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Failing Young and Temporary Workers: The Impact of Covid-19 on a Dual Labor Market

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Abstract

In this paper, we use monthly administrative data covering the universe of individuals registered as unemployed in 278 Portuguese municipalities to study the impact of Covid-19 between March and August 2020. Using event study difference-in-differences, we document a large causal impact on unemployment, with year-on-year growth rate increases of 39 and 38 percentage points in June and July, respectively. New job placements dropped significantly, especially in April. We also employ triple difference-in-differences to show that younger and middle educated individuals fell more into unemployment, while there is no evidence of differences across genders. Portugal has a dual labor market, with a large share of workers employed on temporary contracts. Relying on this specific characteristic, we show that the heterogeneous effects were accentuated in municipalities with a higher share of temporary workers.

Keywords: Covid-19, unemployment, difference-in-differences, Portugal

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1 Introduction

In December 2019, an outbreak of SARS-CoV-2 began to spread in the province of Wuhan, China. Three months later, the World Health Organization (WHO) recognized the outbreak as a pandemic. Due to the nature of the virus, social distancing measures and the mandatory use of face masks were implemented in several countries. To stop the alarming spread of the disease, authorities also responded with the imposition of stay-at-home orders, travel restrictions and the shutdown of schools, businesses and non-essential services.

While the long-term consequences of this shock are yet to be revealed, in the short-run the pandemic impacted almost every aspect of human life. The economic effects were particularly sizeable, as the imposition of tight restrictions nearly brought economic activity to a halt. As a consequence, predictions from The World Economic Outlook published by the IMF in October reveal a 4.4% contraction in global GDP for the year of 2020. Given the unprecedented scale and speed of the pandemic crisis, understanding its impact on the different dimensions of the global economy is paramount.

In this paper, we use an event study difference-in-differences approach to shed light on the effects of Covid-19 on unemployment and new job placements in Portugal during the first six months of the pandemic, i.e., between March and August 2020. We borrow the identification strategy from Carvalho et al. (2020) who identify, for the same time period, a massive negative causal impact of the lockdown on consumption.

Since the early stages of the crisis, it has been clear that not all individuals experienced the consequences of the pandemic the same way. Evaluating the heterogeneous effects caused by this shock is important, especially to produce effective policies targeted at the most affected groups. Taking advantage of the breakdown of our data in three main dimensions (gender, age

and education), we employ a triple difference-in-differences strategy to study the impact on different demographic groups.

In addition, the high proliferation of temporary employment has attracted a lot of attention, especially in Europe. Temporary employment is associated with lower job satisfaction (Aleksynska, 2018), lower cumulative wages in the long-term (Fauser, 2020) and higher psychological morbidity (Virtanen et al., 2005). Our work adds to the literature on the effects of non-permanent employment by testing the hypothesis that the impact of Covid-19 is stronger in municipalities with a higher share of temporary contracts. Portugal provides an interesting laboratory to study these impacts for two main reasons. First, it is the third most segmented labor market across the OECD, with a large gap in labor market protection between permanent and non-permanent workers. Second, there is an extensive use of temporary contracts in the country: temporary workers represent 22% of dependent employment. Similar labor market characteristics are mainly found in a few other Southern European countries and Poland.

We use administrative data provided by *Instituto do Emprego e Formação Profissional*, the Portuguese institute of employment and professional training. The methods are applied to a dataset covering all individuals formally registered as unemployed in 278 Portuguese municipalities between October 2016 and August 2020. Our main findings suggest that Covid-19 caused a rise on year-on-year growth rates of registered unemployment from 27 percentage points in April up to 39 and 38 percentage points in June and July, respectively, and a severe drop in new job placements. We demonstrate that younger and middle educated individuals fell more into unemployment, while we find no evidence of differences across genders. These effects are accentuated in municipalities with a higher share of workers with temporary contracts, reflecting the employment protection legislation disadvantages of non-permanent workers.

The remainder of this paper is structured as follows. Section 2 presents a review of the

literature. Section 3 briefly describes the institutional background and details the evolution of the pandemic and policy responses in Portugal. Section 4 clarifies the data and methodology used. Section 5 analyses the overall results and heterogeneous impacts. Section 6 combines the effects of the pandemic and the labor market segmentation. Finally, Section 7 shows the main conclusions.

2 Literature Review

The rapidly evolving literature on the economic impacts of Covid-19 has uncovered a large and unequal impact of the pandemic crisis on labor market outcomes. Casarico and Lattanzio (2020) use administrative data on a sample of contracts for the first quarter of 2020 in Italy. The authors find that, while gender is not a significant predictor of job loss probability, workers on a temporary contract are 8 p.p. more likely to lose their job. On the contrary, older and higher educated workers are more protected against job loss. Meekes et al. (2020) estimate a triple difference-in-differences specification with data from Statistics Netherlands covering the entire Dutch population and conclude that women and men experienced analogous effects of Covid-19 on employment, but the impacts were larger for non-essential workers. Alstadsæter et al. (2020) explore the individual unemployment benefits applications in Norway and find that, during the first few weeks after the initial government measures were announced, about 12% of the labor force signed up for unemployment benefits. Cajner et al. (2020) analyse US administrative payroll data and show that aggregate employment decreased by 21% through late-April, with slight signs of recovery only by late-June.

The pandemic caused a substantial downturn in labor demand. Various authors have documented severe drops in new vacancies on large job platforms (Bamieh and Ziegler, 2020; Hensvik et al., 2020) and a decrease in hirings on the period following the Coronavirus lockdown (Betcherman et al., 2020). Using job vacancy data collected in real-time by the platform

Burning Glass Technologies, Forsythe et al. (2020) find that, in the US, vacancy postings collapsed by 44% between February and April 2020. For Canada, Jones et al. (2020) found a recovery of new vacancies from 50% to around 80% of the level attained in the weeks prior to the Covid-19 crisis in June.

Further evidence relies on real-time survey data. Adams-Prassl et al. (2020) show that in early April 2020, 18% and 15% of workers in the US and the UK reported having lost their job due to the Coronavirus outbreak, respectively, comparing with only 5% in Germany.[1] In all three countries, permanent and salaried workers were less likely to be affected.[2] Relying on the Canadian Labor Force Survey, Lemieux et al. (2020) find a decline of 15% in employment, with the largest impact felt by workers aged between 20 and 29 years. For the US, Cho and Winters (2020) use the Current Population Survey to show that young, less educated, lower income and minority workers experienced the largest employment losses. Similar findings are reported by Montenovo et al. (2020), who add that workers in jobs more compatible with remote work fared better. Alon et al. (2020) find that women were more struck by the crisis in the US, facing higher employment drops than men, especially since some of the sectors most affected by this crisis have a higher share of female workers. On the contrary, Hupkau and Petrongolo (2020) find no significant job loss differences between genders in the UK.

Two other papers also rely on a triple difference-in-differences strategy to study the impact of Covid-19 on employment. Cho et al. (2020) find that the employed-at-work rate decreases more in larger metropolitan areas than in non-metropolitan areas in the US, the effect being explained mostly by local infection rates and employment density. Kalenkoski and Wulff (2020) show that the impact on employment in the US was larger for coupled women than for coupled men and smaller for single women than for single men.

