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PARENTAL LABOR MARKET PENALTIES DURING TWO YEARS OF COVID-19

by Maria De Paola* and Salvatore Lattanzio**

Abstract

We use a matched employer-employee dataset covering the universe of employees in the Italian private sector to compare labor market outcomes for mothers and fathers during the pandemic. We find that mothers experienced a larger penalty in terms of reduced labor market earnings compared to fathers (-17.4 vs -8.6 percent) in 2020 and the first half of 2021. In contrast, starting from July 2021, we observe similar trends in mothers' and fathers' earnings. Evidence highlighting differences in penalties according to the sector of activity (essential vs non-essential), the type of contract, the age of children, and the pre-pandemic mother-father pay gap suggests that both demand and supply factors have played a role in explaining the gendered impact of COVID-19.

JEL Classification: J16, J31, J70.
Keywords: COVID-19, parenthood, recession.
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Contents

* National Institute of Social Security, University of Calabria, IZA.

** Bank of Italy, Directorate General for Economics, Statistics and Research.

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1. Introduction[1]

The COVID-19 crisis had unprecedented effects on the labor market, both in terms of the severity of the economic downturn and on the groups of workers who bore the highest costs of the pandemic-induced recession. Workers employed in "non-essential" activities, which were forced to shut down during the first and the second pandemic waves in Italy, were more likely to lose their jobs and/or be furloughed. At the same time, school closures had a differential impact across gender, as women traditionally devote more time to childcare within the households. In this respect, governments adopted policies, such as the expansion – both in terms of coverage and generosity – of parental leaves, to push a more equal division of childcare within families. Such policies persisted after the emergency period and may have entailed a cultural change implying an increased involvement of fathers in the child rearing process.

In this paper, we study the labor market outcomes of working parents in Italy, the first Western country to be hit by the pandemic and one of the countries in the world with the highest death tolls from COVID-19. Italy is also interesting because of its labor market, characterized by high gender gaps in employment and participation: female employment rate in the age group 15-64 was only slightly above 50 percent before the pandemic (18 p.p. less than men). In contrast to other works that have analyzed the early months of the pandemic, our analysis considers a longer time frame, including both 2020 and 2021. In this way, we are able to understand whether subjects who experienced the greatest penalties throughout the initial downturn have recouped these losses. Throughout this period, the government adopted different policies to fight the pandemic. It implemented a national lockdown during the first wave (March-May 2020), which involved school closures, and the definition of essential and non-essential economic activities – the former to be continued, the latter to be shut down.[2] In the following waves, the government opted for region- and sector-specific lockdowns, which determined the shut-down of economic activities and schools based on the circulation of the virus at the local level: in regions with high infection levels non-essential activities and middle and high schools were closed. All restrictions were then lifted at the end of April 2021.

We conduct our analyses using a matched employer-employee dataset from Social Security archives (INPS). The data covers the universe of employees in the non-agricultural private sector and allows

[1] We would like to express our gratitude to Fabrizio Balassone, Tito Boeri, Giulia Bovini, Francesca Carta, Federico Cingano, Francesco D'Amuri, Luigi Federico Signorini, Paolo Pinotti, Eliana Viviano, Fabrizio Zilibotti, and participants to the XXIII FRDB European Conference for useful comments and discussion. The views expressed in this paper are those of the authors only and should not be attributed to the Bank of Italy nor to the Eurosystem.

[2] Essential activities include agriculture, some manufacturing, energy and water supply, transports and logistics, ICT, banking and insurance, professional and scientific activities, public administration, education, healthcare and some service activities. Non-essential activities include most of manufacturing activities, wholesale and retail trade, hotels, restaurants and bars, entertainment and sport activities.

the identification of mothers and fathers thanks to a separate archive that records the universe of maternity and parental leave applications from 2010 onwards. Each application reports the date of birth of the child, which we exploit to analyze differential effects for parents of children of different age. The advantage of using administrative over survey data lies in their reliability, which makes them less subject to measurement error. Moreover, the large sample size and the granularity of these data allow us to compare labor market outcomes of mothers and fathers before and after the pandemic, conditional on a number of observable individual, job and occupation characteristics. Our analysis would be among the few that use such detailed and reliable data to study the impact of the pandemic on the labor market, enabling comparisons with results from other papers exploiting survey data. For example, Garcia and Cowan (2022) estimate the impact of school closures on parents' labor market outcomes in the United States using data from the Current Population Survey. They provide evidence of significant intensive margin responses, but little effects on the extensive margin.

We compare labor market outcomes of working parents in each month between January and December in 2020 and 2021 relative to 2019. We find that mothers experience a larger penalty in terms of reduced labor market earnings compared to fathers throughout the period March 2020-May 2021. In particular, differences between mothers and fathers are the largest (-37 vs -19 percent) during the first pandemic wave (March-May 2020); they decline (-7.4 vs -3.1 percent) when the circulation of the virus is low (e.g., summer of 2020); and they increase again, to a lower extent than in the first wave, during the second (November-December 2020; -11.2 vs -4.9 percent) and third waves (March-April 2021; -12 vs -3.4 percent). The penalty in labor market earnings is mainly determined by a substantial fall in days worked (-13.5 percent for mothers and -6.7 percent for fathers), holding the probability of taking parental leave, and that of working short-time hours, constant. We also find that parental leave take-up substantially increased, especially for mothers, during the first six months of the pandemic, and then declined below 2019 levels, probably following the adoption of remote working arrangement that have allowed an easier work-life balance. Starting from September 2021, however, mothers use parental leave more intensively than in the pre-pandemic times, maybe in response to companies beginning to recall employees back in presence. At the same time, while men are more likely to work short-time during the first wave, women face a higher short-time work probability from October 2020 onwards. Such heterogeneity likely reflects the changing composition of firms requesting subsidized hours' reductions: while the nationwide lockdown in the first wave imposed larger constraints on firms' activities, sector-specific lockdowns in the subsequent waves hit particularly firms in services, that may have different policies regarding short-time work use. In addition, at least during the second half of 2020, mothers also display a higher quit rate than fathers.

Starting from July 2021, there is a convergence of labor market earnings for both mothers and fathers to their pre-pandemic levels, without substantial heterogeneity according to gender in the magnitude of these gains. However, also during the recovery phase women have a higher probability of being on short-time work schemes (+2.4 vs +1.5 percentage points compared to 2019).

We investigate heterogeneous effects in the gendered impact of the pandemic. On the one hand, we find differentiated penalties according to the sector of activity (essential vs non-essential), with mothers working in non-essential activities displaying larger penalties that persist also in the first semester of 2021. We also find that among full-time workers mothers pay larger earnings penalties than fathers. Furthermore, we find some evidence that mothers of younger children experience a higher reduction in earnings compared to women with older children (although with some uncertainty around the estimates; no such type of heterogeneity is found for fathers). Finally, our results highlight an increase in gender earnings' differences in couples characterized by an initial higher pay inequality, suggesting that second earners have suffered a higher penalty.

This paper contributes to the existing research documenting the gendered impact of the COVID-19 crisis (Adams-Prassl et al., 2020a; Alon et al. 2020; Forsythe et al., 2020; Yasenov, 2020). In Italy, Casarico and Lattanzio (2022) show that activations of new contracts in 2020 slowed more for women than for men. Alon et al. (2020) find that, in the US, women's unemployment increased more than men's between February and April 2020. Adams-Prassl et al. (2020b) also show that women experienced a larger drop in employment compared to men: by mid-April the gap was 8 and 5 percentage points in the US and the UK, respectively.[3] Our investigation adds to these studies by focusing on the effects of the pandemic on parents. The presence of children and the division of childcare in the household is crucial in explaining the gendered effect of the pandemic (Bovini and De Philippis, 2021). Women with children had to combine their work activity with the provision of time-intensive care, due to the closures of schools and daycare centers (Alon et al., 2020, Sevilla and Smith, 2020, Farré et al., 2022; Del Boca et al., 2020). As a result, a number of papers provide evidence that women with young children were particularly affected by the crisis with greater declines in employment and work hours (see Alon et al., 2020; Collins et al., 2021; Couch et al., 2020; Blundell et al., 2020).[4] Heggeness (2020) focus on the US and shows that mothers living in states were schools

[3] In Germany and Canada, the differentiated impact was smaller but still substantial: in Germany, from February to May there was a rise of 18 percent in female unemployment rate, whereas for men the increase was 14 percent (Bundesagentur für Arbeit, 2020); in Canada, from February to April labor supply dropped by 30.1 percent for women, compared to 27.7 percent for men (Lemieux et al., 2020). Lambert et al. (2020) and Farré et al. (2022) report similar evidence for France and Spain, respectively. Hupkau and Petrongolo (2020), instead, find no increase in the gender gap in paid employment for the UK. For the Netherlands, Zimpelmann et al. (2021) and Meekes, Hassink, and Kalb (2020) find little overall widening of the gender gap in employment or hours.

[4] There is also evidence of negative effects on labor productivity with relevant consequences on women career prospects. Fuchs-Schundeln (2020) find a reduction during the first 5 months of 2020 in paper submissions to the Review of

were closed early are more likely to take temporary leave or stop working entirely. Similar results are found by Russell and Sun (2020) who consider the closure of childcare centers. Other papers show that these effects seem to be generally short-lived, lasting for two quarters since the pandemic onset (e.g., Bluedorn et al., 2021). We provide additional evidence using rich micro data allowing us to assess the role of different channels related to childcare needs and firm- and job-level factors, such as sector and occupation. We are also able to investigate whether the reduction in days worked (the main driver of the earnings reduction) is related to parental leave use, short time work, or transition to non-employment. Thanks to the time span covered by our data we also investigate the role of these factors during the recovery phase. This is particularly important to monitor the work dynamics of mothers and to adequately support them regain the ground lost during the crisis.

2. Institutional context

2.1. Non-pharmaceutical interventions to contain the spread of COVID-19

Italy was the first Western country to be hit severely by COVID-19. To fight the pandemic, the government opted for school closures on 4 March, and for a nation-wide lockdown on 10 March. Schools remained closed throughout the whole school year, which ends in June. The decree establishing the nationwide March lockdown also specified the activities that were deemed as essential and could continue to operate and those that were classified as non-essential and were forced to shut down. The former mainly include agriculture, some manufacturing, energy and water supply, transports and logistics, ICT, banking and insurance, professional and scientific activities, public administration, education, healthcare and some service activities. Shutdown sectors include most of manufacturing activities, wholesale and retail trade, hotels, restaurants and bars, entertainment and sport activities. The lockdown was lifted between May and June, and schools re-opened regularly in September (Lattanzio, 2023). However, the second wave in October pushed the government to introduce new, albeit less stringent, lockdown measures based on local evaluations on the prevalence of the disease. The new range of non-pharmaceutical interventions comprised partial or total school closures, which were adopted with considerable heterogeneity across regions, depending on the local diffusion of the virus.

On 31 December 2020, Italy started the vaccination campaign, whose coverage was still too low in early 2021 to prevent the diffusion of a new variant of the virus, which led the country to a third wave of infections, between March and May 2021. The government then issued another law, which enforced again school closures in areas with high infection levels. As a consequence of this policy

Economic Studies by female economists (-2 p.p.), while male submissions have slightly increased. Similar results are also found by Amano-Patino et al. (2020).

and of the worsening health conditions, schools were closed in many Italian regions in March 2021 and about 6 million of students were forced to attend on-line classes. Since the beginning of April schools have been allowed to reopen—up to Grade 8 (and Grade 6 in high-risk areas). Starting from June 2021, thanks to the progressive vaccination coverage of the population, the country has experienced a summer of normality. In autumn, infections started to increase again, leading to a fourth wave (November 2021–January 2022), during which schools remained nonetheless open, although classrooms were quarantined in the presence of more than two cases among students.

2.2. Family policies during the pandemic

From March 2020 the Italian government adopted a number of measures to help workers facing increased family responsibilities because of school closures. These measures included the provisions for extraordinary parental leave, hereafter "COVID-19 leave", for families with children under the age of 12.[5] Such provisions,[6] with an allowance equal to 50 percent of the monthly worker's wage,[7] provided more extensive financial aid compared to ordinary leave (periods of ordinary parental leave have a 30 percent replacement rate). The duration of the benefit, initially set at 15 days, was extended to 30 days and, starting from September 2020, employees were allowed to take advantage of this leave also for periods of quarantine and teaching suspension. Both employees and the self-employed were entitled to this leave. As an alternative to the COVID-19 leave, employed parents with children younger than 12,[8] in the period March-August 2020, had the possibility to benefit of a voucher for the purchase of child-care services,[9] the "baby-sitting bonus" (if one of the parents decided to use her\his parental leave, s\he could not apply for the voucher for the same period).[10] Both the COVID-19 leave and the baby-sitting voucher were directed to dual-earner couples.

