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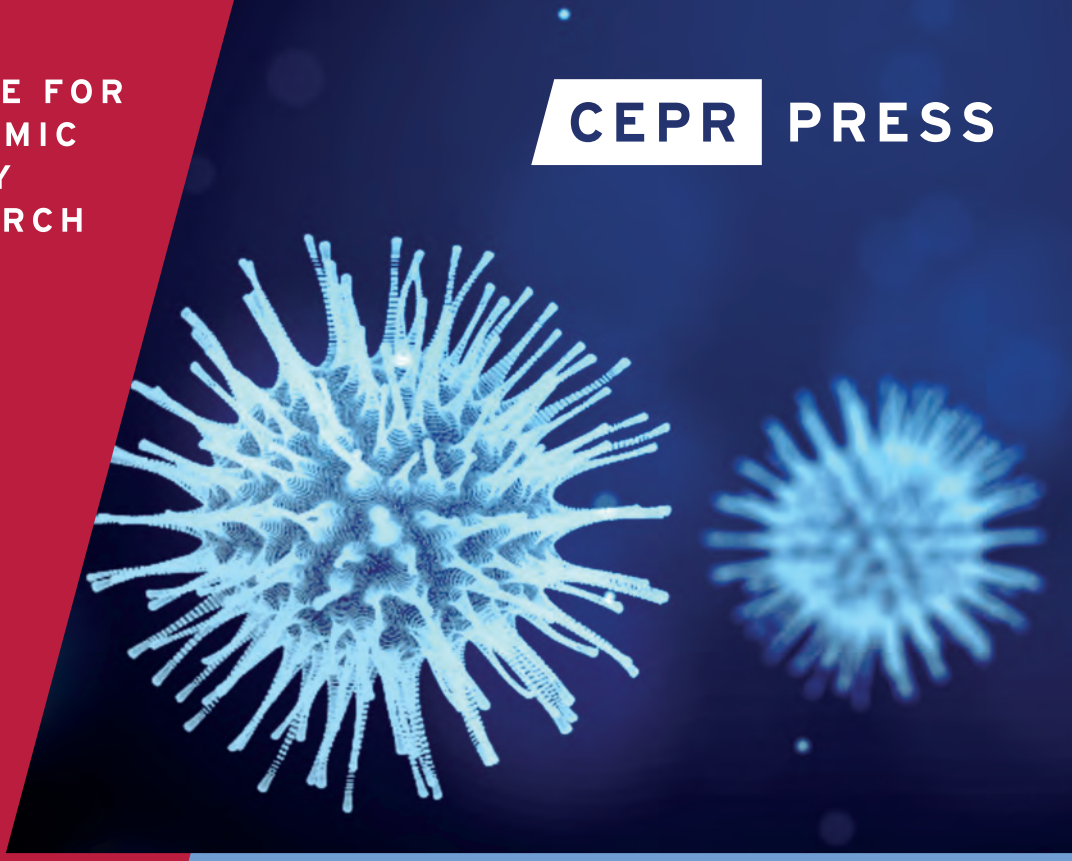

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The heterogeneous effects of COVID-19 on labor market flows: Evidence from administrative data[1]

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We investigate the short term labor market response to the pandemic in Italy and provide a first evaluation of the policies put in place to shield workers from the disruption of economic activity. Using administrative data on a sample of contracts active in the first quarter of 2020, we show that, before the pandemic, workers employed in non-essential activities were in majority men, younger than 35 years old, located in the North of the country and with lower levels of education. When looking at the change in hirings and separations and decomposing it by age, gender, region, type of contract (open-ended or temporary), education level, and sector (essential vs non-essential activities), we find that from the nineth week of the year, there was a pronounced drop in hirings and terminations. On the contrary, firings and quits spiked right after the nineth week, and then dropped significantly, reflecting the effects of the firing freeze and the easing of access to STW compensation schemes. We further explore separations by examining which factors predict the probability of job loss. We find that those workers that were already suffering the consequences of the previous recession (young, temporary, low-skill workers) are those at higher risk of losing their job because of COVID-19. Gender, instead, is a non-significant predictor of job loss in the aggregate.

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1 Introduction

The COVID-19 pandemic is having dramatic consequences on society. In order to contain the spread of the virus, many governments around the world adopted unprecedented interventions that in most cases resulted in lockdowns of entire regions or countries. The suspension of economic activities had severe repercussions on employment and earnings of individuals and on profits of firms. As a consequence, global GDP growth is projected at −4.9 percent (IMF, 2020), with considerable heterogeneity between advanced (−8 percent) and emerging economies (−3 percent). Governments responded to the economic downturn with encompassing packages of fiscal measures, ranging from transfers, loans, postponements of tax dues, to facilitating liquidity and access to credit for firms. Preventing or reducing the disruption of the labor market was among the main goals of government intervention, and the specific instruments adopted varied across countries, also in light of pre-existing labor market institutions. The implemented policy measures and pre-existing labor market conditions and institutions mediate the impact of the pandemic on jobs. For example, Adams-Prassl et al. (2020) compare the United Kingdom, the United States and Germany and show that the job losses were higher in the first two countries, which are characterized by more flexible labor markets.

In this paper, we investigate the labor market response to the pandemic in Italy and provide a first evaluation of the policies put in place to shield workers from the disruption of economic activity associated with the pandemic. Italy was the first country in Europe to be hit by COVID-19 and the first to implement a national lockdown, which was then adopted in most European countries. The lockdown was shortly after followed by two further policy measures relevant for labor market dynamics: a firing freeze and an ease of the requirements to access short-time work (STW) compensation schemes. While the former is unique to Italy for its breadth, the latter is common to most European countries (see OECD, 2020, for details on government policy responses across OECD countries).