[1] The authors attribute the smaller impact in Germany to the *Kurzarbeit*, a well established short-time work scheme.
[2] Aum et al. (2020) estimate employment drops of 6.9% for temporary workers in South Korea.

In Portugal, to the best of our knowledge, the causal evidence is still scarce, especially in terms of the labor market.[3] In a first effort to measure how firms were adapting to the pandemic crisis, Statistics Portugal and the Bank of Portugal conducted surveys on a sample of firms from April until July. The survey results for the week between April 13th and 17th show that only 82% of the inquired firms were operating and 60% reported a reduction in the number of employees working, with 51% having furloughed workers. As time went by, the results improved gradually. On the final wave of the survey, 99% of the firms were operating and only 24% reported a reduction in the number of employees effectively working.

Additionally, Cerejeira et al. (2020) make an analysis of the measures implemented by the Portuguese government to mitigate the effects of the crisis during the first eight months of the pandemic. The authors conclude that the measures aim mainly at avoiding a negative shift on the expectations of the economic agents, with the government making a strong effort to signal this crisis as a temporary exogenous shock. However, the tools adopted do not fully address the individual income losses of all vulnerable groups.

3 Background

3.1 Institutional Background

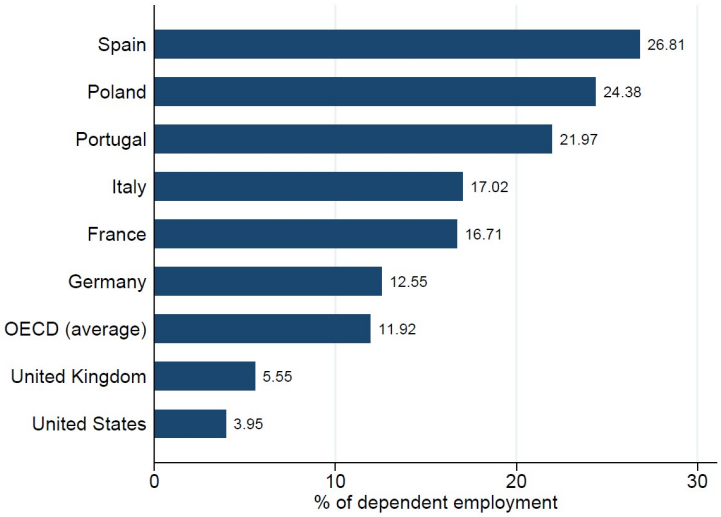
The Portuguese labor market suffered significant changes over the last decades. Among others, there has been i) an improvement in the schooling levels of the working population, ii) a higher proportion of female employment and iii) an ageing of the labor force (Portugal et al., 2018). Between 2010 and 2014, Portugal was badly hit by the global financial crisis. The unemployment rate, which was already on the rise prior to the crisis, increased significantly, especially

[3] Lourenço and Rua (2020) use high-frequency data to compute a Daily Economic Indicator for the Portuguese economy. They report a sharp drop on economic activity from mid-March 2020 onward, accentuated after the State of Emergency was declared. Some timid signs of recovery were found by the end of April.

among the youth. In 2011, the country requested financial assistance to the European Commission, the European Central Bank and the IMF (commonly known as "Troika") and, until 2015, several structural reforms on the labor market were undertaken. However, some issues have constantly characterized the functioning of the labor market.

The labor market is highly segmented, with a strong duality on employment protection legislation between permanent and temporary workers. Even after reforms were undertaken, permanent workers in Portugal still benefit from one of the highest levels of employment protection across the OECD, while the ease of use of temporary contracts leads to a high share of non-permanent employment (OECD, 2017). In particular, the stringent employment protection on individual dismissals for open-ended contracts increases the reluctance of firms to hire permanent employees (European Commission, 2018). Figure 1 presents the share of temporary employment as a percentage of dependent employment in 2018 for seven European countries and the US, according to OECD data. Portugal is a clear outlier, with nearly 22% of dependent employment under temporary contracts. This share is above the OECD average of 12% and is only exceeded in Spain (27%) and Poland (24%).

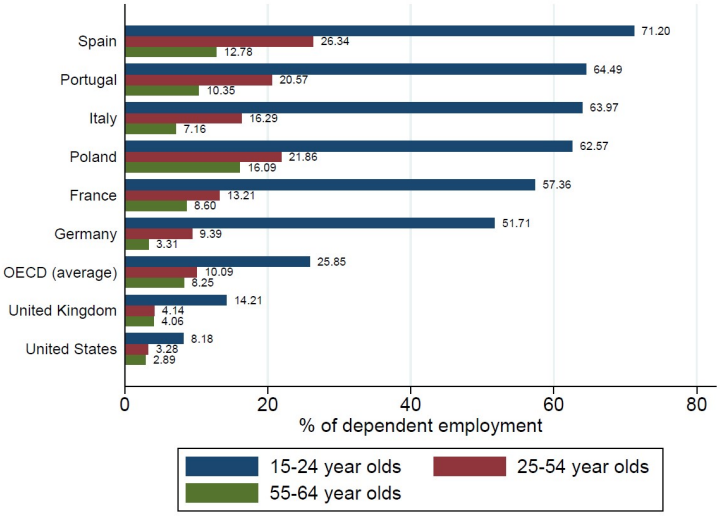
Figure 1: Share of temporary employment (% of dependent employment), 2018



Source: OECD

Figure 2 further decomposes the share of temporary employment as a percentage of dependent employment by age groups. There is a decreasing monotonicity in the share of temporary workers, ranging from 64% for the 15 – 24 year olds group to 10% for the 55 – 64 year olds group. These shares are close to the ones verified in neighbouring Spain and severely contrast with those in the US, where only 8% of younger workers are under non-permanent contracts. In addition, Appendix Figure C.1 shows the decomposition of the share of temporary employment by gender. In Portugal, the share of male and female temporary workers is roughly the same (22% of dependent employment).

Figure 2: Share of temporary employment (% of dependent employment) by age group, 2018



Source: OECD

Moreover, strong downward nominal wage rigidity, due to legal restrictions on nominal wage cuts, and long periods of low inflation leave employers with little margin to adjust real wages. As a consequence, in periods of crisis, employment (and especially temporary employment) becomes the main margin of adjustment (Martins and Portugal, 2019; Carneiro et al., 2014). The long-term unemployment rate is also a concern, as a large number of displaced workers are low skilled and, in part due to globalization, face significant difficulties in finding a new job (Blanchard and Portugal, 2017). In sum, the characteristics of the labor market place

the country in a vulnerable position when faced with an economic downturn.