[5] D.L. 18, March 2020. In 2021 (D.L. n. 30/2021) the policy was extended to parents of children aged up to 14 years old.
[6] In Italy, before the pandemic parents had two measures helping them with child bearing after the end of the compulsory maternity leave, which has a duration of 5 months. The first measure consists in an optional parental leave scheme entitling each household with children aged 12 or younger to a total of 10 months of leave (the first 6 months paid with a 30 percent replacement rate and the remaining months unpaid). The system is designed to encourage parents to share the leave: each parent can take up at most 6 months of parental leave and when the father uses at least 3 months of parental leave, the household is entitled to one additional month for a total of 11 months. The second measure, *Bonus Asili Nido*, is a yearly childcare subsidy of 3000 Euros (Law 11/12/2016 n. 232). This policy became first available in 2012 – *Bonus Infanzia*, Law 28/06/2012 n. 92 – implemented experimentally in the years 2013-2015, and confirmed for 2016, 2017 and 2018.
[7] Similar measures were adopted in other countries. For example, in France working parents with children under age 16 affected by school closure and/or self-isolation were entitled to paid sick leave (paid at 90% of gross earnings for the first 30 days) if no alternative care or work arrangements could be found. In Germany, working parents with children under age 12 who have not been able to work due to school or child care closures have been entitled to six weeks of paid leave, paid at 67% of earnings. See OECD (2020) for further details.
[8] In 2021 the age limit was raised to 14 (D.L. n. 30/2021).
[9] This measure was available for private employees, self-employed, as well as for some specific categories of public employees (doctors, nurses, biomedical and radiological laboratory technicians, staff of the law enforcement officers engaged for emergency-related needs) with children under the age of 12.
[10] The maximum amount of the voucher was firstly set at 600 and 1,000 euros for private employees and medical\security sectors' employees, respectively. Later, these ceilings were increased to 1,200 and 2,000 euros.

3. Data and descriptive statistics

We use data provided by the Italian Social Security Institute (INPS) on the universe of labor contracts from the UNIEMENS modules that all Italian firms in the non-agricultural private sector with at least one employee have to fill in and communicate monthly to the Social Security Institute. We use monthly administrative data, which inform us about the date of birth of the worker, her/his citizenship and municipality of residence, occupation, monthly earnings, days of work, days of leave, hiring and dismissal reasons, type of contract, time schedule and whether the worker is on short-time work.[11] The data also include information on firm size and Ateco 2007 sector.

We merge them with information on childbirth episodes. Specifically, we identify mothers and fathers through applications to compulsory maternity and optional parental leaves, which are recorded in a separate archive. We first identify the universe of working mothers from maternity leave applications.[12] This dataset records the identification code of the woman and the date of birth of the child, which we use to compute his or her age. We then identify a subset of working fathers from various sources. First, for those mothers applying for the optional parental leave, in some cases (57 percent of all mothers taking maternity leave) the dataset also records the identification code of the father: 79 percent of fathers in our final sample are identified in this way or, in other terms, 45 percent (0.57×0.79) of the full sample of working mothers. Second, around 19 percent of fathers come from their direct applications to parental leave. Finally, 2 percent of fathers come from cases in which they use the paternity leave, when the mothers cannot take the maternity leave (e.g., because of death). Therefore, the information on the fiscal code of the partner in mothers' applications to parental leave is crucial as it allows to recover childbirth episodes for fathers who, otherwise, do not take parental leave while working. In this way, the selection concerns on the sample of fathers applying for parental leave (those who could be more involved in childcare) are mitigated by information coming from mothers' applications (whose partners may not be involved in childcare at all), which comprise the majority of fathers included in the data.[13]

[11] The short-time work (STW) compensation scheme, *Cassa Integrazione Guadagni*, is a subsidy, granted by the government, for partial or full-time hours reduction, which preserves employment relationships and replaces 80 percent of the earnings forgone due to hours reduction, up to a threshold. At the onset of the pandemic, the Italian government introduced a special COVID-related STW compensation scheme of the duration of 9 weeks that applied retroactively starting from 23 February. The COVID-related STW scheme extended the coverage of the regular STW to firms with less than 15 employees, which were not covered normally, and to those already using the extra-ordinary STW, one of the sub-species of STW granted by the Italian employment protection legislation, which in normal times cannot be cumulated with the regular one. Moreover, firms using the COVID-related STW could renew temporary contracts, waiving to the norms of standard regulation.

[12] Mothers who had their child when unemployed are not included in the sample, as they do not apply for maternity leave.

[13] Fathers who are partners of women who do not apply for parental leave might be either more or less involved in childcare responsibilities compared to fathers with a partner who applies for parental leave. It is therefore unclear what kind of bias can derive from this type of selection. On the other hand, the selection deriving from including fathers who

Table 1. Descriptive statistics for mothers and fathers

	Mothers		Fathers	
	Mean	SD	Mean	SD
2019				
Monthly earnings	1902.42	1737.60	3031.73	3896.29
Days worked	16.19	9.01	23.78	5.79
Quit rate	0.005	0.07	0.005	0.07
Short-time work	0.01	0.11	0.02	0.14
Experience (months)	240.67	78.70	260.20	83.59
Age	41.65	5.79	42.60	6.09
White-collar	0.63	0.48	0.36	0.48
Number children	1.32	0.51	1.23	0.45
Ordinary parental leave	0.05	0.22	0.03	0.17
Observations	*11,468,752*		*6,789,257*	
2020				
Monthly earnings	1750.92	1872.50	2877.89	4317.72
Days worked	14.60	9.58	22.29	7.36
Quit rate	0.004	0.07	0.004	0.07
Short-time work	0.11	0.31	0.11	0.31
Experience (months)	243.97	80.12	265.399	84.57
Age	41.93	5.97	43.02	6.22
White-collar	0.63	0.48	0.37	0.48
Number children	1.34	0.52	1.23	0.5
Ordinary parental leave	0.03	0.17	0.02	0.13
Covid-19 parental leave	0.02	0.16	0.01	0.12
Observations	*12,585,427*		*7,669,857*	
2021 January-November				
Monthly earnings	1776.717	1809.90	2888.05	4467.15
Days worked	15.60	9.43	23.66	5.71
Quit rate	0.005	0.07	0.006	0.08
Short-time work	0.06	0.23	0.05	0.21
Experience (months)	246.71	81.57	270.16	85.59
Age	42.01	6.22	43.44	6.34
White-collar	0.64	0.48	0.36	0.48
Number children	1.35	0.52	1.23	0.45
Ordinary parental leave	0.04	0.21	0.02	0.14
Observations	*12,420,031*		*7,769,414*	

Notes. The table reports means and standard deviations of outcomes and observables of mothers and fathers, separately for 2019, 2020 and 2021.

For each worker, we select his or her main job in a given month, defined as the one with the highest number of monthly days worked. Besides, we focus on workers between the ages of 19 and 65.

Table 1 reports descriptive statistics about the sample we use for our analysis, separately for 2019, 2020 and 2021. The table shows that average monthly earnings of mothers are around 1750-1900

have applied for parental leave would imply that our estimates of gender differences in labor market outcomes during the pandemic can be interpreted as lower bounds.

euro, lower than fathers' (about 2800-3000 euro).[14] The drop in earnings between 2019 and 2020 is similar in magnitude for both mothers and fathers at about 150 euro. Men work a higher number of full-time equivalent days[15] per month and have slightly larger quit rates in 2021. Fathers are slightly older than mothers and are less likely to work in white-collar jobs (36-37 percent against 63-64 percent). The average number of children is between 1.2 and 1.3, depending if we focus on working fathers or mothers.

4. Empirical strategy

We compare outcomes in the labor market in each month between January and December in 2020 and 2021 relative to 2019.[16] We therefore estimate, separately for mothers and fathers and for each month, the following cross-sectional regression models:

$$y_{itm} = \alpha^m + \beta_0^m \cdot 1[t = 2020] + \beta_1^m \cdot 1[t = 2021] + \delta^m X_{itm} + \eta_{J(i,t)}^m + \varepsilon_{itm}, \qquad (1)$$

where y_{itm} is a labor market outcome of worker i in year t and month m (log annual earnings, log days worked, a binary indicator for whether the worker is in short-time work, a binary indicator for workers quitting their jobs). α^m is a constant. $1[t = 2020]$ and $1[t = 2021]$ are dummies equal to one for 2020 and 2021, respectively. X_{itm} are control variables, including labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes (when it is not the outcome) and region dummies. $\eta_{J(i,t)}^m$ are 2-digit sector fixed effects, and ε_{itm} is an error term. We estimate the twelve separate regressions for each month, and report the coefficients β_0^m and β_1^m, which measure the difference in outcomes for workers in 2020 and 2021, respectively, relative to 2019 in month m.

[14] We therefore measure a 37 percent gender gap in monthly earnings in 2019. To understand potential selection of fathers, we compute the same statistic from Labor Force Survey data, which records self-reported *net* monthly earnings, top coded at 3000 euros. We measure a 20 percent gender pay gap between mothers and fathers employed in the non-agricultural private sector. The difference with administrative social security data is likely a consequence of using net, instead of gross, earnings and, more importantly, top coding. The share of fathers with top coded earnings is more than double that of mothers, likely biasing downwards the estimated gender pay gap.

[15] Our analyses are based on full-time equivalent days, which coincide with raw days for full-time workers and raw days multiplied by half for part-time workers.

[16] We do not estimate coefficients for December 2021 because social security data are still missing for most workers at the time of writing.

5. Results

The effects on mothers and fathers. Figure 1 reports the estimates of β_0^m and β_1^m from equation (1) for mothers and fathers. Panel (a) shows results for log monthly earnings.[17] In 2020, there are striking differences between mothers and fathers, with the former experiencing a considerably larger penalty in terms of reduced labor market earnings than the latter, especially in the months between March and June (-32 vs -16.5 percent). Differences become smaller during the summer (-7.4 vs -3.1 percent) but start to widen again in November and December (-11.2 vs -4.9 percent), when new lockdown measures were taken and most schools closed again. The gap persists until the summer of 2021, when all lockdown measures were lifted. Starting from July 2021, earnings for both mothers and fathers converge back to their levels in 2019. Fathers, contrarily to mothers, experience small, albeit statistically significant, earnings gains in August, September and November.

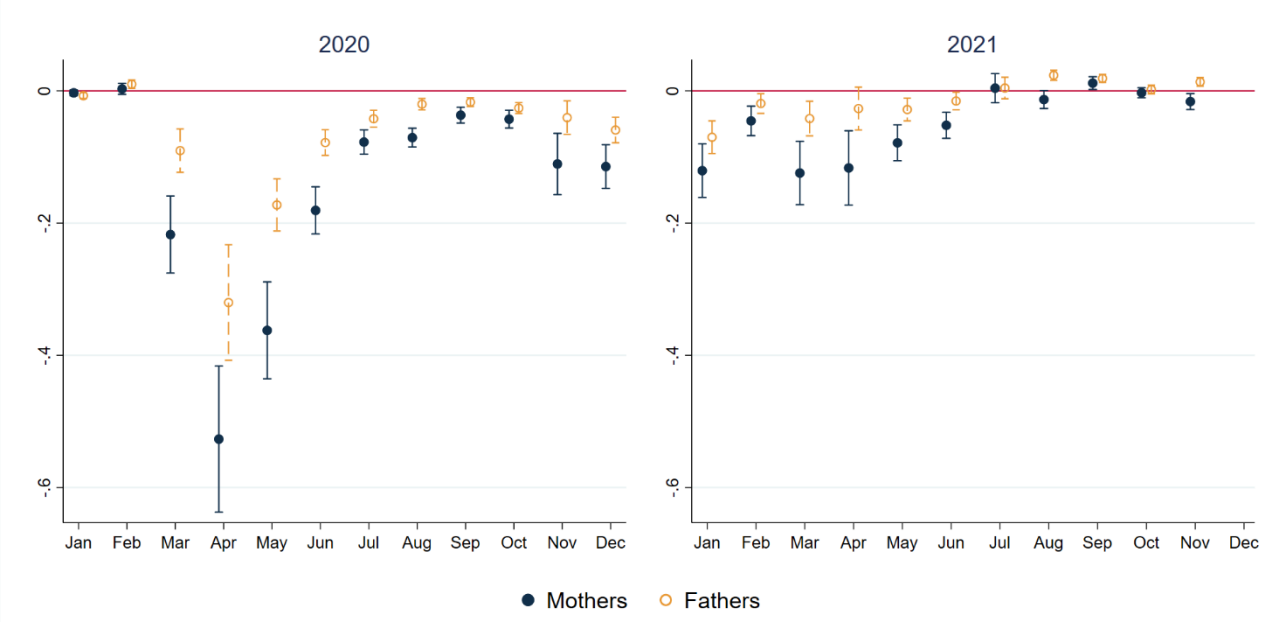
Panel (b) shows that most of the effect on earnings in 2020 and in the first half of 2021 materializes through reduced days worked, which show a very similar pattern to that observed for earnings. The reduction in days worked at the beginning of the pandemic is partially due to an increase in the use of parental leave (more pronounced for mothers than for fathers, +3.5% vs +2%), as panel (c) shows.[18] However, in the period going from September 2020 to August 2021, when the adoption of remote working arrangements becomes common in Italian firms, the probability of using parental leave decreases to smaller levels than those of 2019 (with the exception of March). Starting from September 2021, maybe in response to companies beginning to recall employees back in presence, mothers start to use parental leave more intensively than in the pre-pandemic times.[19]

Panel (d) shows that the increase in the probability of working short-time hours is higher for fathers during the first pandemic wave in March and April 2020.[20] In contrast, from October 2020 to May 2021 mothers are significantly more likely to be on short-time work compensation schemes than fathers. These differences tend to persist also during the recovery albeit they become much smaller in magnitude. The different profiles of short-time work use over time likely reflects the changing composition of firms requesting subsidized hours' reductions, even after controlling for sector fixed effects. In fact, in 2021 compared to 2020 there is an increase in the use of short-time hours among

[17] Results are very similar if, instead of using earnings in the main jobs, we use total earnings across different jobs (as workers may be employed by more than one employer in a given month).
[18] This difference is even more pronounced when we match fathers and mothers in a household (see Figure A4).
[19] It is worthwhile to notice that, under some specific circumstances such as school quarantine or contagion, during 2021 parents could still apply for a special leave with an allowance equal to 50 percent of the salary.
[20] Note that we are only able to study differences in short-time work use on the extensive margin. However, there might be differences on the intensive margin: for example, women with children may use more hours of short-time work relative to fathers (or women without children). Unfortunately, our data does not record hours spent in short-time work, but only whether a worker ever uses short-time work in any given month.

firms operating in the hotels and restaurants sector (23.9 percent of all firms using short time schemes in 2020 vs 29.4 percent in 2020) and a reduction among firms operating in the manufacturing sector (20.9 percent in 2020 vs 15.6 percent in 2021).