Using administrative data on a sample of contracts active in the first quarter of 2020, we look at the ex-ante characteristics of the labor market before the start of the pandemic and at its ex-post short-run impact on the labor market, analyzing how government policies mediated the effects of the spread of the virus. First, we provide descriptive evidence on the personal and job characteristics of workers employed in essential and non-essential activities, as of January 2020. In the wake of the pandemic, the government decided to shut down entire sectors, which were deemed as non-essential. They were mainly concentrated in services, such as restaurants, bars, hotels, and some categories of wholesale and retail shops, in line with government decisions in other countries. We show that workers employed in non-essential

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activities were in majority men, younger than 35 years old, located in the North of the country and with lower levels of education. Second, we analyze the change in hirings and separations – distinguishing between firings, terminations and quits – in each week of the first quarter of 2020 relative to the average of 2017-19. For each labor market flow, we provide graphical evidence of the weekly change and its decomposition into subgroups based on age, gender, region, type of contract (open-ended or temporary), education level, and sector (essential vs non-essential activities). The descriptive evidence shows that, before the pandemic, hirings were slightly above their average in the previous three years, similarly to terminations and quits, whereas firings were in line with their levels in the past. When COVID-19 spread quickly around the country, starting from the nineth week of the year, there was a pronounced drop in hirings and terminations. On the contrary, firings and quits spiked right after the nineth week, and then dropped significantly. The evolution of firings reflects the policy introduced on 17 March, that explicitly forbids firms from firing workers and, at the same time, eases the requirements to have access to STW compensation schemes. Absent the policy, firings were rising with respect to the past. Moreover, the firing freeze may also have contributed to the decreasing dynamics of hirings, as the higher employment protection for workers may have decreased turnover. Third, we further explore separations by examining which factors predict the probability of job loss. We find that a younger age, being on a temporary or part-time contract, working in the Centre or the South relative to the North, having less than upper secondary education are all significant predictors of the separation probability: in other words, those workers that were already suffering the consequences of the previous recession (young, temporary, low-skill workers) are those at higher risk of losing their job because of COVID-19. In this light, the firing freeze guaranteed protection to the most vulnerable groups in the labor market. We also explore the difference in the job loss probability between essential and non-essential activities: we find that the same job and personal characteristics of workers are associated with the separation margin, but in non-essential activities coefficients are generally larger in magnitude. Finally, we explore differences by gender, which in our data is a non-significant predictor of job loss, contrarily to the evidence shown for example in Adams-Prassl et al. (2020). Given the higher concentration of women in temporary contracts and part-time positions, coupled with the nation-wide school closures, one could expect a harsher impact of the crisis on women, as highlighted by Alon et al. (2020). We do not find a higher separation probability for women relative to men in the aggregate, but we do find a significantly higher separation margin for female workers with upper secondary education and female domestic workers (while the opposite holds true for female farming workers). The null effect of gender in the aggregate may be due to different factors. First, we are focusing on the short-term effect of the

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pandemic recession, but differences by gender might take more time to materialize. Second, the policies put in place by the government have been effective in protecting more vulnerable categories and contracts, among which women are more represented. Third, differently from the evidence provided by Blundell et al. (2020) for the UK, we find that female presence in non-essential activities is lower relative to men, hence women's jobs may have had better chances to survive because less likely to be in shut-down sectors. Finally, if women are employed in jobs whose tasks can be more easily performed from home, their employment is relatively more protected. While we can only discuss the extensive margin of adjustment – whether a worker separates from her job or not – clearly, the adjustment may happen also on the intensive margin, if women had to adjust their work hours in response to the pandemic. This is an important element we cannot directly address with the data at hand.

Our analysis contributes to the recent and growing literature on the effects of the pandemic recession on economic activity (e.g. Carvalho et al., 2020; Chetty et al., 2020; Baker et al., 2020) and, specifically, on the labor market and the policy responses put in place by governments. Evidence using real-time survey data (Bick and Blandin, 2020; Adams-Prassl et al., 2020; von Gaudecker et al., 2020), administrative data (Cajner et al., 2020) and a combination of both (Forsythe et al., 2020) highlights the severe and unequal consequences of the pandemic recession on the labor market. A strand of this literature specifically focuses on how different categories of workers were affected by the pandemic (Blundell et al., 2020; Crossley et al., 2020), with particular focus on age (Belot et al., 2020) and gender (Alon et al., 2020; Hupkau and Petrongolo, 2020; Farré et al., 2020). We provide new evidence based on detailed administrative data on a sample of active, new and terminated contracts, coming from the *Comunicazioni Obbligatorie*, i.e. the compulsory information firms need to provide on their workforce. These data are highly reliable and less subject to measurement errors with respect to survey data. We can explore many dimensions of heterogeneity and provide an exhaustive picture of the unequal impact of COVID-19. We also assess the short run impact of a government policy that explicitly forbids dismissals and extends the generosity of STW compensation schemes. We show they were successful in taming firings – as expected –, but may also have reduced hirings. This lays the groundwork for a medium term assessment of their impact on labor market dynamics. Finally, by showing how workers on different types of contracts and different degrees of employment protection are affected by the pandemic recession, we contribute to the literature that analyzes the margins of adjustment in the labor market in the presence of negative shocks (Izquierdo et al., 2017; Garin and Silvério, 2019; Adamopoulou et al., 2020).

The remainder of the paper is organized as follows. Section 2 describes the data and gives details about the evolution of the pandemic in Italy and the policy response by the

government. Section 3 shows the distribution of workers in essential and non-essential activities before the pandemic. Section 4 analyzes the changes in hirings and separations between 2020 and previous years, whereas section 5 focuses on a formal analysis of the determinants of the job loss probability. Finally, section 6 concludes.

2 Data and Institutional Context

2.1 Data and Descriptive Statistics

We use data from a random sample of mandatory notifications (*Campione Integrato delle Comunicazioni Obbligatorie*, CICO) that firms submit to relevant public agencies in Italy and to the Ministry of Labor and Social Policy. The data collects information on a sample of contracts activated and terminated between 2009 and the first quarter of 2020 for public- and private-sector workers, farming and domestic workers.[1] For each contract we have information on the exact start date and, if the contract is terminated, on the end date and the reason for its termination (mainly, firings, termination of temporary contracts, voluntary quits).[2] Furthermore, we have information on the type of contract (open-ended or temporary, full-time or part-time), detailed occupational and sectoral codes (6-digit Isco and Ateco 2007, respectively) and individual characteristics of workers, such as gender, the year of birth, the region of domicile and work, and the education level. Table 1 reports descriptive statistics on the contracts – and on the individual characteristics of the workers holding them – and compares them with the population of workers from the national statistical institute (Istat). Our data over-samples contracts held by female workers, workers in the age group 15-34, workers with high-school diploma and under-samples contracts of workers on open-ended and full-time positions. The bottom part of the table, column (1), reports the sample size of CICO, distinguishing total contracts, total workers (as workers can hold multiple contracts), employment contracts and employees (i.e. the subset of workers holding employment contracts, therefore excluding domestic and farming workers and collaboration contracts) by the end of the sample period.[3] Column (2) reports the number of workers/employees from Istat.