3.2 Covid-19 in Portugal and Policy Responses

The first cases of Covid-19 in Portugal were officially confirmed on March 2nd, in the North region of the country. Days later, the government closed schools and imposed circulation restrictions on the border with Spain. On March 18th, the President declared the State of Emergency. As a consequence, all non-essential services were shutdown with the exception of supermarkets, pharmacies and gas stations. Restaurants were closed and only allowed to serve take-away. Further restrictions on circulation and mandatory teleworking whenever possible were also decreed. Interestingly, fear of contamination was a main driver of the deep lockdown in Portugal. According to Midões (2020), Portugal is one of the European countries where self-imposed social distancing started earlier, with people avoiding to go out to restaurants eight days before the government mandated its closure. The State of Emergency was renewed twice, reaching its end on May 3rd and being substituted by the less severe State of Calamity.[4]

As an extraordinary measure, on March 26th the Portuguese government approved a temporary *simplified layoff* scheme, in an attempt to protect jobs.[5] This measure implied that firms whose activity had been affected by the pandemic or by the legal restrictions in place could take advantage of a financial support mechanism, which allowed them to suspend employment contracts or reduce working hours.

The *simplified layoff* scheme was extended until July and government estimates indicate that more than 115 thousand firms and 890 thousand workers had access to the program (Mateus, 2020).[6] Around 80% of the firms benefiting from this measure were small businesses with less than 10 employees. The percentage of firms covered was higher in the accommodation

[4] A timeline with the main events of the Covid-19 pandemic in Portugal can be found in Appendix Figure C.3.
[5] Before the pandemic, a traditional *layoff* scheme was already established in the country. Comparing with the *simplified layoff* scheme, access to the traditional version is more complex, lengthy and restrictive.
[6] Appendix Figure C.2 presents the evolution in the number of firms and workers under the *simplified layoff* scheme between April and October 2020.

and food services (57.5%) and the transportation (33.5%) sectors. Overall, the percentage of workers supported by the scheme was equivalent to about 25% of employment registered with the Social Security (Banco de Portugal, 2020).

In August, the scheme was substituted by a new recovery support regime under the Social and Economic Stabilization Program. Firms covered could no longer suspend employment contracts but were able to reduce working hours up to 100%. Although these schemes had an impact on preventing short-term job destruction, as firms were not allowed to dismiss permanent workers or take on collective dismissals, they were still not able to avoid an increase in the number of unemployed people in the country. Given all these circumstances, our estimates are likely to be lower bounds of the effects on unemployment, due to i) the implementation of the *simplified layoff* scheme and ii) the unfavorable conditions to actively search for work.

The closures of businesses and services had a strong impact on the Portuguese economy. In the Autumn 2020 Economic Forecast, the European Commission estimates a drop of 9.3% in GDP growth for the year of 2020 in Portugal. Some sectors were more affected than others. The hospitality sector, particularly relevant for the country due to the high importance of tourism for the economy, was deeply affected. Figures show that 90% of the hotel units resorted to the *simplified layoff* scheme and the estimated revenue losses amount to 3.6 billion euros in 2020 (Neto, 2020). According to a report by SIBS Analytics and *Instituto Superior de Economia e Gestão*, during the lockdown period (from March 18th to May 3rd) spending on tourist accommodation and restaurants dropped almost to zero compared to the average in January and February 2020.[7] The textile and automotive industries, very much dependent on exports, also suffered a substantial downturn.

All these effects contributed to a significant deterioration of the Portuguese labor market.

[7] SIBS Analytics is a consumer indicators portal managed by SIBS, the main provider of ATM and MULTIBANCO networks in Portugal, as well as other digital payment channels. The report can be found at: https://www.sibsanalytics.com/wp-content/uploads/2020/06/20200629_Report-100-dias-COVID-19_SIBS_Analytics.pdf

While in July 2019, less than a year before the pandemic crisis, the country reached the lower number of unemployed individuals of the century, more than 400 thousand individuals were unemployed by the end of August 2020. At the same time, the country registered a total of 58,012 cases of infection and 1,822 deaths, numbers that kept rising as the second wave of the virus started to spread in almost every European country.

4 Data and Empirical Methods

4.1 Data

We use administrative data from *Instituto do Emprego e Formação Profissional* (IEFP), the Portuguese governmental institution responsible for fighting against unemployment and promoting the creation and quality of employment in Portugal. The institution manages employment offers and makes the bridge between employers and the unemployed. IEFP provides monthly data on the number of unemployed individuals registered and the number of new job placements that take place for those registered at one of the job centers distributed across the country.

Our sample comprises data on the 278 municipalities of the Portuguese mainland between the months of January and August, for 2017 to 2020, and between the months of October and December, for 2016 to 2019.[8] Data on registered unemployment is split into several dimensions, namely gender, age group and education level. In terms of job placements, the data is only disaggregated by gender. We also use data on the main reasons for registration at the job centers[9], i.e., dismissals, voluntary quits, mutual agreement dismissals, end of temporary jobs, self-employment or former inactivity.[10] It is worth noticing that while data on unemployment

[8] Portugal is divided in 308 municipalities, 278 in the Portuguese mainland and 30 in the Autonomous Regions of Madeira and Azores. IEFP only provides data at the municipality level for mainland Portugal.

[9] A broad category of "other reasons" was dropped from the data as it represents residual situations, such as re-registrations after non-compliance with requirements, being an ex-migrant or reaching the end of military service.

[10] Former inactive workers are workers who were out of the labor force for a period of time and start to actively seek employment again.

refers to the situation at the end of each month (*stock*), data on job placements and the motives for registering at IEFP refers to the movement throughout the month (*flow*). Summary statistics of all variables for the average municipality are provided in Table 1.

Table 1: Descriptive statistics

	Obs.	Mean	St. Deviation	Minimum	Maximum
Unemployment (stock)					
Total	12232	1273.6	2359.5	23	25796
by gender					
Male	12232	567.4	1091	12	13000
Female	12232	706.2	1274.8	7	13895
by age					
Less than 25 years old	12232	137.1	218.6	1	2961
Between 25 and 34 years old	12232	238.2	442.4	1	5953
Between 35 and 54 years old	12232	549.8	1069.5	8	12163
More than 55 years old	12232	348.5	650.7	5	6437
by education					
Primary education (1^{st} – 4^{th} grade) or less	12232	315.4	585.3	5	7341
Basic Education (5^{th} – 6^{th} grade)	12232	187.6	356.5	2	4690
Lower Secondary (7^{th} – 9^{th} grade)	12232	250.5	441.7	4	4928
Upper Secondary (10^{th} – 12^{th} grade)	12232	342	635.2	5	7181
Higher Education	12232	178.1	412.1	0	6157
Job Placements (flow)					
Total	12232	23.9	35.3	0	494
by gender					
Male	12232	11.1	17.9	0	234
Female	12232	12.8	19.2	0	273
Motive to register at IEFP (flow)					
Dismissed from previous job	12232	18.8	36.9	0	831
Voluntarily quit previous job	12232	7.3	11.8	0	132
Mutual agreement dismissal	12232	5.3	12.2	0	189
End of temporary job	12232	73.2	135.3	0	2625
Former inactive worker	12232	15	26	0	369
Self-employed	12232	1.5	3.4	0	48

The main advantage of our data is that it is formally collected and managed by a governmental institution. Additionally, registration at IEFP is one of the necessary conditions to receive unemployment benefits. Hence, our data provides a strong representation of the number of unemployed people actively searching for a job in the country. After registration, individuals

also have access to professional training sessions and internships. In return, they have the obligation to comply with a personal employment plan and actively seek employment by their own means. In case of being proposed a suitable or socially necessary job, individuals cannot reject the offer, otherwise they risk losing the unemployment subsidy.[11]

Due to the pandemic, until December 31st 2020, workers who have between 180 and 360 days of dependent employment during a period of 24 months prior to the unemployment date or were dismissed during the State of Emergency or Calamity are entitled to receive unemployment subsidy.[12] Mandatory job search and training sessions were suspended between March and May, with no consequences for the unemployment subsidy receivers. As the restrictions were lifted, regular rules were reinstated, but digital interactions were still prioritized.