Panel (e) reports the probability of quitting the job.[21] For both fathers and mothers the probability of quitting is lower between March and June 2020 compared to 2019, reflecting the correlation of quits and job-to-job transitions with business cycle conditions (Berson et al., 2020).[22] Nonetheless, the figure suggests that the quit rate declined significantly more for fathers than for mothers between March and June 2020, while in September and October the quit rate for mothers is significantly larger than in 2019, as opposed to fathers who have lower quit rates throughout the whole 2020. About 25 percent of mothers quitting their job in September and October 2020 end up being not employed in the following month, while the remaining 75 percent find a new job (these percentages were equal to 15 and 85 in September and October 2019). There are no significant differences in 2021: the observed increase in quit rates involves both genders with no notable heterogeneity.

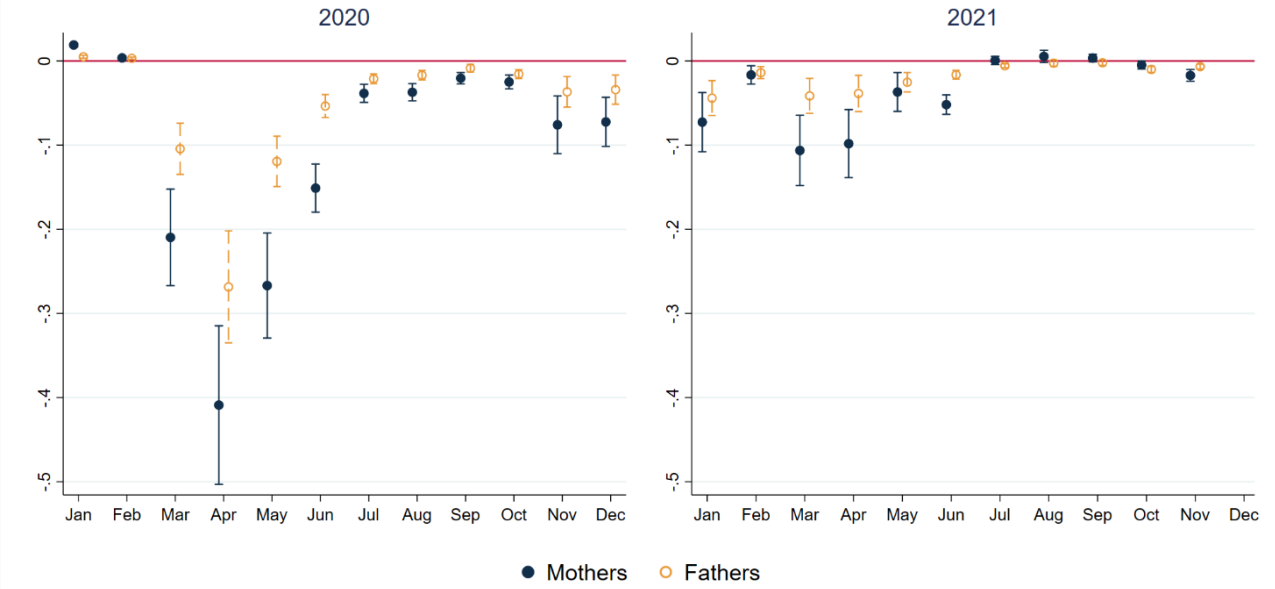


(a) Log monthly earnings

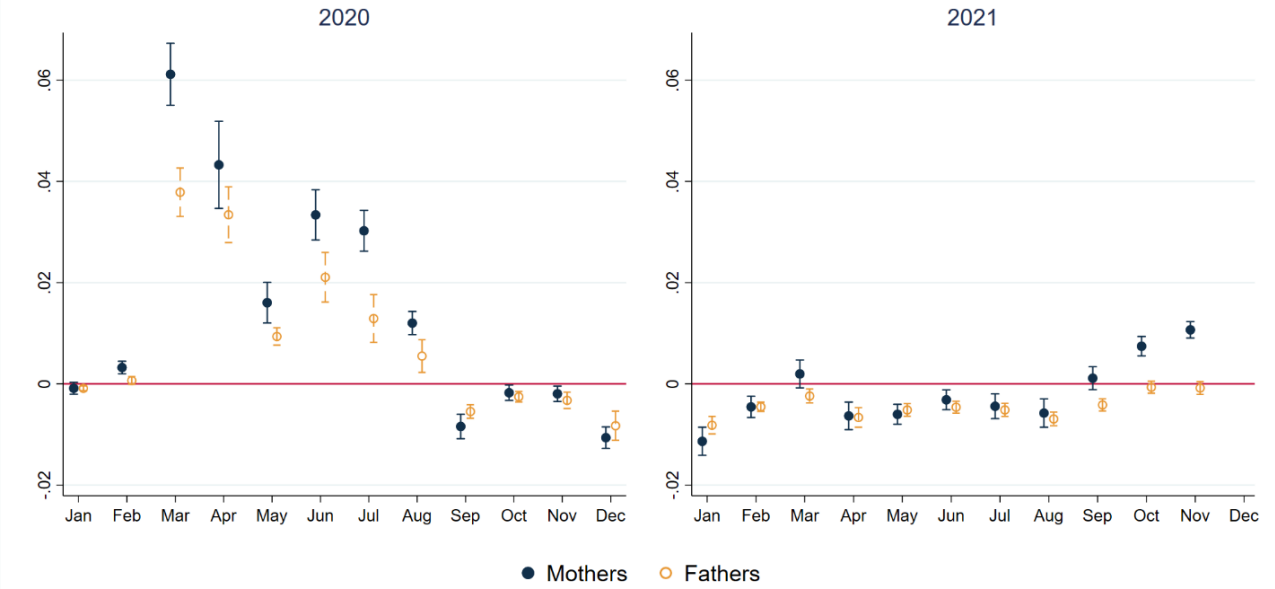
Figure 1. Dynamic estimates of the impact of the pandemic on labor market outcomes of mothers and fathers

[21] Depalo and Viviano (2022) show that workers, especially older ones, quit their jobs moved by fear of contagion, especially in essentially (continuing) activities. Fear-induced quits by gender were larger in magnitude for men than for women.

[22] We do not consider the probability of being fired as the Italian government in March 2020 introduced a ban on the dismissal of employees for economic reasons.

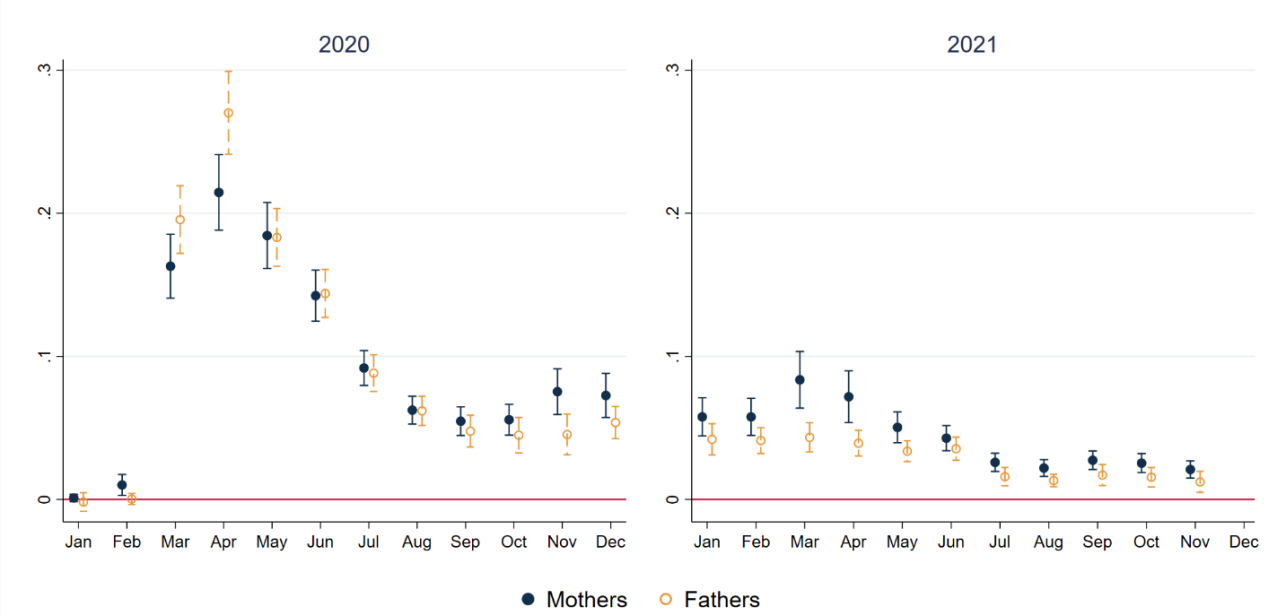


(b) Log monthly days worked

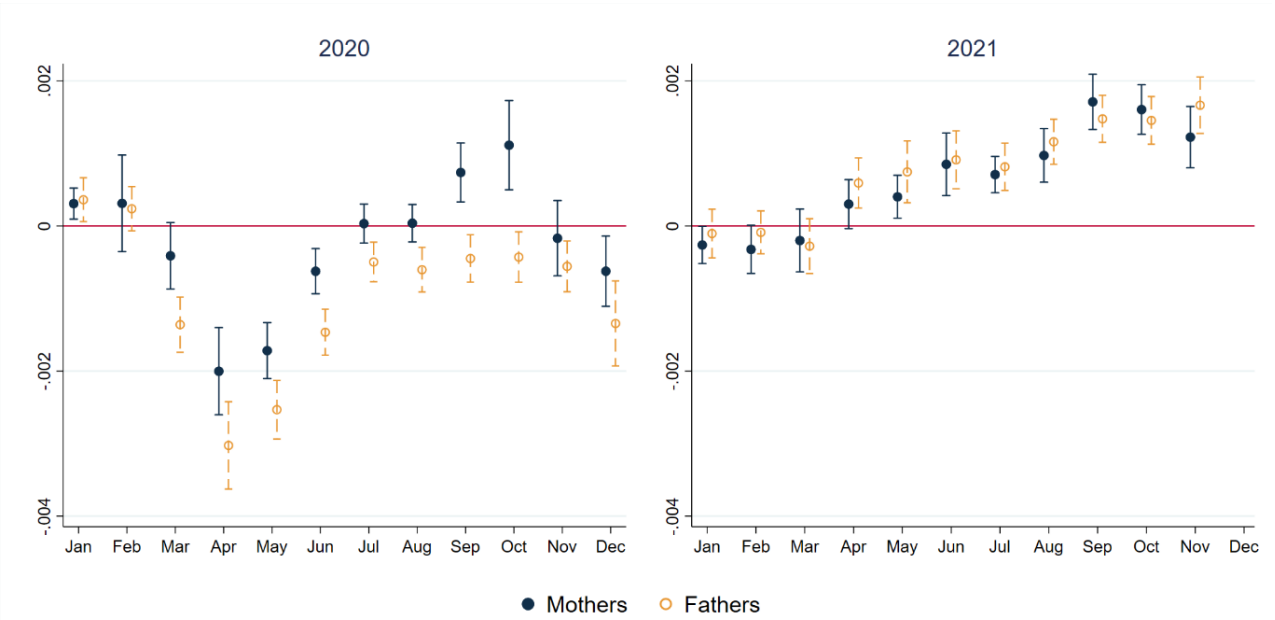


(c) Parental leave

Figure 1 (continued)



(d) Short-time work



(e) Quit rate

Figure 1 (continued)

Notes. Each panel reports the estimated coefficient β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers. Control variables include: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave (except in panel c), dummy for workers in short-time work compensation schemes (except in panel d) and region dummies.