[1]The sampling strategy is based on the day of birth: workers born on the 1st, 9th, 10th and 11th day of each month and year in the full administrative records are included in the sample. CICO contains information on contracts that have been activated, transformed or ended starting from 2009. Hence, the data contains information on new contracts from 2009 and on contracts that have been established before 2009 but that were either terminated or transformed in subsequent years. Therefore, the data do not contain information on contracts that have been stipulated before 2009 and that have not been modified since then.

[2]We exclude from the sample terminations due to retirement, death or modification of the end date of the contract, as there is no further information on whether the end date is anticipated or postponed.

[3]Throughout the rest of the paper the unit of observation will be the single contract. Hence, it might be that workers holding multiple contracts appear more than once in our data. This choice does not affect the

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Table 1: Descriptive statistics

	(1) CICO	(2) Istat
Female	0.46	0.42
Age 15-34	0.31	0.22
Age 35-54	0.53	0.56
Age 55+	0.16	0.22
North	0.53	0.52
Centre	0.22	0.21
South	0.25	0.26
High-school diploma	0.84	0.76
University degree	0.16	0.24
Open-ended contract	0.62	0.83
Full-time contract	0.62	0.79
Industry	0.23	0.26
Total contracts	2,314,429	-
Total workers	1,951,450	23,383,281
Total employment contracts	1,352,872	-
Total employees	1,164,297	18,096,880

Notes. The table reports the share of contracts in each group from the sample of *Comunicazioni Obbligatorie* (CICO) and the share of workers from official statistics provided by the National Statistical Institute (Istat). The last four rows of the table report the total number of contracts and workers and the total number of employment contracts and employees (as a worker/employee may have multiple contracts) present in CICO and the total number of workers and employees in Istat.

Overall, our sample represents approximately 8.3% of the population of workers in Italy and 6.4% of employees. The fact that younger and female workers are over-represented, whereas more stable contractual arrangements – such as, open-ended and full-time contracts – are under-represented comes as no surprise given the sample selection described above. The data over-samples contracts stipulated in the last decade, which capture the first contract of new workers, who are therefore more likely to be young and on temporary/part-time positions. Women may be over-represented in light of the progression in female labor force participation in recent years. However, although not representative of the population of workers at a given point in time, the data allows us to compare flows between different years (e.g. the change in hirings or separations over time) and also compare the distribution of workers in the subgroups of essential and non-essential activities, as one can believe the sampling bias

composition of our sample: if we use only one observation per worker and replicate Table 1 we get almost identical sample shares.

would not be different in the two subgroups.

2.2 COVID-19 in Italy and Public Policy

The first cases of COVID-19 in Italy date back to 31 January 2020, but the disease began to spread exponentially in the second half of February. At the beginning, the virus spread predominantly in Northern regions and the first COVID-related death was registered in Lombardy on 21 February. Following the diffusion of the virus in the North, two "red zones" were implemented, involving 11 municipalities in Lombardy and Veneto. At the same time, many Northern regions opted to close schools, a measure that extended to the whole nation on 4 March. On 10 March the whole country went into lockdown. The decree establishing the nationwide 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. In light of these closures the government adopted on 17 March a Decree Law that considerably increased worker's employment protection. Two main labor market policies were adopted:

(1) A special COVID-related STW compensation scheme of the duration of 9 weeks, that could apply retroactively starting from 23 February. This measure aimed at preserving employment relationships and allowing firms to cut labor costs during the lockdown period, by reducing hours of work thanks to a wage subsidy granted by the government. The measure extended the regular STW by allowing firms with less than 15 employees and firms that were already using the extra-ordinary STW (one of the sub-species of STW granted by the Italian employment protection legislation) to use it. Moreover, firms using the COVID-related STW could renew temporary contracts, waiving to the norms of the standard regulation.

(2) A firing freeze that halted firings for 60 days from 17 March and that could be applied retroactively to pending firings (i.e. those that were yet to be validated) from 23 February.

In the rest of the paper we will highlight how our results may be affected by the implementation of such policies.

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3 Before the Pandemic: the Distribution of Workers in Essential and Non-Essential Activities

Using data from CICO up to January 2020, we show the distribution of workers in essential and non-essential activities (i.e. between open and shutdown sectors) at the onset of the pandemic. Figure 1, panels (a)-(d), shows the distribution of workers by gender, age, region of work and education level. Panel (a) shows that women are over-represented in essential activities (67.1%) relative to men (57.8%): this result is in contrast with the evidence provided, for example, by Blundell et al. (2020) for the UK, where more women than men were employed in shutdown sectors before the pandemic. This may be explained by low female labor force participation and by the strong positive selection of women in the Italian labor market.[4]

Panel (b) shows the distribution by age, distinguishing workers in age groups 15-34, 35-54 and 55 or older. The figure shows that, while young workers are almost equally distributed between essential and non-essential activities, middle-aged and older workers are more present in essential activities. Hence, the closure of non-essential sectors has a stronger impact on young workers, 48.2% of whom are employed in shutdown sectors.

Panel (c) reports the distribution by region of work. Differences between the North, the Centre and the South are small and, if anything, more workers are employed in shutdown sectors in the North, relative to the rest of the country. This may seem counter-intuitive, considering that tourism and connected services are some of the strengths of Southern Italy. This distribution may also be correlated with the presence of the informal economy, which is higher in the South, as documented, for example, in Boeri et al. (2019), and particularly relevant for workers in accommodation, tourism and restaurants—sectors belonging to non-essential activities.

Panel (d) shows the distribution by education level. While 41.6% and 41.7% of workers with lower and upper secondary education are in shutdown sectors, only 18.5% of individuals with university degree work in non-essential activities, suggesting a disproportionate impact of the pandemic on workers with lower levels of education.

This analysis takes a snapshot of the Italian labor market at the onset of the pandemic. We now turn to the inspection of the impact of the crisis on hirings and separations in the first quarter of 2020.

[4]This result is not driven by the fact that our data over-samples women relative to the population. Aggregate data from the National Statistical Institute (Istat, 2020), based on the labor force survey, confirm that women are over-represented in essential activities (72.8%). If anything, our sample share is a lower bound to the population share.