Besides this data, we use the share of workers with temporary contracts in the private sector of each municipality in 2018 as a labor market indicator to investigate possible heterogeneity between municipalities.[13] This variable was retrieved from PORDATA, based on data from *Quadros do Pessoal*, a linked employer-employee dataset covering all private-sector firms based in Portugal with at least one wage earner.

4.2 Methodology

To evaluate the impact of Covid-19 on the labor market outcomes, on our baseline strategy, for which results are shown in Subsection 5.1, we use the identification strategy from Carvalho et al. (2020) and implement a difference-in-differences (DD) event study. On Subsection 5.2 and Section 6, we use triple difference-in-differences to assess heterogeneous effects.

We begin by estimating the following event study equation:

[11] Socially necessary jobs are temporary work opportunities filled by unemployed individuals to satisfy social or collective needs of non-profit public or private entities.
[12] Prior to the pandemic, workers needed to have at least 360 days of dependent employment during a period of 24 months prior to the unemployment date in order to be entitled to receive unemployment benefits.
[13] Descriptive statistics for this variable are displayed in Appendix Table B.1.

$$ln(y)_{imt} = \alpha + \gamma_i \mathbb{1}_i + \delta_m \mathbb{1}_m + \lambda \mathbb{1}_{Oct19-Aug20} + \beta_m \times \mathbb{1}_{Oct19-Aug20} \times \mathbb{1}_m + \varepsilon_{imt} \quad (1)$$

where $ln(y)_{imt}$ corresponds to the outcome of municipality i, in month m and year $t \in \{2016, 2017, 2018, 2019, 2020\}$. Municipal, γ_i, and month, δ_m, fixed effects are also included. Additionally, $\mathbb{1}_i$ is an indicator variable for the municipality, where $i \in \{1, ..., 278\}$, $\mathbb{1}_m$ is an indicator for the month m and $\mathbb{1}_{Oct19-Aug20}$ is an indicator for the months between October 2019 and August 2020. February 2020 is the omitted month, since it is the month right before the pandemic crisis occurred. Standard errors are clustered at time period (month, year) and NUTS II level and all confidence intervals are shown at the 95% level.[14]

The identifying assumption for the estimation of (1) is that, if the pandemic had not occurred, the monthly year-on-year change between March/August 2020 and March/August 2019 would have been parallel to the geometric mean of the year-on-year change of the previous 3 years, in which more weight is given to the most recent years. Thus, for our identification strategy to be valid, the parallel trend assumption must be verified, i.e., $\hat{\beta_m}$, where $m \in \{1, 10, 11, 12\}$, must not be statistically different from zero.

Since we are comparing the growth rates of the period between October 2019 and August 2020 with those from each year to 2020, we must adjust our coefficients of interest $\hat{\beta_m}$, where $m \in \{3, ..., 8\}$, in order to obtain the causal impact of Covid-19 in each month from March onward. Given that $\hat{\beta_m}$ is an estimate of a growth rates function, we perform a simple mathematical manipulation that allows us to use the growth rates observed in the data to correct for seasonal differences. The complete derivation of the causal impacts can be found in Appendix A.

We then explore the possibility that the impact of Covid-19 for the different groups in each dimension of our data (gender, age and education) is not homogeneous. We use a triple difference-in-differences strategy.

[14] Mainland Portugal is divided in 5 NUTS II regions: Norte, Centro, Lisboa e Vale do Tejo, Alentejo and Algarve. Appendix Figure C.4 shows the division of the territory by NUTS II and III.

The following equation is estimated for each dimension:

$$
\begin{aligned}
ln(y)_{imt} &= \alpha + \gamma_i \mathbb{1}_i + \delta_m \mathbb{1}_m + \mu'\mathrm{X} + \eta\, \mathbb{1}_{Oct19-Aug20} + (\lambda'\mathrm{X}) \times \mathbb{1}_{Oct19-Aug20} \\
&+ \upsilon\, \mathbb{1}_{PostMarch} + (\theta'\mathrm{X}) \times \mathbb{1}_{PostMarch} + \sigma\, \mathbb{1}_{PostMarch2020} + (\rho'\mathrm{X}) \times \mathbb{1}_{PostMarch2020} + \varepsilon_{imt}
\end{aligned}
\tag{2}
$$

In this case, $\mathbb{1}_{PostMarch}$ is an indicator for the months between March and August and $\mathbb{1}_{PostMarch2020}$ is the interaction between the Oct19–Aug20 indicator and the post March indicator. The vector $\mathbf{X}$ is defined differently depending on the heterogeneity dimension evaluated. For gender, $\mathbf{X}$ includes 1 dummy variable, for age includes 3 dummy variables and for education includes 4 dummy variables, each dummy representing a different group.[15] This is so because, for each heterogeneity dimension, we define a specific group as the reference group and do not include it in the regression. The coefficients ρ, if statistically significant, represent the impact of Covid-19 on each group relative to that of the omitted one. On the other hand, if the coefficients are not statistically different from zero, we find no differentiated impacts of the pandemic between the group under analysis and the comparison one.

Lastly, on Section 6 we use the triple difference-in-differences specification (3). This time, we interact the indicators described above with $ShareTemporary_i$, the share of workers with temporary contracts in the private sector of each municipality i in 2018.

$$
\begin{aligned}
ln(y)_{imt} &= \alpha + \gamma_i \mathbb{1}_i + \lambda_1 \mathbb{1}_{Oct19-Aug20} + \lambda_2 \mathbb{1}_{Oct19-Aug20} \times ShareTemporary_i \\
&+ \theta_1 \mathbb{1}_{PostMarch} + \theta_2 \mathbb{1}_{PostMarch} \times ShareTemporary_i + \rho_1 \mathbb{1}_{PostMarch2020} \\
&+ \rho_2 \mathbb{1}_{PostMarch2020} \times ShareTemporary_i + \varepsilon_{imt}
\end{aligned}
\tag{3}
$$

The effect of this municipal characteristic on the causal impact of Covid-19 on unemployment for each dimension is given by ρ_2. Since we control for municipality fixed effects and $ShareTemporary_i$ is time invariant, we do not include it alone in the regression.