Mechanisms behind the reduction in days worked. We further analyze what explains the patterns in days worked, the main driver of the evolution of log earnings. We investigate whether the reduction in days worked is driven by short-time work, by parental leaves or by employment to non-employment transitions. We therefore estimate an augmented version of equation (1) in which we interact the year dummies $1[t = 2020]$ and $1[t = 2021]$ with dummies for being on short-time work, taking parental leave or moving from employment to non-employment (E-NE) in the next month.[23] Figure A1 reports the marginal effects of such regressions for mothers in panel (a) and fathers in panel (b). The line labelled "Baseline" shows the coefficients on the year dummies. Hence, it measures the reduction in days worked for individuals not in short-time work, not taking parental leave, and not moving to non-employment in the following month. The other three lines are the linear combination of the "Baseline" coefficient and, respectively, that on the dummy for short-time work, parental leave take-up and E-NE transitions. Hence, each shows the decrease in days worked for mothers and fathers that reduce their labor input for one of the above-mentioned reasons, keeping the others fixed. The figure highlights that, for both men and women, what matters in explaining the reduction in days worked is mainly short-time hours and transitions to non-employment.[24] In particular, the reduction in days worked related to short-time work is the largest in April 2020, when it almost reaches -80 percent. In all the other periods, the line for short-time work is always below the baseline. The contribution of E-NE is more volatile, being particularly important for both women and men between April and June 2020 and in October and November 2020.[25] The contribution of E-NE transitions to the pronounced drop in days worked during the first pandemic wave, which was stronger for mothers than fathers, is also consistent with the decline in participation rates, which declined for both women and men, but the more so for the former (-3.8 p.p. vs. -2.9 p.p. between 2019Q4 and 2022Q2).[26] It becomes less clear-cut in 2021, especially for mothers. Finally, parental leave take-up contributes to the reduction only between March and July of 2020, and it does so by weighing more on mothers than fathers (as seen already in panel (c) of Figure 1).

Extensive and intensive margin. Overall, the evidence presented so far suggests that the pandemic had a disproportionate impact on working mothers relative to fathers. In particular, we find that working mothers suffer larger earnings penalties, due to larger reductions in monthly days worked.

[23] For employment to non-employment transitions, we define a dummy variable taking the value of one when the worker is observed in our dataset in any month m and is not observed in month $m + 1$.

[24] The figure again displays how the baseline reduction in days worked (related for example to ordinary leave taking or ending of fixed-term contracts that are not conducive to a move to non-employment) is larger for women than for men during the first wave (March-April 2020) and, to a lesser extent, during the second (November-December 2020) and third (March-April 2021) waves.

[25] E-NE transitions between April and June are mostly driven by endings of fixed-term contracts and retirements; those between October and November are driven by quits as shown in Figure 1, panel (e).

[26] Seasonally adjusted participation rates, age group 15-64. Istat, Quarterly Labor Force Survey.

The decrease in days worked can be a consequence of a higher number of absences from work (due to ordinary, parental or sick leave) or exit from employment. Hence, days worked partially capture exit from employment within a given month, but they do not fully capture the extensive margin of labor input, as we only observe non-zero values. We assess more precisely the relative importance of adjustments along the extensive and intensive margins,[27] by including year-month observations when a worker is not employed (imputing a value of zero in the outcome variable) in the non-agricultural private sector and therefore had zero earnings and zero working days: hence, if in any month between January 2019 and November 2021 the worker is not observed with positive earnings, we impute a value of 0 to that observation, excluding observations after retirement or death.[28] This expands the sample of mothers by about 9.1 million person-month-year observations and that of fathers by about 4.1 million person-month-year observations. In order to include non-employment spells in the estimation (i.e., the observations set to zero), we adopt two approaches. First, we use earnings and days worked in levels as outcomes in equation (1). We then rescale the coefficients by the predicted outcome when excluding the year dummies for 2020 and 2021, in order to get percent effects.[29] Figure A1 reports the estimates for monthly earnings and days in panel (a) and (b), respectively. The patterns are quantitatively and qualitatively similar to those reported in Figure 1, with mothers experiencing larger penalties in earnings and days worked than fathers. The estimates are smaller in magnitude than those reported in Figure 1, but it must be noted that the sets of estimates are not directly comparable. The normalization with respect to the predicted average in 2019 makes the estimates in Figure A1 fundamentally different. Therefore, in order to better understand how the inclusion of non-employment spells quantitatively affects the results, we adopt a second approach and use the log of one plus outcomes as dependent variables in Figure A2.[30] The use of this alternative metric signals that, when including non-employment spells in the data, the penalties in terms of foregone earnings and days worked for both mothers and fathers become larger than those recorded when ignoring

[27] With intensive margin we mean here days worked. One additional margin would be hours within days, which we cannot measure as the social security data do not record hours worked.

[28] Our measure of non-employment refers to the non-agricultural private sector only. Hence, we cannot exclude that workers non-employed in a given year-month pair are self-employed or employed in the public sector, although these transitions in a period of shutdown of economic activities and general economic downturn are quite unlikely to happen.

[29] In other terms, we report $\tilde{\beta}_t^m = \frac{\beta_t^m}{E[\tilde{y}_{itm}]}$, where β_t^m are the coefficients estimated from equation (1) for $t = \{2020, 2021\}$ and $\tilde{y}_{itm}$ is the predicted outcome in 2019, when omitting the contribution of the year dummies for 2020 and 2021 dummies, i.e., $\tilde{y}_{itm} = \hat{\alpha}^m + \hat{\delta}^m X_{itm} + \hat{\eta}^m_{J(i,t)}$.

[30] The arbitrary transformation of the dependent variable by adding one, in order to use log values, is not ideal for a number of reasons. First, coefficients do not have a percent interpretation comparable to that of the log transformation. Second, the transformation introduces non-linearity, which could cause negative weighting problems (see, e.g., Cohn et al, 2022). These issues are less problematic when the number of censored observations is small. In our sample, they represent 6.1 percent of total person-month-year observations among fathers and 10 percent among mothers. Given they involve a relatively small number of observations and they serve with the only purpose of providing a robustness check, we still report estimates with the log of one plus outcomes.

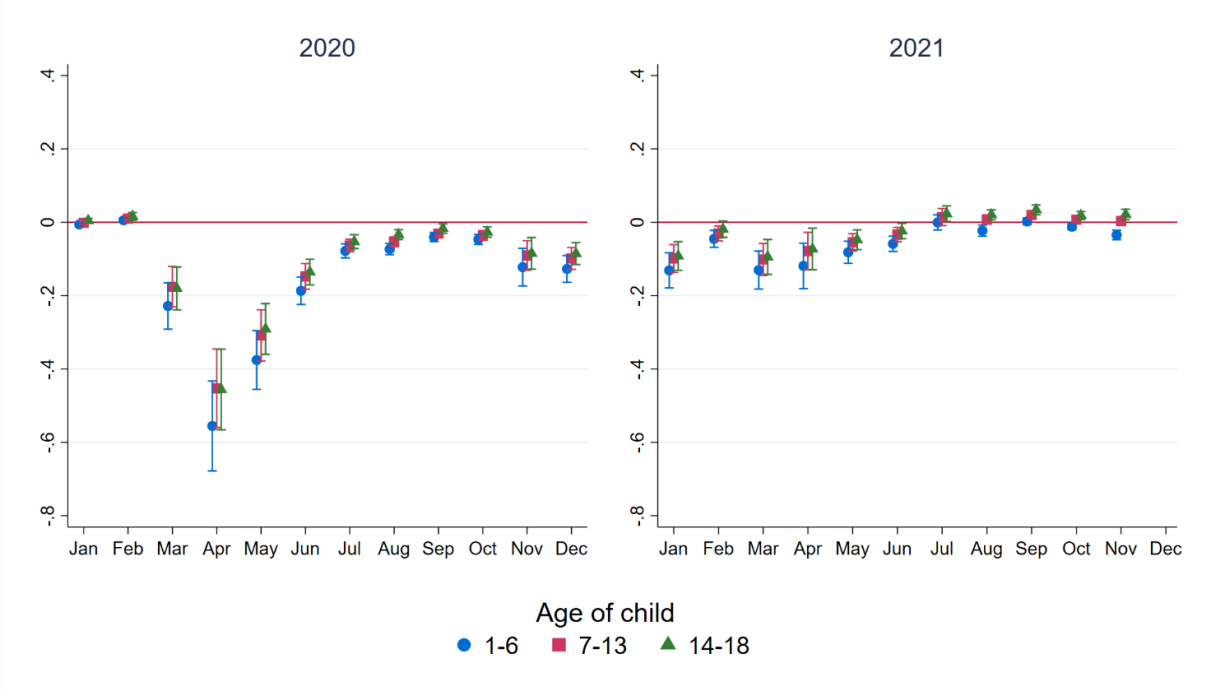
periods of non-employment. The differences between mothers and fathers are, however, still present and of similar magnitude to those reported before, confirming that the main margin of labor market adjustment is the intensive one.[31] This finding is likely related to the effects of policies implemented by the Italian government – namely, the layoff ban and the easing of requirements to access short-time work compensation schemes – that considerably increased firing costs.

6. Heterogeneity in labor market penalties

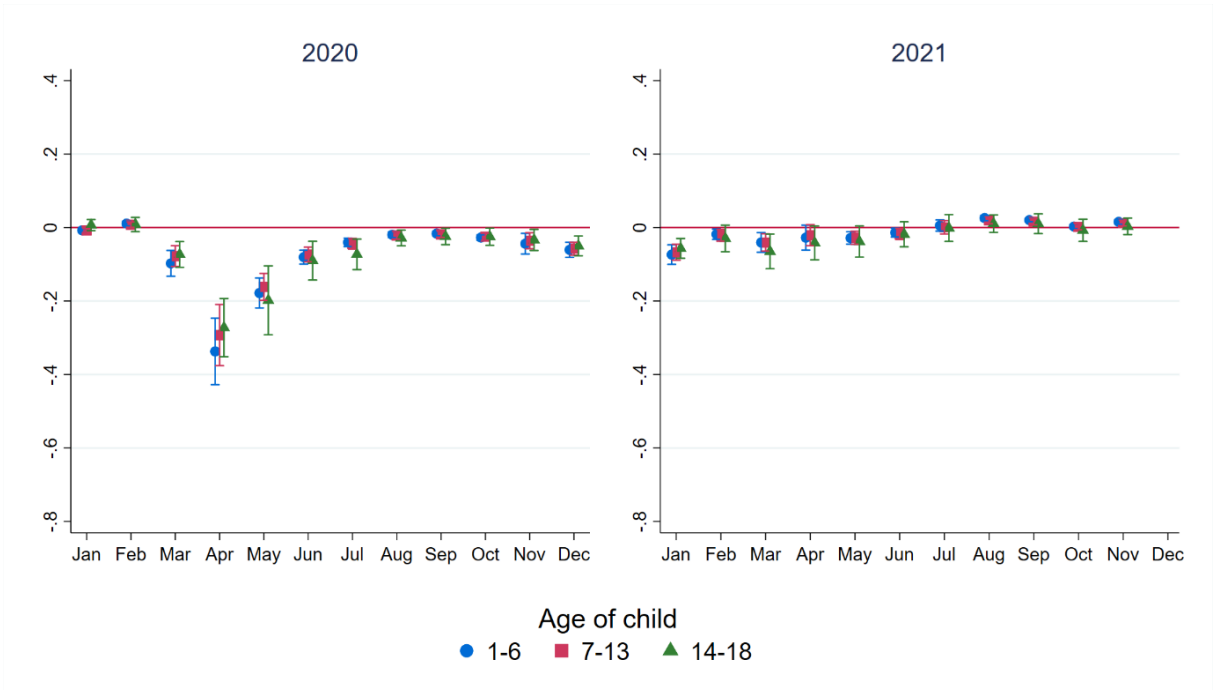
The relatively stronger impact that the COVID-19 crisis has produced on mothers compared to fathers can be related to a number of different factors, which we investigate in heterogeneity analyses related to both demand and supply-side determinants of the patterns observed throughout the pandemic. We investigate four sources of heterogeneity, based on (*i*) the age of children, (*ii*) the within-couple gender wage gap, (*iii*) the sector of employment (essential vs. non-essential, i.e., continuing or shutdown) at the onset of the pandemic, and (*iv*) the contract type (part- vs. full-time and temporary vs. permanent).

(i) Heterogeneity by children's age. Our first hypothesis is that parents with younger children have suffered larger penalties than those with older children, as they were more affected by closures of childcare facilities and schools. Given traditional gender norms that assign to mothers a higher share of childcare duties, we also posit that heterogeneous effects by child's age are stronger for mothers than fathers. We find some evidence in favor of this hypothesis in Figure 2, which reports the estimates of β_0^m and β_1^m from equation (1) separately for mothers (panel (a)) and fathers (panel (b)) and for three different child's age groups (1-6, 7-13, and 14-18 years old). Looking at the point estimates, the figure shows that mothers of children in the age group 1-6 experience more severe reductions in earnings in 2020 and, albeit to a lesser extent, in 2021, than mothers of older children. However, there are overlaps in confidence intervals, especially with the adjacent age group of 7-13 years old. For fathers, we observe smaller penalties across each children's age, with little differences between age groups. Hence, the gender differences tend to be larger for parents of children between 1 and 6 years old and smaller for parents of older children. We cannot draw strong conclusions from this exercise given the lack of statistical significance, but it suggests – at least descriptively – a role of childcare in determining the observed patterns for mothers and fathers during the pandemic.