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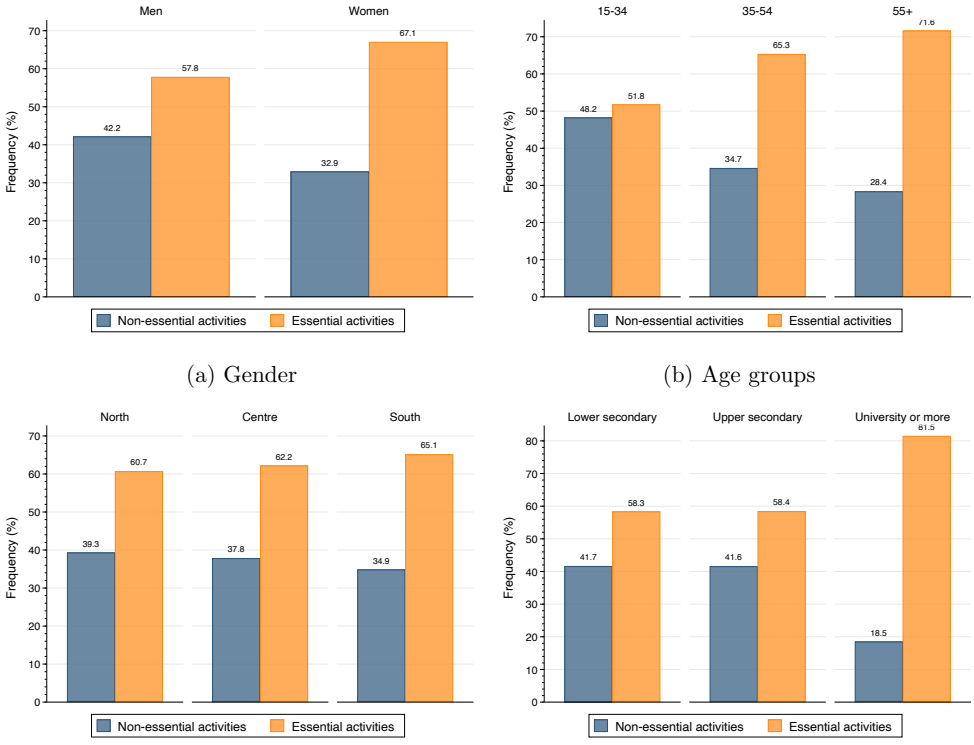

(a) Gender (b) Age groups

(c) Region (d) Education level

Figure 1: Distribution of workers in essential and non-essential activities as of January 2020

4 After the Pandemic: the Short-Run Impact of the Recession on Hirings and Separations

In this section, we analyze the dynamics of hirings (H) and separations – distinguished in firings (F), terminations (T) and quits (Q) – in the first quarter of 2020. Specifically, we compare the weekly change in hirings and separations between 2020 and the average of 2017-19, decomposing such change into the contribution of various subgroups based on the following categories G: age, gender, region of work, type of contract (permanent or temporary), education level and sector (essential or non-essential). In other words, for each week t we compute the percent change in $Y_t = \{H_t, F_t, T_t, Q_t\}$ as:

$$\triangle Y_t = \frac{Y_{t,2020} - \overline{Y}_{t,2017-19}}{\overline{Y}_{t,2017-19}}.$$

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We present the weekly change $\triangle Y_t$ graphically, together with its decomposition into subgroups $g \in G$, $\triangle Y_t^g$:

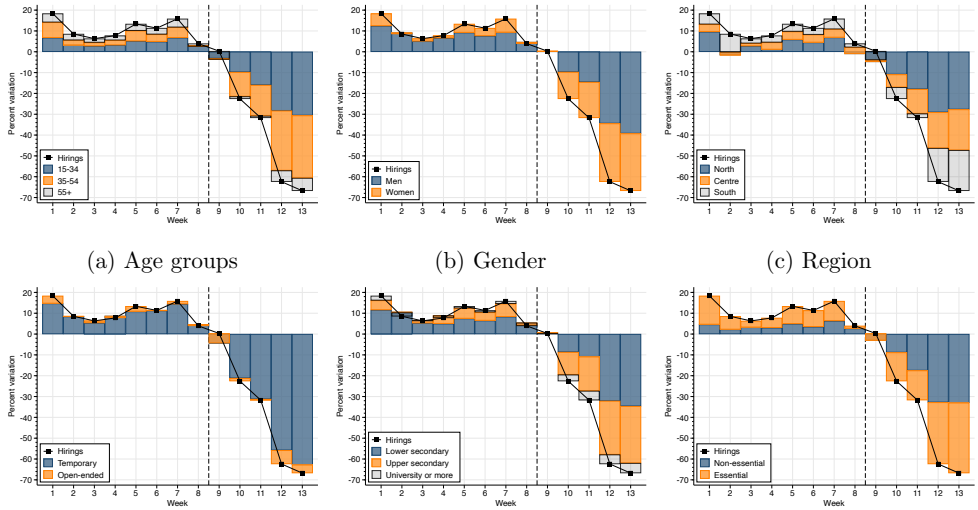
$$\triangle Y_t = \sum_{g \in G} \triangle Y_t^g = \frac{\sum_{g \in G} Y^g_{t,2020} - \overline{Y}^g_{t,2017-19}}{\overline{Y}_{t,2017-19}}.$$

Hirings Figure 2, panels (a)-(f), shows the weekly change in hirings in 2020 relative to 2017-19. In each graph, the black line is the total change. The figures show that 2020 had more hirings than previous years in the first 8 weeks (that is, until the week ending on 25 February[5]). On average, in the first 8 weeks of 2020, weekly hirings have been 10.6% higher than previous years. Starting from week 9, though, weekly hirings experience a sharp drop, which becomes even worse from the 12th week of the year. The first drop in hirings is attributable to the nationwide lockdown and the closure of activities which effectively froze the labor market. The second drop in hirings happens after the decision to freeze layoffs. Although it is impossible to separately measure the impact of the lockdown and that of the firing freeze, the evidence is in line with the latter policy having a negative effect on hirings.[6]

Panel (a) decomposes the total weekly change in hirings into the contribution of the age groups 15-34, 35-54 and above 55. It is clear that most of the decrease in hirings comes from a decline in new hires of younger and middle-aged workers. For example, in week 13 the total weekly change in hirings amounts to -67%, -31% due to the drop in hirings of workers of age 15-34, -30% due to the drop for workers in the age group 35-54 and only -6% attributable to older workers. When looking at differences by gender, in panel (b), we do not see significant differences between men and women and, if anything, the drop in hirings was slightly more pronounced for male workers: on average, the drop in weekly hirings after week 8 amounts to -37%, -20% for men and -17% for women. Panel (c) shows the decomposition based on the region of work. In weeks 9 and 10, the reduction in hirings was stronger in the North, as it went into partial lockdown before the rest of the country. Starting from week 12, when the lockdown extended to the whole country, the contribution of the South to the drop in hirings increased substantially. On average, however, half of the drop in hirings is concentrated in the North (-18%). Remarkably, the drop in hirings is almost entirely concentrated among temporary contracts (panel d) and workers with low levels of education (panel e): workers on open-ended contracts and with a university degree contribute only for -1.6% and -3.3%, respectively, to the weekly change of -37% on average for weeks 9-13. Finally, panel (f) shows that workers employed in non-essential activities contributed slightly

[5]The first COVID-related death was notified in that week, on 21 February.