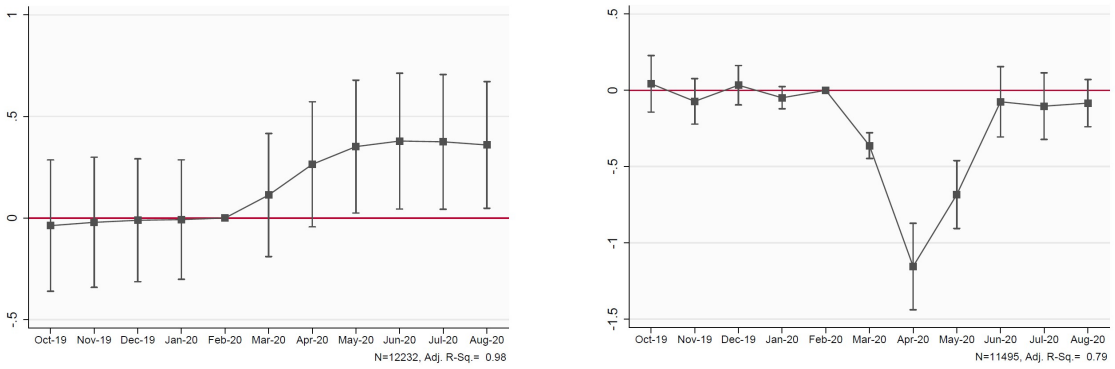
[15] The number of dummy variables excludes the reference group. For instance, for the gender dimension, the comparison group is male. Thus, $\mathbf{X}$ equals 1 only if gender is female.

5 Empirical Results

5.1 Aggregate Results

We start by using (1) to estimate the impact of the pandemic crisis on registered unemployment and new job placements. The coefficient estimates are depicted in Figure 3. The first important remark is that in both cases the estimates for β_m, where $m \in \{1, 10, 11, 12\}$, are not statistically different from zero. As such, our identification strategy is verified and we can be confident that our results reflect the causal impact of Covid-19 on the variables of interest, as explained in Subsection 4.2.

Figure 3: Event study aggregate effects



(a) Unemployment

(b) New Job Placements

Panel (a) on Figure 3 shows a strong impact on unemployment following the lockdown period that began in March 2020. The increase is persistent but more pronounced until June, month after which it stabilized. In terms of job placements, Panel (b) presents a colossal drop of new placements, especially in April, followed by a recovery in May and June and a subsequent stabilization. Although between June and August the point estimates are not statistically different from zero, they are still negative.

Table 2 displays the net causal impact of the pandemic on the YoY growth rates, computed as explained in Appendix A. The YoY growth rates of unemployment increased gradually over

time, from 27 p.p. in April, up to 39 p.p. and 38 p.p. in June and July, respectively. The sharp decline of new job placements shown in Panel (b) on Figure 3 corresponds to a 63 p.p. drop in April. From June onward, the impact has been attenuated but is still negative. These effects are consistent with the deep lockdown in April and the slow restart of the economic activity during the summer.

Table 2: Event study aggregate effects: magnitudes

Dep.Var.:	Unemployment			New Job Placements		
	Point Estimate	t-test	Effect (pp)	Point Estimate	t-test	Effect (pp)
	(1)	(2)	(3)	(4)	(5)	(6)
Mar-20	0.113	1.04	10.67	-0.363	-12	-23.55
Apr-20	0.265	2.39	26.92	-1.155	-11.31	-62.74
May-20	0.352	2.99	37.25	-0.683	-8.53	-43.14
Jun-20	0.379	3.15	39.06	-0.075	-0.91	-3.37
Jul-20	0.375	3.14	38.42	-0.104	-1.33	-8.48
Aug-20	0.360	3.2	35.5	-0.084	-1.5	-0.23

Notes: Point estimates are the coefficients β_m from (1). The effect is given by $(1+g_2^{20,19})(\vartheta_m - 1)$. Please refer to Appendix A for more information.

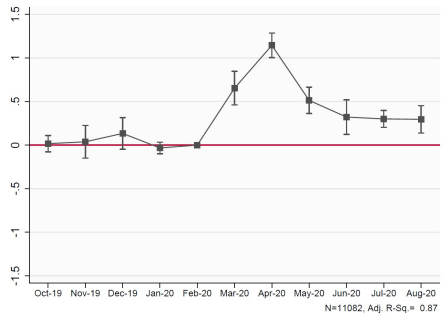
To provide additional evidence of the strength of our results, we perform robustness tests to i) further assert that the parallel trend assumption holds and ii) show that the remaining coefficient estimates are stable across different specifications. Appendix Figure C.5 compares the baseline results for unemployment and new job placements with those from when we replace the municipality fixed effects by NUTS III fixed effects (in red) and NUTS III x month fixed effects (in green). The rationale for using NUTS III x month fixed effects lies on the fact that there may be unobserved regional seasonality not accounted for on our baseline specification. The results are very similar across specifications, validating our approach.

We then use (1) to analyse regional differences on unemployment across the five Portuguese mainland NUTS II regions. Event studies and the causal impacts are shown in the Appendix (Figure C.6 and Table B.2, respectively). The Algarve region was by far the most hit by the pandemic, with YoY growth rate increases of 166 p.p., 187 p.p. and 180 p.p. in May, June and July, respectively. This effect is likely a consequence of the Algarve region being

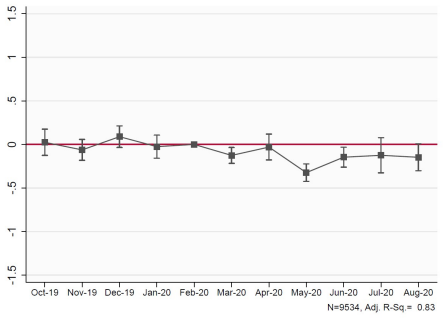
highly dependent on tourism and hospitality services, which suffered a severe downturn due to the restrictions imposed in the country. The second most affected regions were Lisboa e Vale do Tejo and Alentejo. By August, all the regions remained still far from recovery.

In addition, we investigate the impact of the pandemic on the motives of registration at job centers. Figure 4 shows an event study for each motive. Since these are flow variables, the results measure the impact on new unemployment each month, net of composition effects.