[31] The relatively larger drop in log earnings during the first wave in 2020 is again consistent with the decline in participation rates in the first half of 2020. The contribution of the latter to non-employment spells is, however, short-lived, as by the end of 2021 participation rates fully recovered the pre-pandemic levels.



(a) Mothers



(b) Fathers

Figure 2. Dynamic estimates of the impact of the pandemic on log monthly earnings of mothers and fathers by child's age.

Notes. Panel (a) and (b) report – for mothers and fathers, respectively – the estimated coefficients β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1), separately for the youngest child's age. The estimates are conditional on the following set of control variables: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes and region dummies.

(ii) Heterogeneity by the within-couple gender wage gap. For a subset of observations in our data, related to mothers' applications for parental leave with non-missing partners' identification codes, we can match fathers and mothers in a household (80,015 couples). Figure A4 reports the estimates of equation (1) for this restricted sample, which are largely comparable to those reported in Figure 1 for the full sample of workers.[32] We then investigate whether the effects of the pandemic were heterogeneous according to the initial gender wage gap within the household. Specifically, within each household, we measure the average gender gap in log daily wages in 2019 and divide households in three groups:[33] those with a negative gender pay gap, i.e., where the woman earns more than the man; those with a "mild" positive gender pay gap, i.e., where the woman earns less than the men, but the difference is below the median of the household level gender pay gap distribution; those with a "high" positive gender pay gap, i.e., above the median of the distribution of the gender gaps.[34]

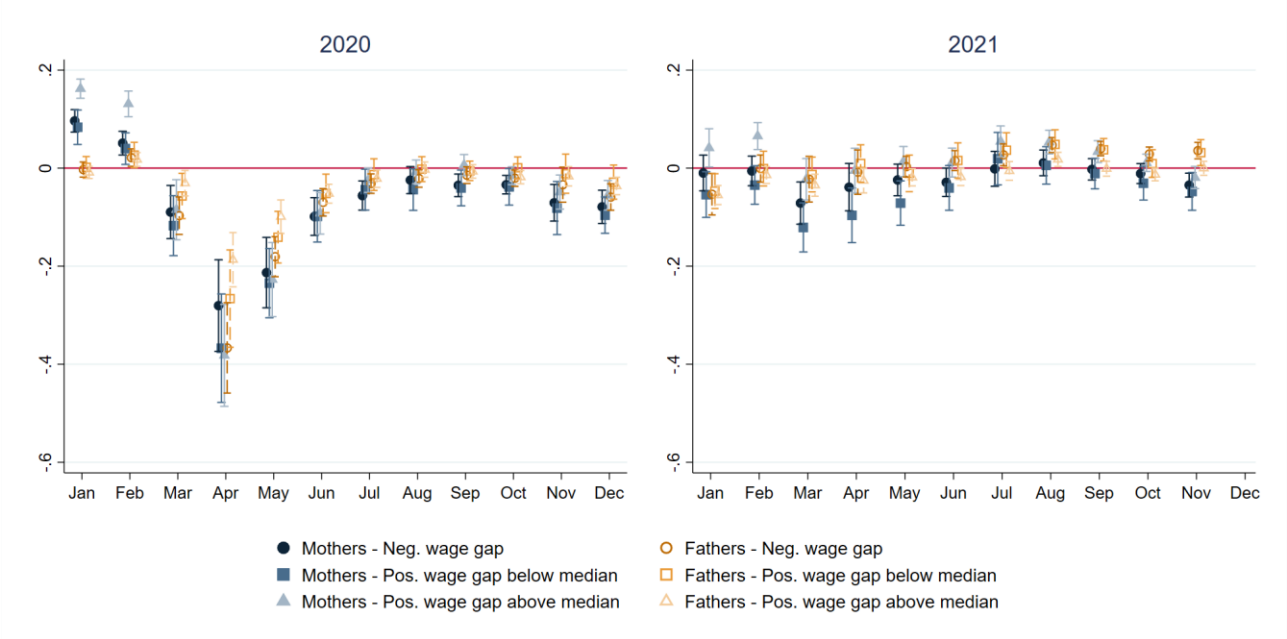
Figure 3 reports the coefficients separately for mothers and fathers in each group in panel (a) and the household gender gap in log monthly earnings in deviations from the gap in January in panel (b). Panel (a) shows that mothers in high gender pay gap household are on a positive trend in January and February, but then experience a larger drop in earnings compared to men and to households with lower gender pay gaps. This is better seen in panel (b), which normalizes the gap to be null in January:[35] gender pay gaps increase in all households, but in the more unequal ones the gap in log earnings increases more in 2020 than in less unequal households. Hence, earnings inequality between men and women tend to become larger during the pandemic, and there is an increase in differences between more and less unequal households. In 2021, differences between households evolve in similar ways throughout January until November. The amplification of gender differences in households with higher starting inequality levels suggests that earnings of the second earner were sacrificed where differences between partners were the largest, implying some role for household-level bargaining in determining the observed gender differences throughout the pandemic.

[32] The only noticeable difference is in panel (e) of Figure A4, which reports that coefficients for quit rates are generally not statistically significant, with some more exceptions for fathers. Overall, we conclude that the restriction on household level data does not change the main conclusions on the effects of the pandemic on parents.

[33] We use daily wages instead of monthly earnings to divide households in order not to categorize data based on the outcome (monthly earnings, in this case). Also, note that in this case we make a further sample restriction by requesting that both household members are observed at least once in 2019. Therefore, there could be some differences between the disaggregated patterns shown in Figure 3 and the aggregate ones in Figure A4.

[34] These results are not driven by low-wage mothers, who may stay at home in the presence of negative shocks irrespective of considerations on household-level bargaining. To verify this, we did replicate the analyses excluding mothers in the first decile of the 2019 daily wage distribution, obtaining very similar conclusions to those reported in the text.

[35] Hence the points shown in the Figure can be interpreted as difference-in-differences, the first difference being that between mothers and fathers and the second one that relative to January.



(a) Log earnings, mothers and fathers

(b) Log earnings gap relative to January

Figure 3. Dynamic estimates of the impact of the pandemic on log earnings of mothers and fathers, household matched data, separately for initial gender wage gap within the household

Notes. Panel (a) reports the estimated coefficient β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers in the sample with household information. Control variables include: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes (except in panel c) and region dummies. Panel (b) shows the difference in coefficients for mothers and fathers, in deviations from the coefficient in January.

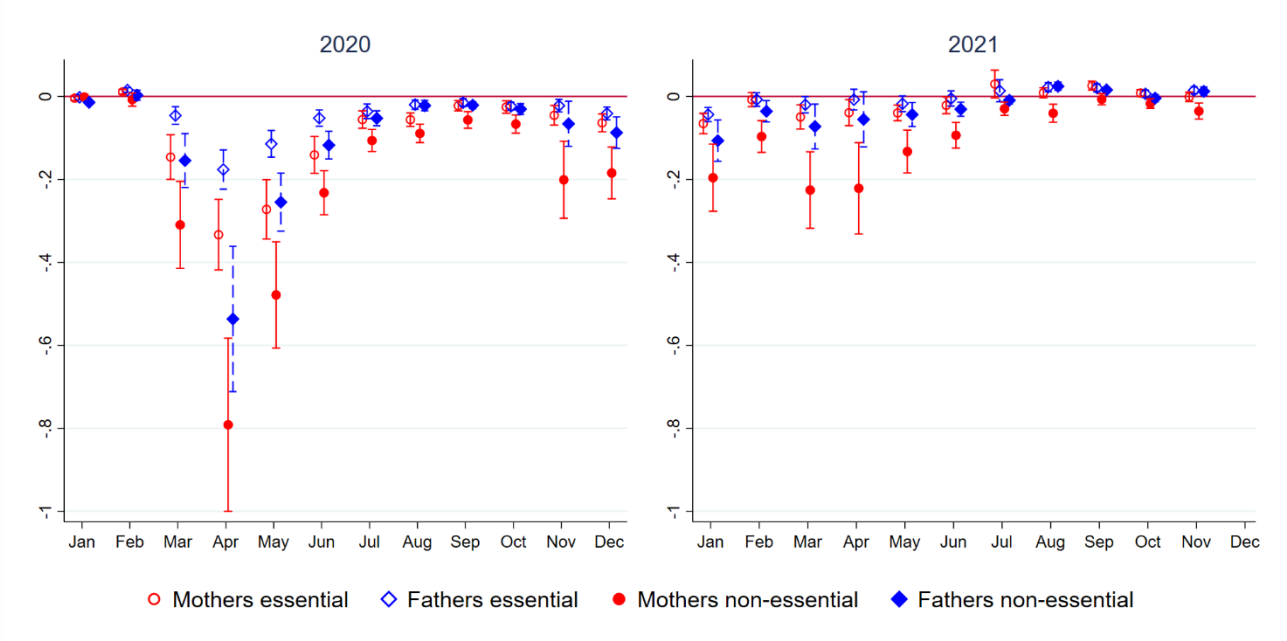


Figure 4. Dynamic estimates of the impact of the pandemic on log monthly earnings of mothers and fathers by sector (essential vs non-essential activities).

Notes. The figure reports the estimated coefficients β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers, distinguishing workers employed in essential and non-essential sectors. The estimates are conditional on the following set of control variables: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes and region dummies.

(iii) Heterogeneity by sector. Our third hypothesis is that workers in non-essential sectors (those that were forced to shut down during the first pandemic wave) have suffered larger earnings penalties due to a stronger disruption in production. Being the probability of working in a non-essential sector similar for mothers and fathers (47 vs 45 percent) the differentiated impact of the pandemic highlighted in our analysis is unlikely to be related to this type of compositional effects, although within each of the two branches the earnings of mothers and fathers might have had a different response. Our results, reported in Figure 4, highlight that mothers in non-essential activities experience a larger decrease in their labor market earnings than fathers and mothers in essential activities. The gap between essential and non-essential activities tends to become irrelevant in periods characterized by a low diffusion of the virus and after the introduction of COVID-19 vaccines. Moreover, female non-essential workers are more affected than male non-essential workers, especially in periods of high COVID-19 diffusion. These penalties persist also during the recovery phase, when all lockdown measures are lifted, signaling the possible presence of scarring effects, which are not observed for fathers though. In addition, we find that the differences between mothers

and fathers are relatively large also in essential activities.[36] These results may stem from the decision of firms to shift the cost of the crisis more on female than on male workers or from mothers having different child-rearing responsibilities, which become more demanding when child-care services are unavailable.

(iv) Heterogeneity by contract type. Our fourth hypothesis is that parents on part-time contracts may experience different labor market penalties than those on full-time contracts. The direction of the penalty is, however, a priori unclear. On the one hand, part-time workers should have more flexibility to combine childcare and work duties and therefore suffer smaller penalties than workers on full-time contracts. On the other hand, part-time workers may be less attached to the labor market and, in couples where the partner has a full-time job, the optimal choice is to reduce even further the labor supply of the part-time partner in order to preserve the full-time (and likely more remunerative) position. We do find strong evidence in support of heterogeneous effects between full- and part-time workers for the period going from February 2020 to June 2021, as reported in Figure 5, panel (a), for both mothers and fathers.[37]

The estimates suggest that workers on part-time contracts suffer larger penalties than workers on full-time contracts, therefore providing support in favor of the hypothesis that part-time workers are less attached to the labor market, rather than exploiting the additional flexibility to combine childcare and work duties. Most of this penalty comes from reduced days worked.[38] Part-time fathers exhibit larger penalties than part-time mothers; this is likely due to the fact that fathers working part-time are highly selected and more dissimilar from the "average" father than part-time mothers are.[39] Indeed, the incidence of part-time among fathers is only 7 percent, compared with 46 percent among mothers. In contrast, there are no substantial differences between workers on part- and full-time contracts in the second half of 2021, except for full-time fathers experiencing earnings gains from August onwards. Interestingly, the different patterns of part- and full-time workers suggest that the overall penalty for mothers in 2020 and the first half of 2021 partly stems from compositional effects, being mothers on part-time contracts almost half of the total number of mothers in the labor market. It must be noted,

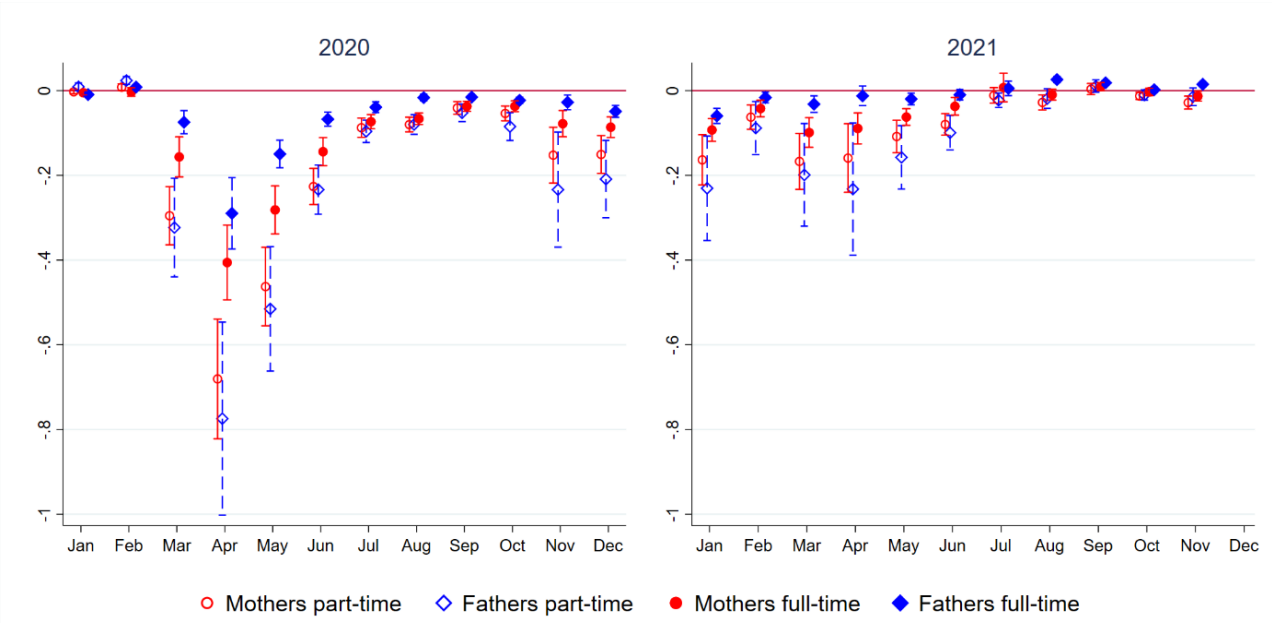
[36] We do not investigate here heterogeneity by whether workers were able to work from home or not, because we do not have information on work arrangements or on detailed occupations. However, remote working may mediate the results of this heterogeneity analysis. For example, women may be over-represented in non-essential activities that have fewer remote-work opportunities, thus explaining the larger penalty for mothers in non-essential activities.