[6]See, e.g., Kugler and Pica (2008) for evidence on the impact of increased employment protection legislation on worker flows.



(a) Age groups (b) Gender (c) Region

(d) Type of contract (e) Education level (f) Sectors

Figure 2: Weekly change in hirings between first quarter of 2020 relative to average 2017-2019

more to the drop in hirings (−19%) relative to essential activities (−18%).

Firings Figure 3 reports the weekly change in firings and its decomposition into different subgroups. Until the beginning of the pandemic recession, weekly firings were in line with those registered in the past (on average −1.8% in the first 8 weeks). After the onset of the pandemic, we observe a sharp increase in firings, which was particularly evident in weeks 10 and 11, when firings were 70% and 33% higher than their level in previous years, respectively. In week 12, the firing freeze together with special STW compensation scheme came into force and we observe a sharp drop in firings, as expected. Overall, this evidence suggests that, absent the policy, firms would have resorted to firings to cut labor costs, although it is difficult to separate the impact of the firing freeze from that of STW. It is unclear, however, whether the firings we observe in the data in weeks 10 and 11 have been validated or not: in fact, the firing freeze, although introduced on 17 March, had retroactive effect until 23 February. Hence, in principle, those workers could have been reinstated. This does not change the main conclusion that we draw from this analysis, i.e. that the firing freeze effectively stopped firms from laying off workers, that traditional instruments (e.g. the regular STW scheme) would have not protected.

Which categories of workers were being fired and which benefited the most from the firing freeze? Decomposition results are similar to those outlined for hirings. Panel (a) shows that

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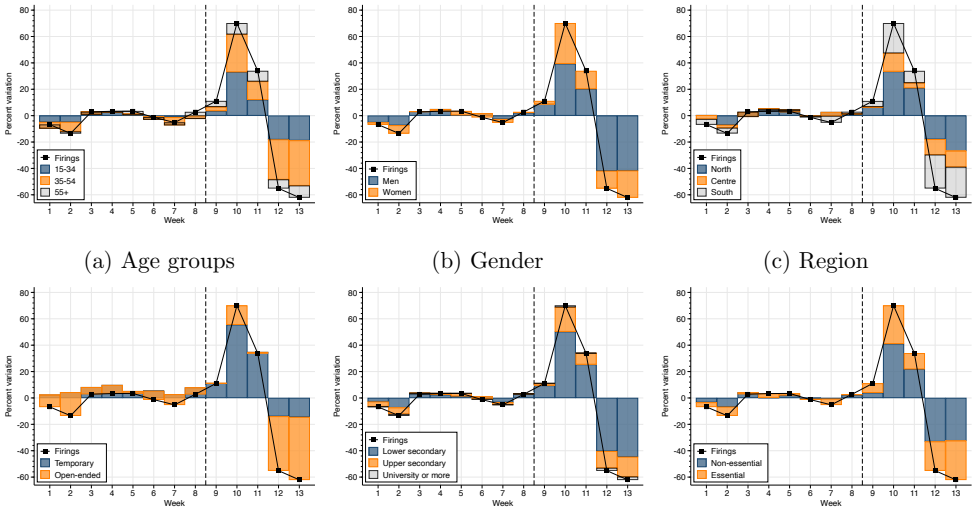

(a) Age groups (b) Gender (c) Region

(d) Type of contract (e) Education level (f) Sectors

Figure 3: Weekly change in firings between first quarter of 2020 relative to average 2017-2019

workers being fired in weeks 10 and 11 are mainly young and middle aged workers, which were also the most protected categories in weeks 12-13. Panel (b) displays differences by gender. The rise in firings hit men more: the average rise in firings of 52% was due to a rise of male firings of 30% and of female hirings of 22%. After the freeze, men benefited more from the protection of the policy and the reduction in their firings constitute most of the decline in weeks 12 and 13 (-42% over an average total change of -59%). When we look at geographical differences, we find that the initial rise in firings was concentrated in the North (half of the total change), but a significant portion of firings happened in the South, too, though the consequences of the pandemic hit it at least two weeks later than the North. This may be due to anticipation effects, disruptions of supply chains and trade relationship with the North or lower travels to the South, which may have impacted the accommodation sector. Panel (d) shows that temporary contracts were bearing most of the burden of firings in weeks 10-11, but when the firing freeze takes effect workers on open-ended contracts benefited more. Panel (e) shows that workers with low levels of education were being fired and then shielded by the firing freeze. Finally, panel (f) suggests that the majority of the surge in firings is concentrated in shutdown non-essential activities (-31% versus -21% in essential activities on average in weeks 10 and 11). The reduction in firings was also higher in non-essential activities after the imposition of the firing freeze.

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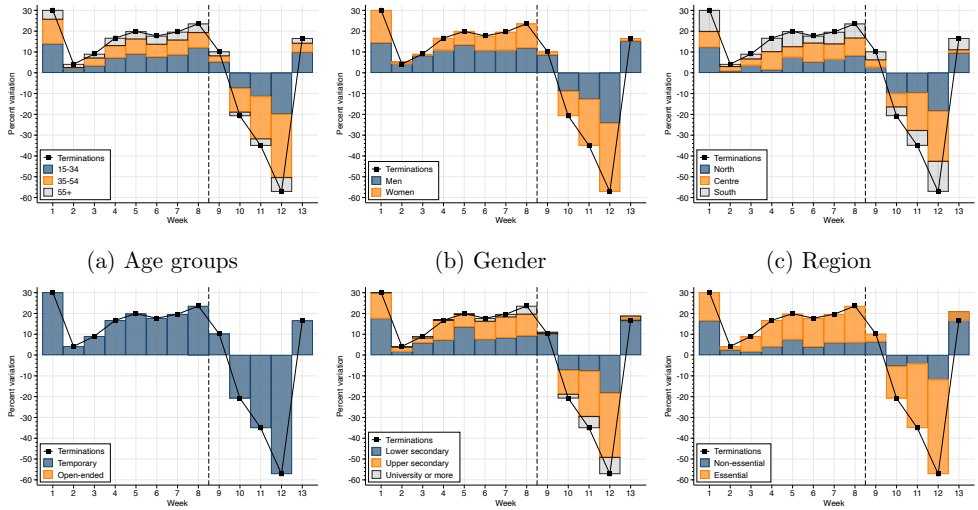

