional increase in housework time in 2-adult households was larger for men than women, leading to a *reduction* in the gender gap in housework hours from 7.6 to 6 weekly hours – contrary to evidence from other countries.

[Qian and Fuller \(2020\)](#) provide evidence from Canada: They find sizeable gender gaps in employment declines for parents between February and May, using Canada's official monthly Labor Force Survey (LFS). The paper shows that these gaps grew by more for parents of elementary age children (6-12 years) compared to those with pre-K children. The findings that effects are larger for somewhat older children are in line with our model that shows that closing schools has a larger effect on the gender employment gap than closing daycare centers. They further find that gaps are particularly large for parents with only a high school (or less) degree. The gender gaps are even larger when "being employed and at work" is used as an outcome variable. [Beauregard et al. \(2020\)](#) analyze data from Quebec, Canada, based on primary school re-openings which started in May in some regions, but not others. Using a triple-difference-strategy, they find a positive effect of re-openings on parental work, a more pronounced effect on singles and a stronger impact when the job cannot be done from home.

[Alstadsæter et al. \(2020\)](#) provide evidence from Norway – using administrative data from the early crisis period (March and April). They find that women were more affected than men by layoffs (temporary and permanent combined) in March and April and so were parents. The effect that having young children has on layoffs remains largely unaffected once firm and job fixed effects are controlled for. Once firm and occupational differences are accounted for, the

gender effect in layoffs is only associated with the presence of young children: women with young children are more likely to be laid off and this is a within-firm and within-occupation effect. [Kristal and Yaish \(2020\)](#) show in Israeli survey data that between early March and early May women's employment and income declined by more than that of men. [Kikuchi, Kitao, and Mikoshiba \(2020\)](#) conclude, based on official survey data, that female employment declined by more than male employment in Japan from January to April and May.

[Ma, Sun, and Xue \(2020\)](#) provide evidence of the effect of school closures due to Covid-19 in China. They find that school closures were an important reason for mothers (not fathers) not to be returning to work after the "economy reopened" in March/April and especially so if prior to the pandemic children were in boarding school. The effect was particularly large for migrant workers (who usually work away from home), and somewhat smaller if grandmother care was available. A few papers provide evidence of the effect of school closures on parental labor supply from other contexts. [Dunbar \(2013\)](#) provides evidence on the impact of school closures due to teachers' strikes on parental labor income in the US. They find a sizeable effect in families with school-aged children (6-12 years) in which both parents work. There is no significant effect for families with older children (12-18 years). [Jaume and Willén \(2018\)](#) analyze teachers' strikes in Argentina and find a sizeable impact on labor market participation and labor earnings of mothers. The effect is most pronounced for lower-skilled mothers and mothers in dual-income households. There is no effect on the average father; however for fathers with lower earnings than their wives, a small reduction in participation is found as well.