[37] We distinguish workers in subgroups based on whether they have a part-time or full-time contract in February of each year, in order to avoid dividing workers on a potentially endogenous variable.

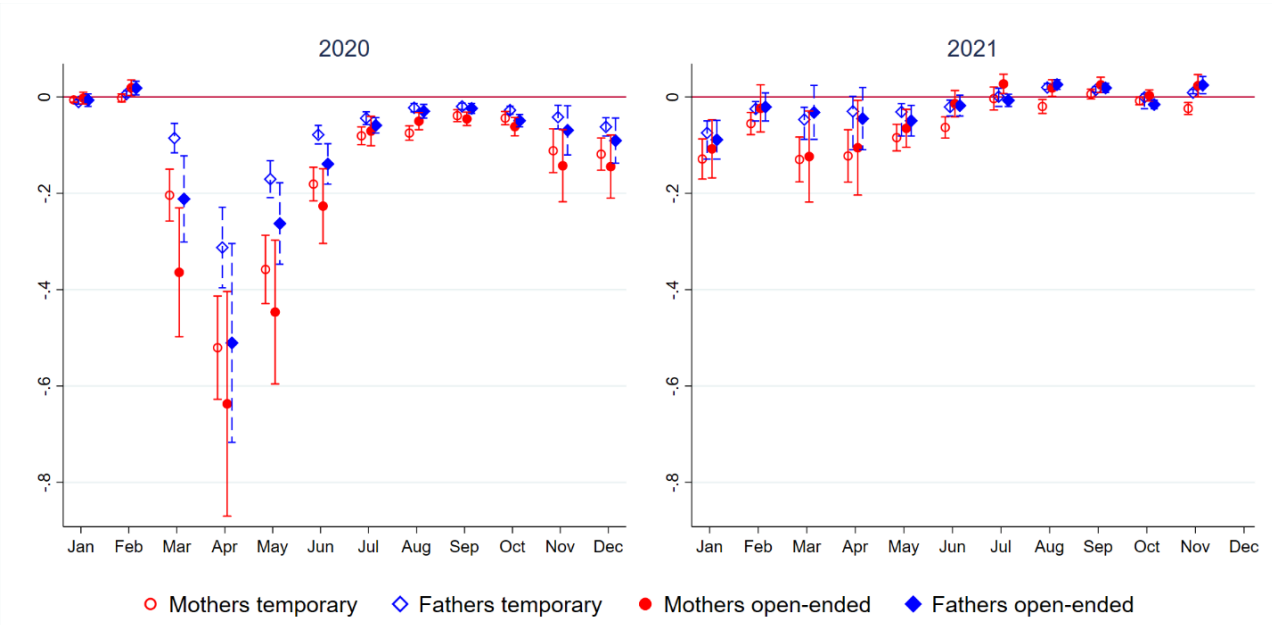
[38] Results are available upon request.

[39] For example, part-time fathers are more likely be on temporary contracts than the average father (14 vs. 6 percent). This difference is larger than the one observed for mothers (9 vs. 8 percent). Part-time fathers are also more likely to be migrants (15 vs. 9 percent; for mothers, 9 vs. 10 percent), have one-year lower labor market experience (no such difference is observed for mothers) and are disproportionately employed in services (23 vs. 14 percent; for mothers, 25 vs. 23 percent).

though, that even among full-time workers, mothers pay larger earnings penalties than fathers. Differences are particularly large in the first months of the pandemic, especially in May and June, and then tend to reduce.



(a) Part- vs. full-time



(b) Temporary vs. open-ended

Figure 5. Dynamic estimates of the impact of the pandemic on log monthly earnings of mothers and fathers by contract type.

Notes. The figure reports the estimated coefficients β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers, distinguishing workers with part-time vs full-time contract (panel a) and workers with temporary vs. open-ended contract (panel b). The estimates are conditional on the following set of control variables: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes, sector and region dummies.

The differences between part-time and full-time workers in 2020 and in the first two quarters of 2021 cannot be explained by differential selection of part-time contracts in essential vs. non-essential activities, as the estimates reported in Figure 5 are conditional on sector dummies. Moreover, the penalty for part-time workers seems not to be determined by the higher part-time share among temporary contracts (36 percent vs. 27 percent among open-ended contracts in 2019). Figure 3, panel (b), shows indeed that earnings differences between 2020-2021 and 2019 tend to be similar for workers on temporary vs open-ended contracts. Only during the first pandemic wave in 2020, differences emerge between contract types, yet with wide overlaps in confidence intervals.

7. Conclusion

A growing literature documents the large and unequal impacts of COVID-19 on the labor market, with a particular focus on gender and parenthood. Nation-wide mandated shutdown of non-essential activities, coupled with school closures, had unprecedented effects on parents' labor market opportunities, and women's in particular. The additional childcare responsibilities have weighed disproportionately on female employment, putting a halt on the process of gender convergence in labor market opportunities. This paper adds to this evidence by showing how the pandemic affected mothers and fathers, using Italy as a case study.

We use rich administrative data on the universe of private-sector workers from social security records and find that mothers experience larger penalties in terms of foregone earnings relative to fathers. Our results are similar to those found by the literature documenting the effects of the pandemic during its early stages. However, we complement this literature by providing evidence for a longer time span, covering both 2020 and 2021, therefore including also the recovery phase.

We also provide suggestive evidence that during the pandemic a particularly relevant channel in driving the gendered impact of the pandemic is represented by child-rearing needs and the unequal involvement in household chores between men and women. This is especially true during the first wave of the pandemic, while in subsequent periods mothers seem to have benefited from the diffusion of flexible work arrangements. Suggestive evidence in favor of this assumption comes from our results showing that, while during the first semester of the crisis parental leave use increases significantly more for mothers than for fathers, between September 2020 and August 2021, when remote working arrangement become widespread, the probability of using parental leave reduces below 2019 levels and then increases again from September 2021 (when many firms start to require their employees to return to the workplace). The increase in parental leave use by mothers in the last

months of 2021 may stem from a habit-forming mechanism: the individuals who spent more time with their children during the pandemic may do the same also when childcare services become available again. It can also relate to economic conditions for some types of parental leave being more generous than in 2019. Further research is needed to disentangle which mechanism prevails.

Our findings also reveal differences in penalties according to the sector of activity (essential vs non-essential), type of contract, and within-couple gender wage gap. We also show that while most of these heterogeneous effects vanishes during the recovery phase, mothers employed in non-essential activities experience some earnings losses also during the second half of 2021, which might lead to wider gender gaps. Difficulties faced by these women in benefiting from labor market opportunities deriving from the strong economic recovery of 2021 on a par with their male counterparts highlights how temporary shocks can have persistent scarring effects. An alternative or companion mechanism may stream from the human capital lost during the pandemic that translates in lower earnings once the shock is over and in a reduction of the labor input.

Understanding whether the different patterns observed for mothers in the aftermath of the pandemic and the amplification of gender differences in households with higher starting inequality levels will last also in the long run is an important avenue for future research. Investigating the channels behind these phenomena would be useful to design interventions aimed at mitigating the negative effects of the pandemic and promote the achieving of gender equality.

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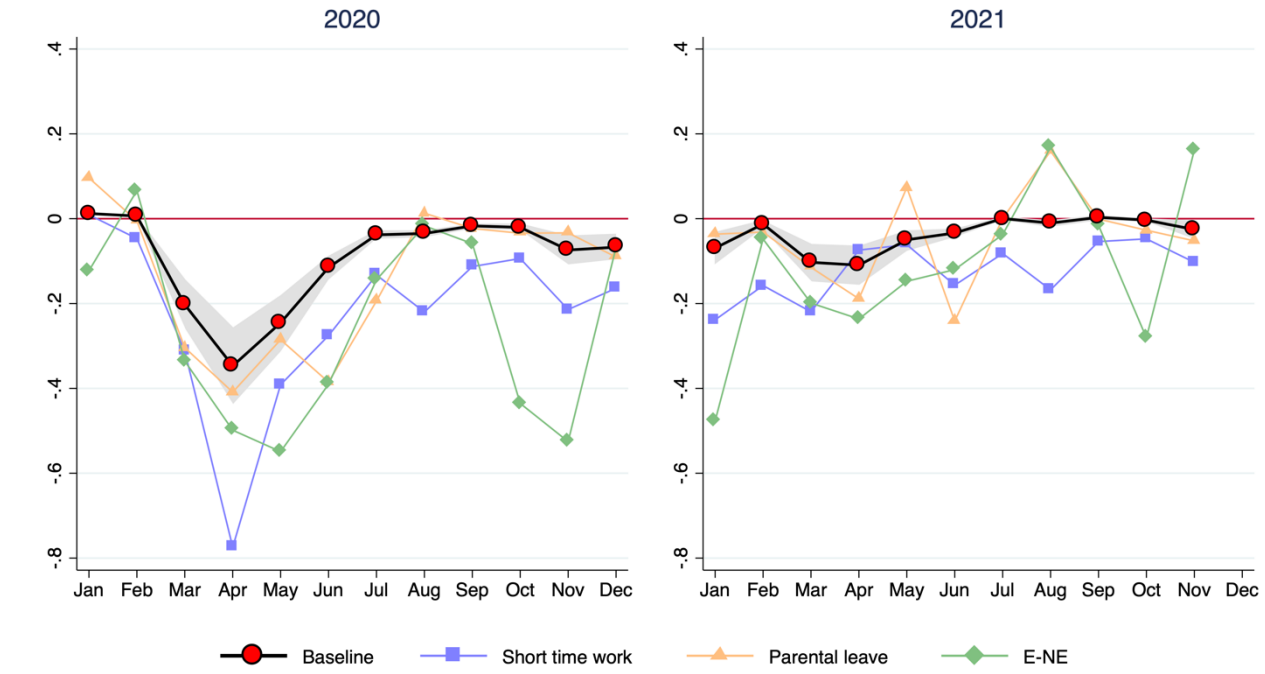
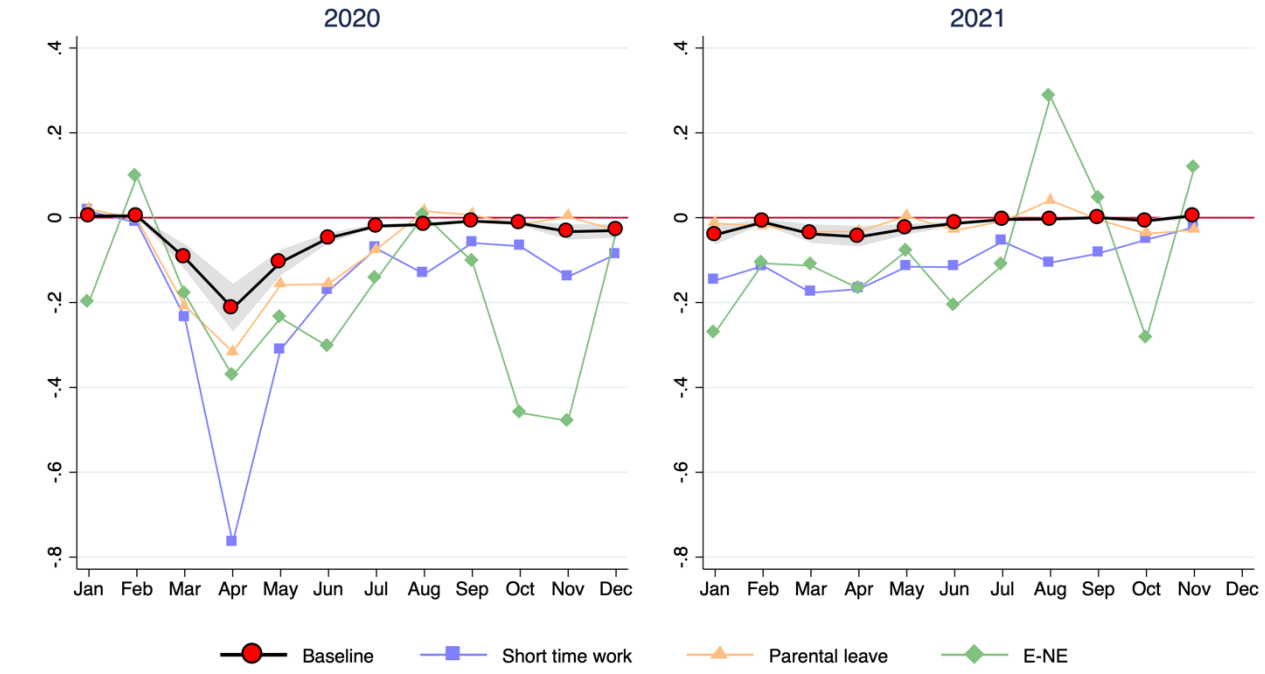
Appendix – Additional Figures