(a) Age groups (b) Gender (c) Region

(d) Type of contract (e) Education level (f) Sectors

Figure 4: Weekly change in terminations between first quarter of 2020 relative to average 2017-2019

Terminations Figure 4 reports the evolution of terminations of temporary contracts. In the first 8 weeks of 2020, terminations have been 18% higher on average relative to the period 2017-19.[7] After the start of the pandemic, there was a drop, particularly evident in weeks 10-12, when weekly terminations were on average 38% lower than in previous years. The lockdown may have played a role in determining the drop in terminations, as a lower number of temporary contracts implies also a lower number of terminations. Moreover, some temporary contracts have been suspended, by delaying the termination date to when businesses re-opened.[8] We find that most of the reduction in terminations involves younger workers (panel a), women (panel b), workers in the North and Centre (panel c), workers with low education levels (panel e) and workers in non-shutdown essential sectors (panel f).[9]

[7]The fact that terminations were higher relative to the past in the first two months of the year may be related to the effects of the so-called Dignity Decree, introduced in the summer of 2018. The Decree attempted to limit the use of temporary contracts by firms, by decreasing the maximum length of contracts from 36 to 24 months and the maximum number of renewals from five to four, requiring employers to specify the causes for renewals after the first 12 months.

[8]It is also important to highlight that the special COVID-related STW compensation scheme allowed firms requesting it to roll-over existing temporary contracts and hire temporary workers, contrarily to regular STW which forbids it.

[9]Reassuringly for the quality of the data, panel (d) confirms that separations due to terminations involve temporary contracts only.

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Quits Figure 5 reports the evolution of quits. Voluntary quits were on average 15% higher in the first 8 weeks of 2020 than what registered in the period 2017-19. The first week of the pandemic recession – week 9 – sees a spike in quits, which reach a level about 40% higher than the same week in 2017-19. This spike in quits merits attention. On the one hand, the spike can be the consequence of school closures, which started during that week and became a nationwide decision the week after. With school closures, in the absence of alternative options, some workers may have decided to quit their jobs to take care of their children: in fact, panel (b), suggests that most of the increase in quits in week 9 is due to an increase in female quits, which before the pandemic were contributing only for one third of total quits whilst in that week they contributed for more than half. On the other hand, given the uncertainty determined by the pandemic, quits may have also been a way of anticipating retirement for older workers (or, again, a way for parents to help their sons and daughters with family duties, once schools closed): this is consistent with the evidence presented in panel (a) that shows how the majority of quits came from middle aged and old workers. Surprisingly, quits were also more present in the South in week 9 rather than the North (panel c), which was the first part of the country to be hit by the pandemic. Therefore, firms may have used quits as an alternative to firings, either by bargaining with the worker in order to reduce labor costs or by forcing workers to blank resignations.[10]

After week 9 we start to observe a downward trend in quits which become negative relative to the past in weeks 11-13, as with the other separation flows. In particular, quits have declined substantially for younger workers, males, for workers in the North of the country, with open-ended contracts, low education levels and working in non-essential activities (see panels a-f of Figure 5).

5 Job Loss Probability

We focus on the job loss probability, by analyzing what categories of workers are more likely to lose their job during the recession. To this end, we identify all contracts active between 24 February 2020 and 31 March 2020 (when our data ends) and all contracts that have ceased over the same period. We select a total of 2.3 million contracts. We then estimate the following cross-sectional linear probability model:

$$s_i = \alpha + \beta X_i + \delta_{s(i)} + \phi_{o(i)} + \epsilon_i, \tag{1}$$

[10]The latter possibility is however much more difficult to materialize, as the Jobs Act (Legislative Decree 151/2015) changed the procedure to communicate quits – which have to be done online through specific online forms provided by the Ministry of Labor – and explicitly forbid employers to make any changes to those forms.

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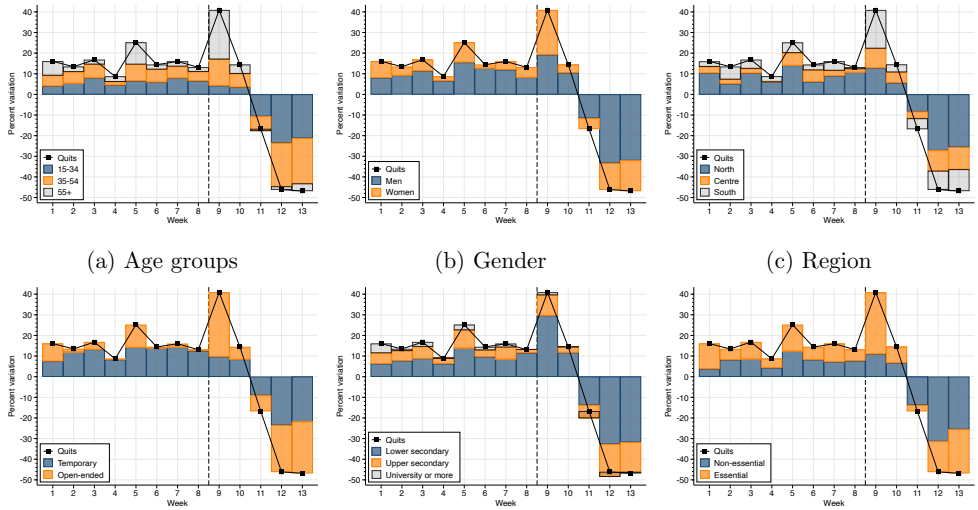

(a) Age groups (b) Gender (c) Region

(d) Type of contract (e) Education level (f) Sectors

Figure 5: Weekly change in quits between first quarter of 2020 relative to average 2017-2019

where s_i is a dummy equal to one if contract i ceases in the period under analysis (because of termination, firing or quit). α is a constant. X_i is a vector of observables that includes a dummy for female workers, the type of contract (temporary or open-ended), the geographical area of work (North, Centre or South), the level of education (lower secondary, upper secondary, university), age and the type of worker (employee, farmer, domestic worker or "not linked"[11]). Finally, $\delta_{s(i)}$ and $\phi_{o(i)}$ are sector and occupation fixed effects (both at a 6-digit level). We are interested in the vector of coefficients β, which measures the correlation between the vector of characteristics $\mathbf{X}$ and the separation probability.