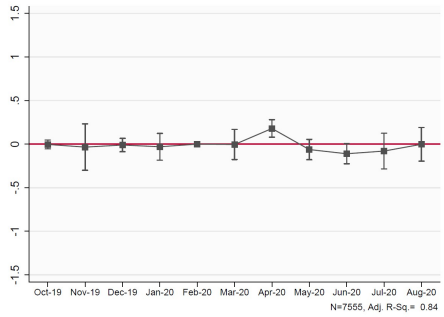
Figure 4: Motives to register at IEFP



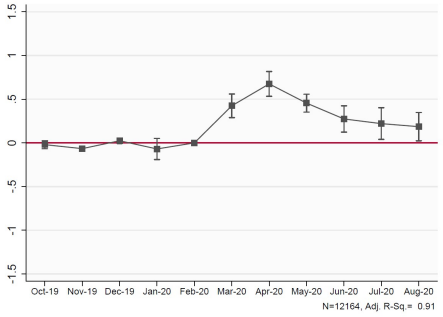
(a) Dismissed from previous job



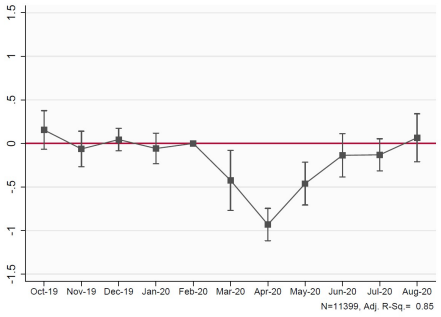
(b) Voluntarily quit previous job



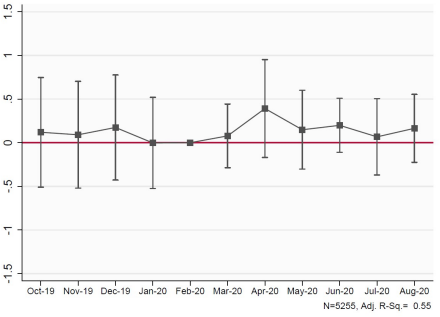
(c) Mutual agreement dismissal



(d) End of temporary job



(e) Former inactive worker



(f) Self-employed

Covid-19 caused a substantial rise on dismissals and terminations of temporary jobs. The effects were particularly strong in April, with YoY growth rate increases of 216 p.p. and 87

p.p. for dismissals and end of temporary jobs, respectively.[16] After April, the impact was less pronounced, but always above the baseline levels before the pandemic. These results suggest that many firms let go of employees to reduce costs. As can be seen in Appendix Figure C.7, registrations at job centers due to end of temporary jobs in previous years represent, on average, around 58% of total new registrations between March and August. In 2020, temporary workers were even more affected and this share increased to 63.9%. Interestingly, in such a segmented labor market, the increase in new registrations due to dismissals was proportionally higher (from around 15% in previous years to 21.3% in 2020), reinforcing the profound impact of this crisis on permanent jobs associated with higher protection levels.

The effect on former inactive workers reveals discouragement of these workers to rejoin the labor force. By April, the YoY growth rate was down by 53 p.p., implying that individuals refrained from actively seeking employment during the stricter lockdown period. This impact increases the strength of the remaining results, as even with a reduction in the number of individuals going from inactivity to unemployment, the latter rose substantially.

Over the first six months of the pandemic, there was a general drop of voluntary quits and a decrease in mutual agreement dismissals from May until August. Finally, the YoY unemployment growth rate for self-employed individuals increased by 51 p.p. in April, although the impact was less stable and non-significant across the whole period under analysis.

5.2 Heterogeneous Impact

In this section, we use a triple difference-in-differences strategy to explore the heterogeneous effects of the Covid-19 shock in the outcomes of interest for different i) genders, ii) age groups and iii) education levels. On Tables 3, 4 and 5, we report the estimates of σ and ρ from (2). In all specifications, the estimates of the $\mathbb{1}_{PostMarch2020}$ indicator variable represent the impact for

[16] The causal impacts of Covid-19 on all variables are shown in Appendix Table B.3.

the reference group.

Table 3 shows the results for gender, using male as the omitted group. Column (1) presents the impact on registered unemployment while column (2) presents the impact on new job placements. The coefficient estimates for $\mathbb{1}_{PostMarch2020}$ indicate that Covid-19 increased male unemployment by 33.8% and decreased new job placements by 24.1% in March - August 2020. In terms of unemployment, there is no statistically significant difference between men and women. This implies we don't find evidence of women being more affected than men by the pandemic's shock. However, in terms of new job placements, women were more negatively affected than men, suffering an additional drop of 17.5% in placements after March.

Table 3: Triple DD on unemployment and new job placements, by gender

Dep. Var.:	Unemployment	New Job Placements
	(1)	(2)
$\mathbb{1}_{PostMarch2020}$	0.338**	-0.241*
	(0.08)	(0.11)
$\mathbb{1}_{PostMarch2020}$ × Female	-0.026	-0.175*
	(0.02)	(0.08)
Number of Obs.	24,464	21,265
R-squared	0.968	0.725

Notes: Standard errors (in parenthesis) are clustered at NUTS II and time period (month, year) level.

Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

The results regarding unemployment, albeit surprising, are not unique to the Portuguese labor market. As mentioned in Section 2, research concluded that gender was not a predictor of job loss in Italy (Casarico and Lattanzio, 2020) and both males and females were equality affected at the extensive margin, measured as job loss or furloughing, in the UK (Hupkau and Petrongolo, 2020). Indeed, some papers have found evidence that women were strongly hit by the pandemic, on the one hand due to a higher proportion of female workers at the most affected industries (ILO, 2017) and on the other hand due to higher responsibility for household chores and childcare needs, especially after school closures and work from home restrictions (Farré et al., 2020; Del Boca et al., 2020). Nonetheless, other factors can help to explain why

males and females appear to have been equally affected by the pandemic. First, the adjustment for women may have been stronger at the intensive margin, leading to significant differences in terms of hours worked between genders, rather than at the extensive margin in terms of employment. Second, a higher share of female workers may work in sectors protected by government measures or be responsible for tasks that can more easily be performed from home, thus not being so affected by the shutdowns. Unfortunately, the data available to us does not allow to observe these effects.

As mentioned in Subsection 4.1, data on new job placements is only disaggregated by gender. Hence, for the remainder of our analysis we will focus exclusively on unemployment.

To study the impact on different age groups, we use unemployed with more than 55 years old as the comparison group. Our findings are displayed in Table 4. The repercussions of the pandemic caused a disproportional increase in youth unemployment after March 2020 than in the homologous period of previous years. Those with less than 25 years old experienced an additional increase of 20.8% in unemployment than their older counterparts. The impact was even stronger for the group between 25 and 34 years old: 25.8%.

Table 4: Triple DD on unemployment, by age

Dep. Var.:	Unemployment
	(1)
$\mathbb{1}_{PostMarch2020}$	0.177**
	(0.05)
$\mathbb{1}_{PostMarch2020}$ × Less than 25 years old	0.208**
	(0.06)
$\mathbb{1}_{PostMarch2020}$ × Between 25 and 34 years old	0.258***
	(0.04)
$\mathbb{1}_{PostMarch2020}$ × Between 35 and 54 years old	0.179***
	(0.03)
Number of Obs.	48,928
R-squared	0.953

Notes: Standard errors (in parenthesis) are clustered at NUTS II and time period (month, year) level.

Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

These results are consistent with the difficulties younger workers face to achieve job stability in Portugal. According to OECD data, the country is an outlier in terms of the proportion of non-permanent contracts among the youth: 64% of workers between 15 and 24 years old were under a temporary contract in 2018.[17] Younger workers are also less unionized than older ones (Portugal and Vilares, 2013) and more vulnerable to precarious working conditions.

Table 5 shows the heterogeneity in terms of education levels. The comparison group are individuals with higher education, which experienced an increase of 23.9% in unemployment after March 2020. The impact of the crisis was 17.5% higher for individuals with upper secondary education, 15% for individuals with lower secondary education and 9.6% for individuals with basic education than for those with higher education. On the contrary, the difference between those with primary education or less and the comparison group is not statistically significant.