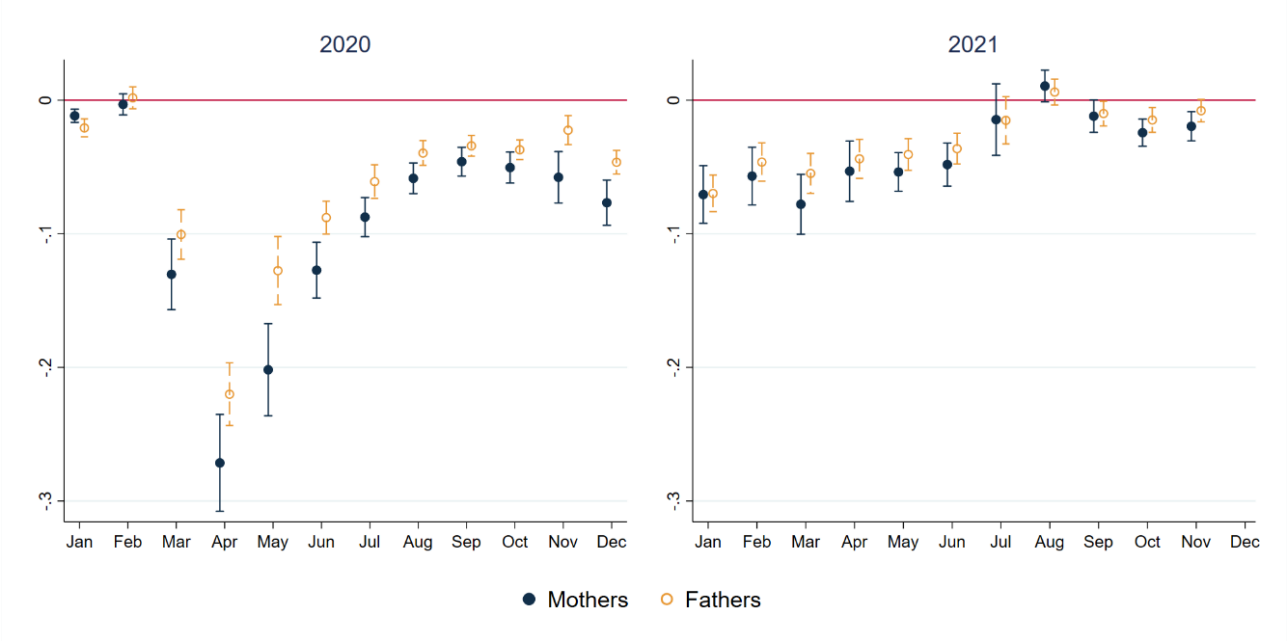
(a) Mothers



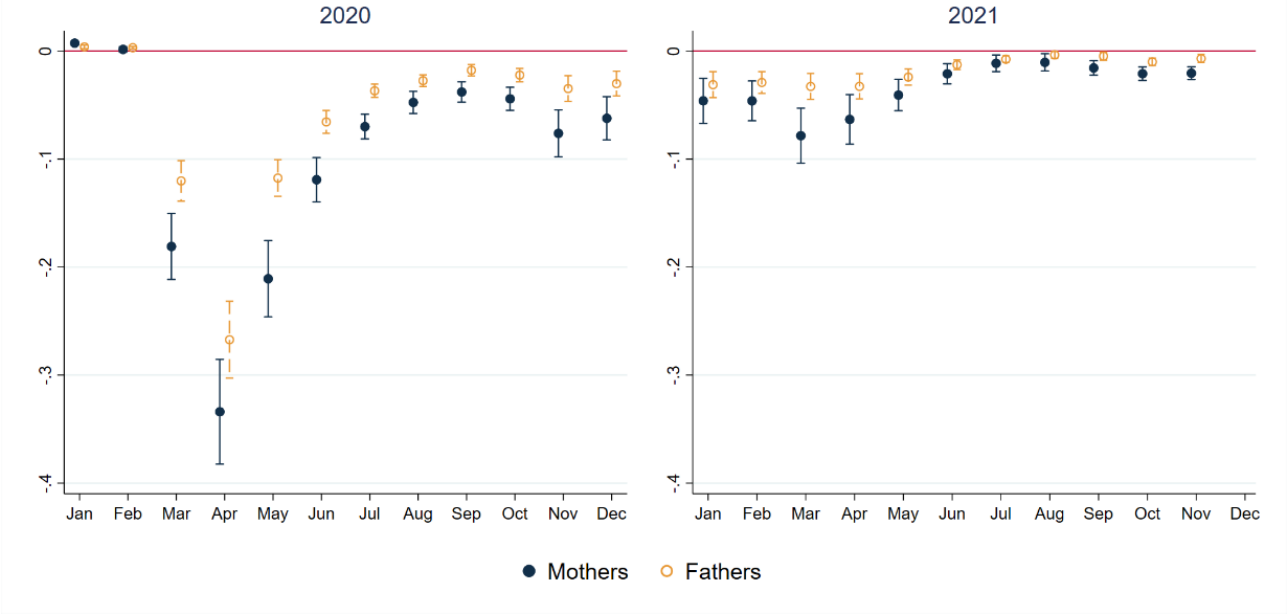
(b) Fathers

Figure A1. Decomposition of the reduction in days worked

Notes. The figure reports the marginal effects from an augmented equation (1) in which year dummies are interacted with dummies for being on short-time work, taking parental leave or moving to non-employment, for mothers. "Baseline" reports the coefficients on the year dummies, representing the baseline change in days worked in 2020 or 2021 relative to 2019 for a worker that does not: work short-time hours, take parental leave, move to non-employment. "Short-time work", "Parental leave", "E-NE" are the sum of the baseline effect plus the one for workers reducing their labor supply because of one of these reasons.



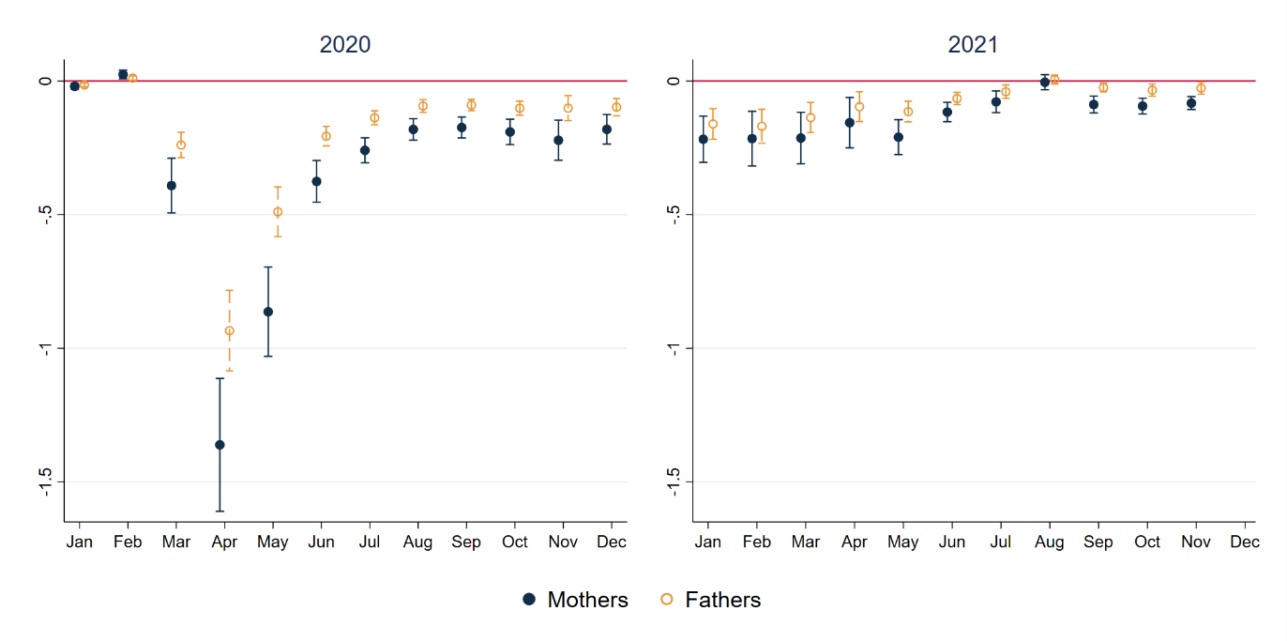
(a) Monthly earnings



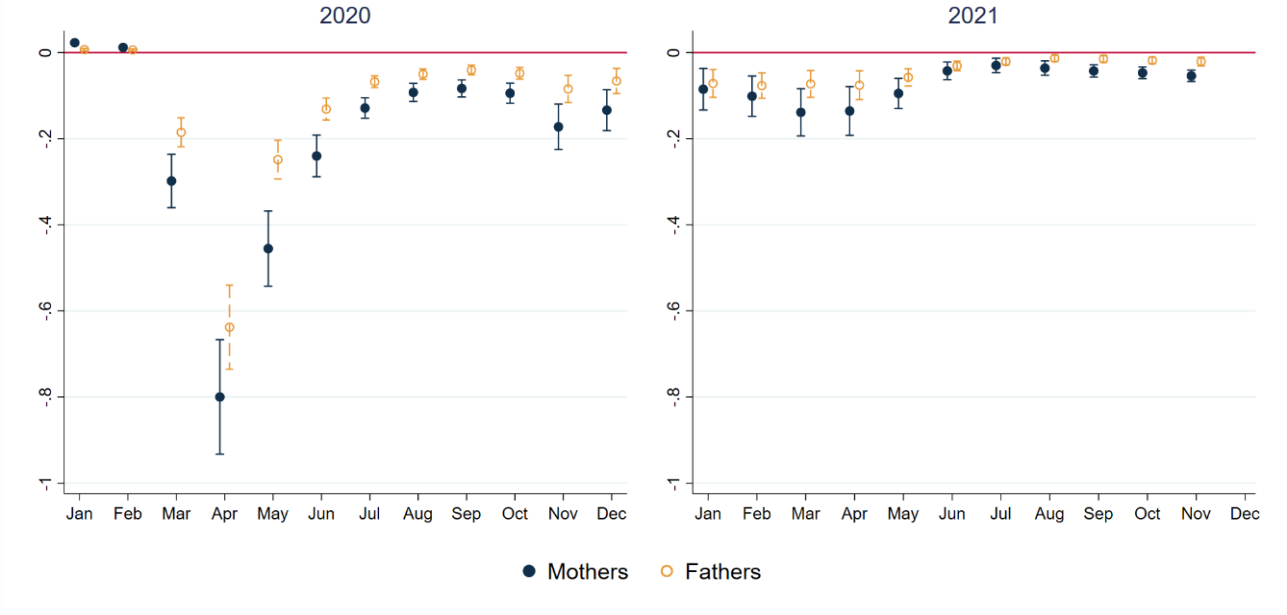
(b) Monthly days worked

Figure A2. Dynamic estimates of the impact of the pandemic on labor market outcomes of mothers and fathers, sample including non-employment spells

Notes. Each panel reports the estimated coefficient β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers. The sample includes year-month observations when a worker is not employed, imputing a value of zero in the outcome variable. The coefficients are rescaled by the average predicted outcome excluding the contribution of year dummies for 2020 and 2021. Control variables include: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes and region dummies.