Table 2 reports the results of the estimation of equation (1). Columns (1) and (2) use the whole sample of employees (linked with social security records and not linked), farming and domestic workers. Columns (3) and (4) restrict the sample to employees only. Columns (2) and (4) further restrict the sample excluding separations due to firings, since this was the separation margin most affected by the firing freeze policy. The estimates show that being on a temporary contract implies a higher separation probability of approximately 8 p.p. (ranging from 7.8 to 8.4 p.p depending on the sample restriction). Moreover, older workers are less likely to separate (being 10 years older implies a 0.4-0.7 p.p. lower separation probability). Working in the Centre or South implies a higher separation probability relative

[11]This category contains workers not linked with administrative social security records: mainly, workers on seasonal contracts or collaboration contracts.

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to the North, whereas higher levels of education shield against job loss relative to workers with lower secondary education. Moreover, if we focus on columns (1) and (2) only, employees, farmers and domestic workers are less likely to separate from their jobs relative to the residual category of workers on less stable contracts. Finally, gender is not a significant predictor of the job loss probability. Although the magnitude of coefficients changes according to the sample used, the results are consistent across samples.

Table 3 uses the full sample and reports results from the estimation of equation (1) separately for workers employed in essential activities (columns 1 and 2) and non-essential ones (columns 3 and 4) and again restricting the sample to exclude firings in columns (2) and (4). The sign of the coefficients is the same across both subgroups, but estimates are higher in magnitude in the subgroup of non-essential activities. For example, workers on temporary contracts are 9.3-9.5 p.p. more likely to lose their job relative to permanent workers in non-essential activities, as opposed to a point estimate of 7.5 p.p. in essential activities (although there is a wide overlap in confidence intervals between the two subgroups). Similarly, the coefficients on age, on the dummy for full-time workers and workers in the South, and on the indicator for farming workers are larger in non-essential activities. In other words, being employed in non-essential shutdown sectors is more penalizing in terms of job loss probability for these categories of workers relative to those employed in essential activities. On the contrary, the gap in the job loss probability between workers with upper secondary education and lower secondary education is smaller in non-essential activities than in essential activities and the coefficients for workers with university degree are similar across subgroups. Finally, we find that women are slightly less likely to lose their jobs in non-essential activities relative to men. We further explore differences by gender in the next paragraph.

Differences by gender The evidence presented so far is in line with gender not being a significant explanatory variable for the job loss probability. However, a number of papers highlight how this recession may be particularly harmful for female employment, because it has hit the service sector more, and the presence of female workers (Alon et al., 2020; Adams-Prassl et al., 2020) is higher in that sector. In addition, school closures and working from home burdened women with additional time devoted to childcare and household chores (Del Boca et al., 2020). We further investigate gender differences in job loss probability, by estimating equation (1), gradually including controls and fixed effects and focusing on the coefficient on gender only, to understand whether the rich set of controls included explain the insignificance of the gender dummy. The results are presented in Figure 6, panel (a), which reports estimates from four different specifications. The first one (blue circle) includes only the dummy for female workers as explanatory variable. The second one (red diamond)

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Table 2: Determinants of job loss probability

	Full sample		Employees only	
	(1) All	(2) No firings	(3) All	(4) No firings
Woman	-0.25	-0.23	-0.18	-0.12
	(0.17)	(0.16)	(0.10)	(0.09)
Full-time	-0.72*	-0.78**	-0.86**	-0.89**
	(0.30)	(0.27)	(0.19)	(0.17)
Age	-0.04**	-0.04**	-0.07**	-0.07**
	(0.01)	(0.01)	(0.01)	(0.01)
Temporary contract	8.26**	8.38**	7.83**	7.96**
	(1.09)	(1.07)	(1.10)	(1.08)
Apprenticeship	0.78	1.10	-1.50	-1.12
	(1.13)	(1.07)	(0.94)	(0.84)
Centre	0.66*	0.63*	0.50**	0.48**
	(0.28)	(0.28)	(0.18)	(0.17)
South	1.89**	1.65**	1.94**	1.66**
	(0.36)	(0.36)	(0.34)	(0.31)
Upper secondary education	-0.55**	-0.38*	-0.80**	-0.63**
	(0.18)	(0.17)	(0.12)	(0.11)
University or more	-0.97**	-0.73*	-1.27**	-1.00**
	(0.29)	(0.28)	(0.26)	(0.25)
Employee	-2.29**	-2.34**		
	(0.48)	(0.48)		
Farming worker	-1.90**	-1.43**		
	(0.46)	(0.43)		
Domestic worker	-1.63	-0.97		
	(1.03)	(0.61)		
Constant	6.04**	5.37**	5.79**	5.02**
	(0.67)	(0.63)	(0.54)	(0.57)
Occupation fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes
R^2	0.083	0.089	0.062	0.063
Observations	2,332,888	2,319,918	1,370,157	1,362,254

Notes. The table reports estimates of a linear probability model where the dependent variable is a dummy equal to 1 for contracts ended between 24 February and 31 March 2020. Columns (1) and (2) report results for the full sample of workers. Columns (3) and (4) report results for employees only. Columns (2) and (4) further exclude firings from the sample. Coefficients are multiplied by 100. Standard errors, robust to clustering within 3-digit sectors and occupations, are reported in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$.

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Table 3: Determinants of job loss probability in essential and non-essential activities

	Essential activities		Non-essential activities	
	(1) All	(2) No firings	(3) All	(4) No firings
Woman	-0.22	-0.24	-0.33**	-0.25**
	(0.27)	(0.24)	(0.09)	(0.08)
Full-time	-0.58	-0.64*	-1.02**	-1.04**
	(0.33)	(0.32)	(0.29)	(0.24)
Age	-0.03**	-0.03**	-0.06**	-0.06**
	(0.01)	(0.01)	(0.02)	(0.02)
Temporary contract	7.46**	7.53**	9.33**	9.52**
	(0.97)	(0.94)	(1.58)	(1.57)
Apprenticeship	1.85	2.14	-0.18	0.16
	(1.56)	(1.48)	(0.75)	(0.74)
Centre	0.80	0.77	0.44*	0.42*
	(0.41)	(0.41)	(0.18)	(0.18)
South	1.53**	1.36**	2.54**	2.17**
	(0.46)	(0.48)	(0.48)	(0.43)
Upper secondary education	-0.72*	-0.51	-0.33*	-0.22
	(0.33)	(0.32)	(0.14)	(0.13)
University or more	-1.01*	-0.76	-1.04**	-0.80**
	(0.44)	(0.43)	(0.25)	(0.25)
Employee	-2.69**	-2.73**	-1.73**	-1.80**
	(0.69)	(0.70)	(0.40)	(0.38)
Farming worker	-1.66**	-1.13**	-2.61*	-2.54*
	(0.41)	(0.38)	(1.29)	(1.19)
Domestic worker	-2.08**	-1.24**	0.26*	0.16*
	(0.43)	(0.19)	(0.11)	(0.07)
Constant	5.98**	5.30**	6.25**	5.58**
	(0.71)	(0.64)	(1.07)	(1.04)
Occupation fixed effects	Yes	Yes	Yes	Yes
Sector fixed effects	Yes	Yes	Yes	Yes
R^2	0.099	0.106	0.064	0.068
Observations	1,447,031	1,439,678	885,855	880,238