Table 5: Triple DD on unemployment, by education level

Dep. Var.:	Unemployment
	(1)
$\mathbb{1}_{PostMarch2020}$	0.239**
	(0.07)
$\mathbb{1}_{PostMarch2020}$ × Primary Education or less	-0.037
	(0.03)
$\mathbb{1}_{PostMarch2020}$ × Basic Education	0.096**
	(0.02)
$\mathbb{1}_{PostMarch2020}$ × Lower Secondary Education	0.150***
	(0.03)
$\mathbb{1}_{PostMarch2020}$ × Upper Secondary Education	0.175***
	(0.02)
Number of Obs.	61,156
R-squared	0.930

Notes: Standard errors (in parenthesis) are clustered at NUTS II and time period (month, year) level.

Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

In Portugal, workers with secondary education are usually associated with jobs in non-essential industries that can't be performed from home, thus being in a more vulnerable position during this crisis. A study by Statistics Portugal shows that during the second quarter of 2020,

[17] For more details, see Figure 2.

4.7% of the employed population with lower secondary education or less was working from home compared with 53.8% of the population with higher education degrees (INE, 2020).

6 Dual labor market and the Covid-19 crisis

Given the characteristics of the Portuguese labor market described in Subsection 3.1, in this section we explore the possibility that municipalities with a higher share of temporary contracts are more impacted by the crisis and we disentangle the effects to understand which groups suffer the most. The estimates of ρ_2 from (3) for each dimension are presented in Table 6.

Table 6: Share of temporary contracts and the Covid-19 crisis

Dep.Var.:	Unemployment					
Dimension:	**Gender**		**Age**			
	Men	Women	< 25	25-34	35-54	> 55
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}_{PostMarch2020} \times ShareTemporary_i$	0.854**	0.877*	1.255**	1.103**	0.836**	0.524*
	(0.22)	(0.34)	(0.35)	(0.36)	(0.29)	(0.19)
Number of Obs.	12,232	12,232	12,232	12,232	12,232	12,232
R-squared	0.970	0.975	0.939	0.960	0.971	0.983
Dimension:	**Education**					
	Primary or less	Basic	Lower Sec.	Upper Sec.	Higher	
	(7)	(8)	(9)	(10)	(11)	
$\mathbb{1}_{PostMarch2020} \times ShareTemporary_i$	0.739*	0.780*	0.986**	0.886**	0.702**	
	(0.29)	(0.31)	(0.30)	(0.24)	(0.22)	
Number of Obs.	12,232	12,232	12,232	12,232	12,232	
R-squared	0.968	0.961	0.962	0.969	0.970	

Notes: Standard errors (in parenthesis) are clustered at NUTS II and time period (month, year) level. Significance levels: * p < 0.10, ** p < 0.05, *** p < 0.01

As expected, municipalities with a higher share of workers in temporary contracts experience a bigger shock to unemployment. While the sign of the effect is positive for all dimensions, the magnitude is not the same for all groups, with some being more affected than others.

Our findings show that, on average, an increase of 1% in the share of temporary contracts increases unemployment by 0.85 p.p. for men and 0.88 p.p. for women, suggesting a relatively similar impact across genders. Evidence also shows that younger individuals in municipalities

with a higher share of temporary contracts are more affected by the crisis. The coefficient estimates imply that a jump of 1% in the municipal share of temporary contracts causes a rise of 1.26 p.p. in unemployment for the group with less than 25 years old and 1.1 p.p. for the group between 25 and 34 years old, on average. Our estimates reflect exactly the incidence of the share of temporary employment present in the OECD data, with a decreasing monotonicity of the impact in terms of age and a similar effect for both genders. This is of extreme relevance, as even thought we use the total share of temporary contracts in each municipality as an indicator, we are able to pinpoint exactly which groups are more exposed to this crisis.

The effects on education follow an inverted U-shaped pattern. In municipalities with a higher share of temporary contracts, Covid-19 impacts less severely individuals with primary education or less and individuals with higher education. The sharper impact falls on the those with lower secondary education, for which a 1% increase in the municipal share of temporary contracts causes a rise of 0.99 p.p. in unemployment, on average.

7 Conclusion

In March 2020, the Coronavirus pandemic hit the world economy and rapidly turned into the biggest shock since the Second World War. Labor markets are especially vulnerable to this crisis and, given the magnitude of the shock, it is critical to understand its consequences in order to produce effective policy responses.

We take advantage of administrative data from *Instituto do Emprego e Formação Profissional* covering the universe of unemployed individuals registered at job centers from October 2016 to August 2020. Using event study difference-in-differences, we rely on the assumption that, in absence of the Covid-19 outbreak, the monthly evolution of year-on-year growth rates between March/August 2020 and March/August 2019 would have been the same as the evolution of the geometric mean of the YoY change in the same period of the previous 3 years.

We document a large causal impact of the pandemic on registered unemployment, with YoY growth rate increases from 27 percentage points in April up to 39 and 38 percentage points in June and July, respectively. New job placements were also severely affected, i.e., the YoY growth rates were below pre-crisis levels from March to August, with a negative peak of 63 percentage points in April.

The shock was not homogeneous across demographic groups. We perform a triple difference-in-differences analysis and show that the impact on unemployment is more pronounced for individuals of lower age and middle education. We find no evidence of gender differences unemployment-wise, but women are more affected in terms of new job placements, with an additional decline of 17.5% when compared to men. We also find evidence that dismissals and end of temporary jobs were the main reasons for new unemployment registrations, while there was a significant discouragement of inactive workers to rejoin the labor force between March and July.

Finally, our findings suggest that the impact of Covid-19 on unemployment is higher in municipalities where temporary work is more prevalent. The most affected individuals are those with less than 25 years old, between 25 and 34 years old and with lower secondary education, for which a 1% increase in the municipal share of temporary contracts causes a rise of 1.26, 1.1 and 0.99 percentage points in unemployment, respectively.

This paper is part of the growing literature on the effects of the Coronavirus pandemic and is one of the first to study the causal impact on the labor market in Portugal. That being said, one should note that the results displayed focus on the short-run effects. Further research on the long-term effects of Covid-19 will be of extreme relevance, as remote work and virtual environments may lead to a structural change in work organization, with important (and unknown) consequences for employment.