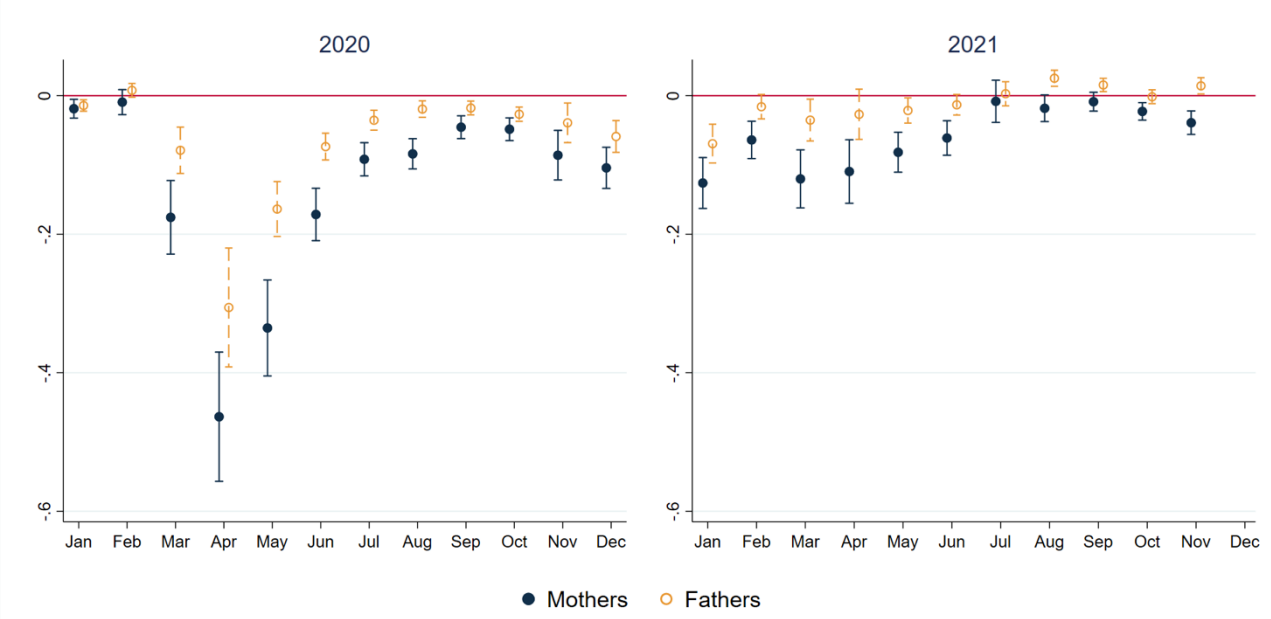
(a) Log one plus monthly total earnings



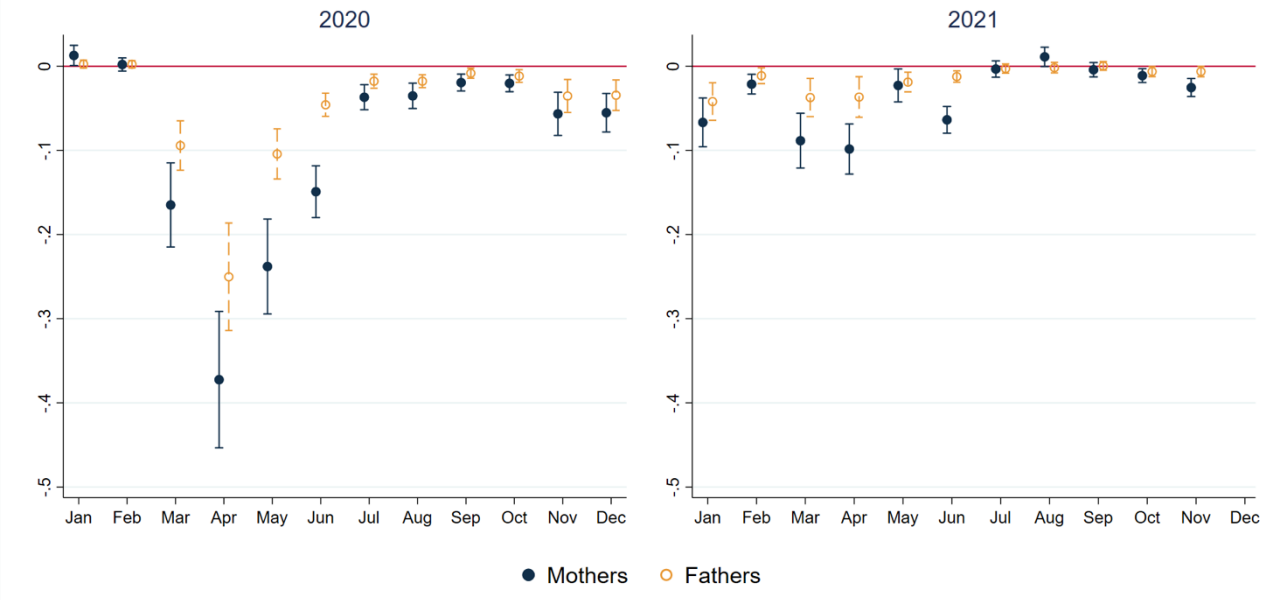
(b) Log one plus monthly total days worked

Figure A3. Dynamic estimates of the impact of the pandemic on labor market outcomes of mothers and fathers, sample including non-employment spells

Notes. Each panel reports the estimated coefficient β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers. The sample includes year-month observations when a worker is not employed, imputing a value of zero in the outcome variable. The dependent variables are the log of one plus the outcomes. Control variables include: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave, dummy for workers in short-time work compensation schemes (except in panel c) and region dummies.

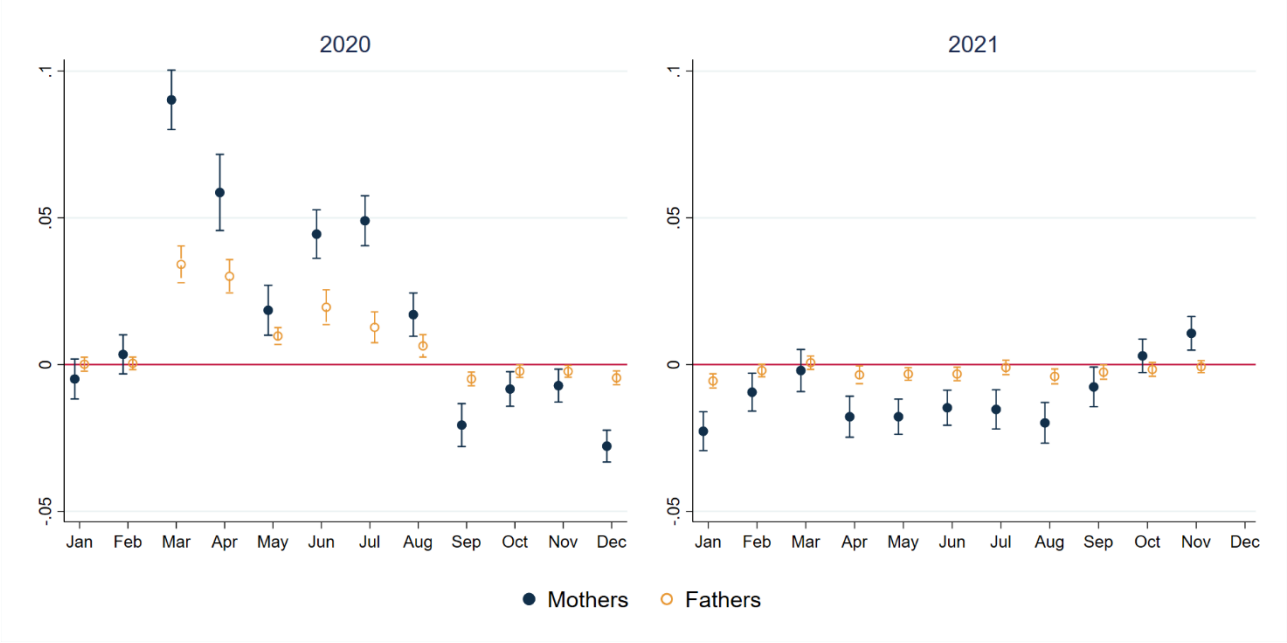


(a) Log monthly earnings

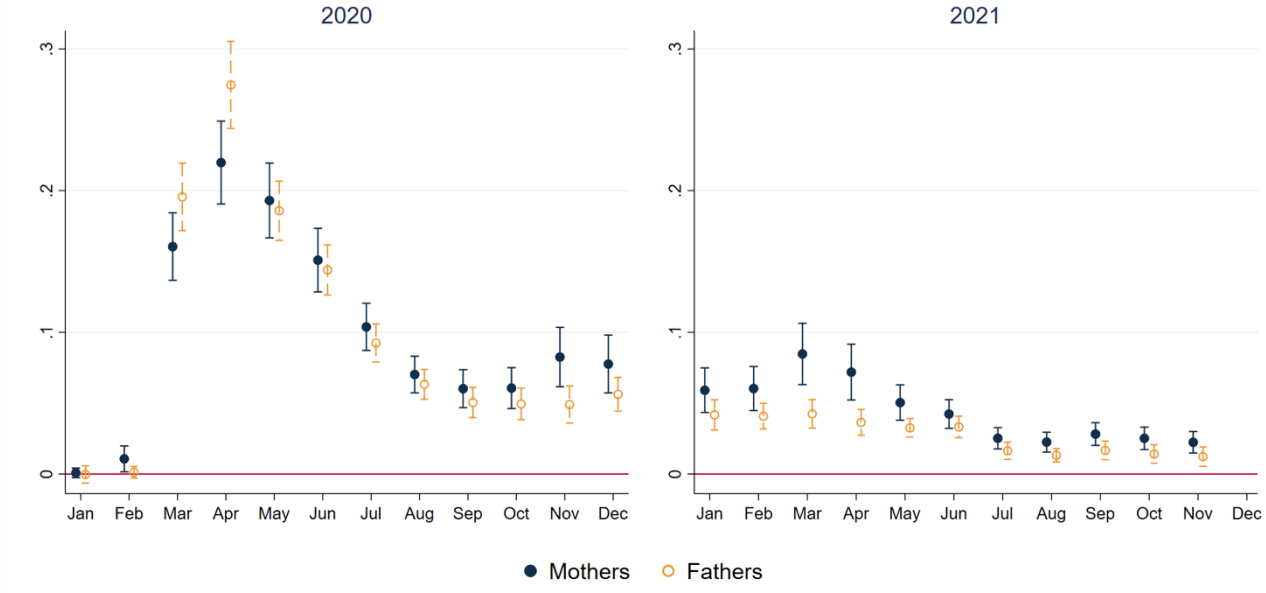


(b) Log monthly days worked

Figure A4. Dynamic estimates of the impact of the pandemic on labor market outcomes of mothers and fathers, household matched data

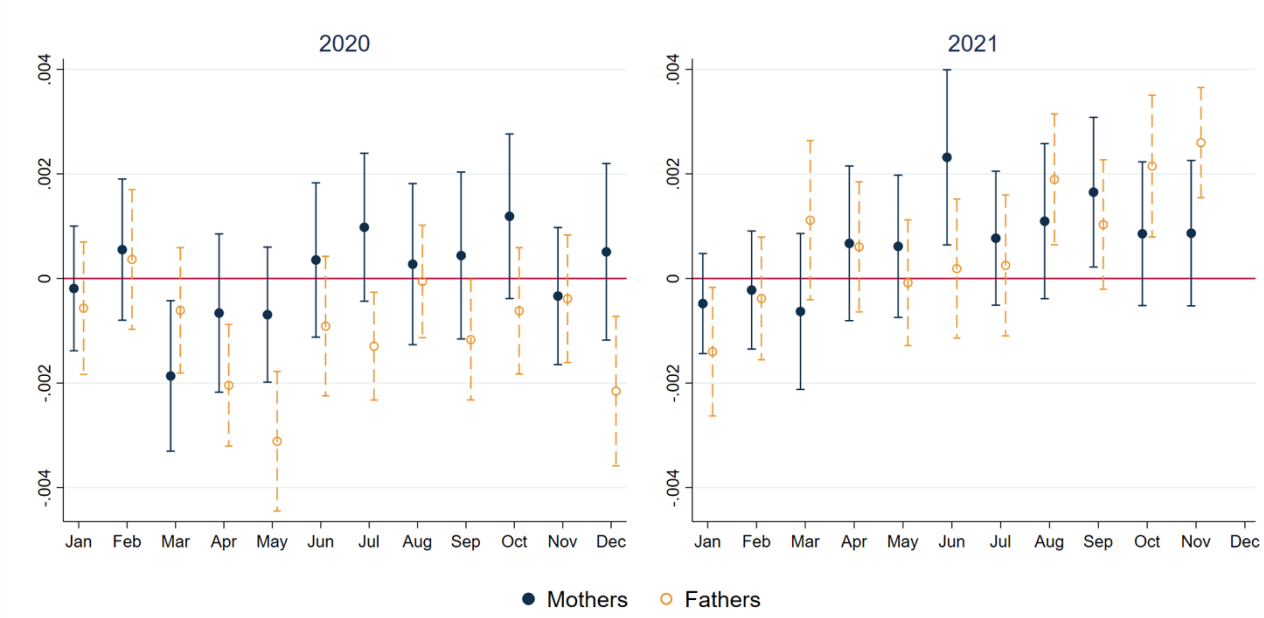


(c) Parental leave



(d) Short-time work

Figure A4 (continued)



(e) Quit rate

Figure A4 (continued)

Notes. Each panel reports the estimated coefficient β_0^m and β_1^m (the difference in each outcome for workers in 2020 and 2021 relative to 2019 in each month) from equation (1) for mothers and fathers in the sample with household information. Control variables include: labor market experience, age, dummy for white-collar workers, the number of children, dummies for workers taking the parental leave and COVID-19 leave (except panel c), dummy for workers in short-time work compensation schemes (except in panel d) and region dummies.