Notes. The table reports estimates of a linear probability model where the dependent variable is a dummy equal to 1 for contracts ended between 24 February and 31 March 2020. Columns (1) and (2) report results for workers in essential activities. Columns (3) and (4) report results for workers in non-essential activities. See text for a definition of essential and non-essential activities. Columns (2) and (4) further exclude firings from the sample. Coefficients are multiplied by 100. Standard errors, robust to clustering within 3-digit sectors and occupations, are reported in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$.

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further controls for all variables included in **X**, besides gender (therefore, dummies for full-time, temporary and apprentice contracts, geographical dummies, education dummies and type of worker dummies). The third one (green square) adds sector fixed effects. The fourth one (yellow triangle) adds occupation fixed effects (which is equivalent to the estimate presented in column 1 of Table 2). In all specifications, the coefficient on the gender dummy is not statistically significant at 95% confidence level and the point estimate becomes closer to zero as more explanatory variables are added in the model. Hence, we conclude that – in the Italian labor market at the onset of the pandemic recession – there is no evidence of a different separation probability by gender.

The null effect of gender in the aggregate may be due to different factors. First, we are focusing on the short-time effect of the pandemic recession, since our data covers the first quarter of 2020 only. Differences by gender may take more time to materialize. Second, the policies put in place by the government were intended to protect more vulnerable workers, among which women are more represented. Third, given their presence in non-essential activities is lower relative to men (see section 3), their jobs may have had better chances to survive because less likely to be in shut-down sectors. Finally, if women are employed in tasks that can be more easily performed from home, they are less likely to be separated during the pandemic. Note that the absence of a gender-differentiated effect of the pandemic on hirings and separations does not exclude that adjustments are present on the intensive margin, and that men and women may change differently their number of hours worked which, however, we cannot observe.

Since the null effect on gender may mask heterogeneous effects, we estimate a linear probability model interacting the female dummy with the explanatory variables included in **X** (excluding gender) and we report the coefficients of the interactions. Figure 6, panel (b), shows the estimates. Generally, the null result is confirmed also in subgroups determined by observable worker characteristics. However, we do find a significant effect for women with upper secondary education, who are 0.6 p.p. more likely to lose their job relative to men with the same education level. Furthermore, we find that women employed in the farming sector are 2.2 p.p. less likely to lose their job relative to men, and female domestic workers are 1.8 p.p. more likely to lose their job relative to male domestic workers. However, these two subgroups represent only 3.4% and 6.5% of workers included in the sample and they display a clear gender imbalance, with more men employed as farmers and more women employed as domestic workers. Hence, part of the gender differences in job loss probability may be explained by selection. We therefore confirm there are no strong indications of an overall gender difference in the separation probability. This result is in contrast with the evidence for the US and the UK, but in line with that on Germany (Adams-Prassl et al., 2020), a

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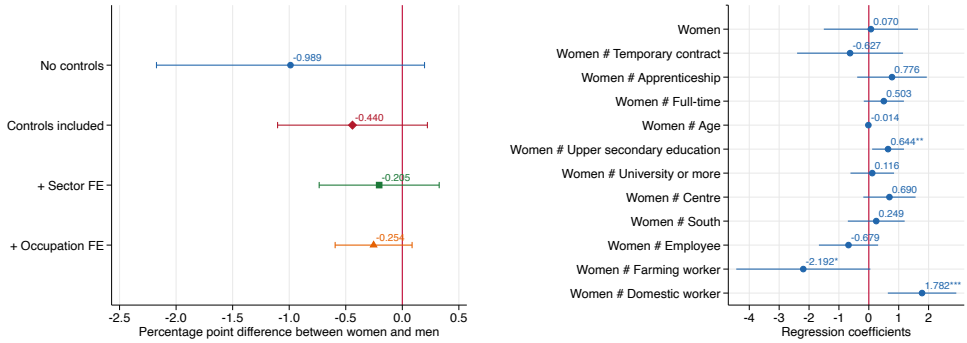

(a) Regression models with different controls (b) Interaction effects

Figure 6: Impact of COVID-19 on job loss probability by gender

country with labor market institutions and policies closer to the Italian ones.

6 Conclusion

This paper explores the short-run heterogeneous effects of COVID-19 on labor market flows in Italy and how policy enacted to reduce the spread of the virus and the disruption of economic activity mediated them.

We show that, before the pandemic, workers employed in non-essential activities shutdown by the government were in majority men, younger than 35 years old, located in the North and with lower levels of education. When looking at the change in hirings and separations and decomposing it by age, gender, region, type of contract (open-ended or temporary), education level, and sector (essential vs non-essential activities), we find that from the nineth week of the year – when the virus started to spread exponentially across the country –, there was a pronounced drop in hirings and terminations. On the contrary, firings and quits spiked right after the nineth week, and then dropped significantly, reflecting the effects of the firing freeze and the easing of access to STW compensation schemes. The firing freeze may also have contributed to the decreasing dynamics of hirings, as the higher employment protection for workers may have decreased turnover. We further explore separations by examining which factors predict the probability of job loss. We find that those workers that were already suffering the consequences of the previous recession (young, temporary, low-skill workers) are those at higher risk of losing their job because of COVID-19. Gender, instead, is a non-significant predictor of job loss in the aggregate, but we do find a significantly higher separation rate for female workers with upper secondary education and female

domestic workers.

While we focus on short-term outcomes and cannot account for changes in hours worked, our evidence contributes to the understanding of labor market and policy responses in the wake of the pandemic. The use of detailed administrative data allows us to separately analyze how hirings and separations – distinguishing between firings, terminations and quits – have evolved relative to normal times and how different categories of workers have been affected. Given the critical importance of the firing freeze and the special STW compensation scheme in affecting labor market flows, it is important to monitor the labor market transitions if these policies will be lifted, since they have protected vulnerable workers the most.

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