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A Derivation of the causal impacts

Departing from Equation 1, we can write the coefficients $\hat{\beta}_m$ as an estimate of a function of growth rates:

$$ln\left(\sqrt[3]{\frac{1+g_m^{20,19}}{1+g_2^{20,19}}\frac{1+g_m^{20,18}}{1+g_2^{20,18}}\frac{1+g_m^{20,17}}{1+g_2^{20,17}}}\right)$$

where $g_m^{20,19}$, $g_m^{20,18}$ and $g_m^{20,17}$ represent the YoY growth rate of the outcome variable in month m, where $m \in \{3,...,8\}$, from 2019, 2018 and 2017 to 2020, respectively. This expression can be further simplified to:

$$ln\left(\frac{1+g_m^{20,19}}{1+g_2^{20,19}}\sqrt[3]{\frac{\left(1+g_m^{19,18}\right)^2}{\left(1+g_2^{19,18}\right)^2}\frac{1+g_m^{18,17}}{1+g_2^{18,17}}}\right)$$

with $g_m^{19,18}$ representing the YoY growth rate of month m from 2018 to 2019 and $g_m^{18,17}$ representing the YoY growth rate from 2017 to 2018. As such, to estimate the causal impact of the pandemic crisis on the gross YoY growth rates $\frac{1+g_m^{20,19}}{1+g_2^{20,19}}$, we can compute:

$$\vartheta_m = Exp(\hat{\beta}_m) \times \sqrt[3]{\frac{\left(1+g_2^{19,18}\right)^2}{\left(1+g_m^{19,18}\right)^2}\frac{1+g_2^{18,17}}{1+g_m^{18,17}}}$$

Hence, we use the growth rates observed in the data to correct for any possible seasonal differences between the YoY growth rates of each month m and February. Finally, we estimate the net YoY growth rates by computing $(1+g_2^{20,19})(\vartheta_m - 1)$, with which we obtain the net impact of the crisis on the outcome variables in percentage points.

B Additional Tables

Table B.1: Descriptive statistics: Share of temporary contracts

Variable	Obs.	Mean	St. Deviation	Minimum	Maximum
Share of temporary contracts (2018)	12232	0.31	0.11	0	0.69

Table B.2: NUTS II: magnitudes

Dep.Var.:	Unemployment									
	Norte		**Centro**		**Lisboa VT**		**Alentejo**		**Algarve**	
	P.E.	Eff. (pp)	P. E.	Eff. (pp)	P.E.	Eff. (pp)	P.E.	Eff. (pp)	P.E.	Eff. (pp)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Mar-20	0.079	6.77	0.099	9.24	0.126	11.88	0.126	14.18	0.284	33.22
	(0.75)		(0.9)		(0.98)		(0.99)		(6.9)	
Apr-20	0.210	19.15	0.206	19.39	0.323	35.03	0.257	27.88	0.683	101.17
	(1.99)		(1.93)		(2.51)		(1.99)		(9.46)	
May-20	0.284	27.18	0.274	27.25	0.413	46.09	0.330	35.57	0.963	166.11
	(2.59)		(2.48)		(3.16)		(2.5)		(11.02)	
Jun-20	0.300	27.03	0.287	27.01	0.442	49.01	0.371	39.22	1.042	186.71
	(2.7)		(2.56)		(3.43)		(2.85)		(10.97)	
Jul-20	0.305	28.04	0.292	28.64	0.462	50.06	0.325	31.27	0.994	179.54
	(2.74)		(2.59)		(3.66)		(2.57)		(11.26)	
Aug-20	0.296	26.71	0.280	25.62	0.448	46.50	0.322	30.92	0.889	146.78
	(2.78)		(2.64)		(3.71)		(2.72)		(12.12)	

Notes: t-statistics in parenthesis. Point estimates are the coefficients β_m from (1). The effect is given by $(1+g_2^{20,19})(\vartheta_m - 1)$. Please refer to Appendix A for more information.

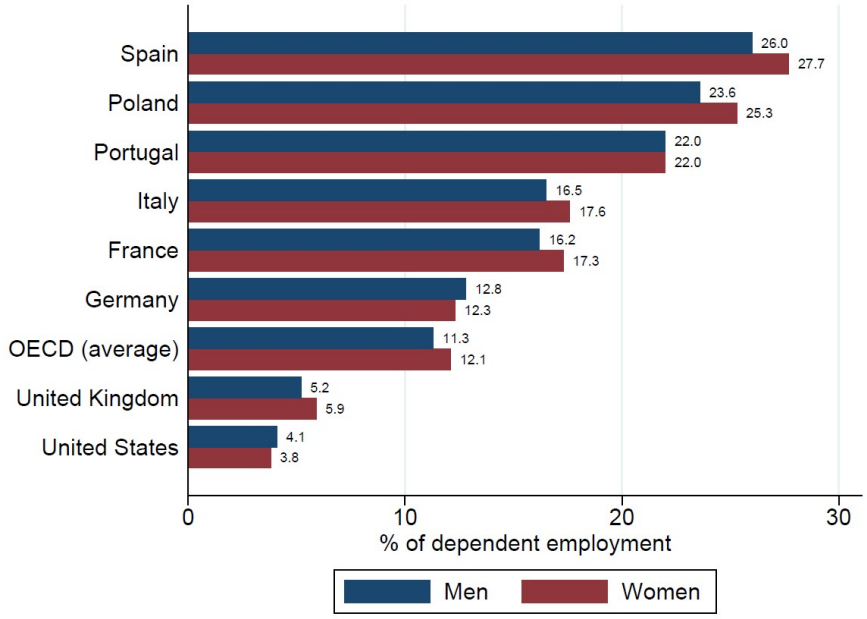
Table B.3: Motives for registration: magnitudes

Dep.Var.:	New Unemployment					
	Dismissed from previous job		**Voluntarily quit previous job**		**Mutual Agreement Dismissal**	
	P.E.	Eff. (pp)	P. E.	Eff. (pp)	P.E.	Eff. (pp)
	(1)	(2)	(3)	(4)	(5)	(6)
Mar-20	0.654	112.52	-0.126	-6.10	-0.004	3.99
	(9.45)		(-3.85)		(-0.07)	
Apr-20	1.145	215.70	-0.031	-6.37	0.179	26.08
	(22.62)		(-0.57)		(4.98)	
May-20	0.513	72.80	-0.324	-23.31	-0.062	-10.59
	(9.4)		(-8.94)		(-1.49)	
Jun-20	0.322	55.72	-0.147	0.53	-0.110	-7.79
	(4.49)		(-3.57)		(-2.62)	
Jul-20	0.301	33.27	-0.125	-14.68	-0.080	-8.96
	(8.68)		(-1.71)		(-1.08)	
Aug-20	0.296	40.17	-0.148	-6.25	-0.002	-2.55
	(5.24)		(-2.66)		(-0.03)	
	End of temporary job		**Former inactive worker**		**Self-employed**	
	P.E.	Eff. (pp)	P. E.	Eff. (pp)	P.E.	Eff. (pp)
	(7)	(8)	(9)	(10)	(11)	(12)
Mar-20	0.424	69.58	-0.424	-25.97	0.078	24.58
	(8.73)		(-3.41)		(0.59)	
Apr-20	0.675	87.26	-0.932	-53.48	0.392	50.53
	(13.14)		(-13.89)		(1.94)	
May-20	0.455	58.00	-0.462	-29.07	0.148	18.40
	(12.34)		(-5.22)		(0.91)	
Jun-20	0.274	36.88	-0.136	-2.25	0.199	37.38
	(5.03)		(-1.52)		(1.79)	
Jul-20	0.220	19.64	-0.131	-16.53	0.067	11.82
	(3.37)		(-1.96)		(0.42)	
Aug-20	0.186	22.94	0.065	13.40	0.165	27.36
	(3.19)		(0.65)		(1.17)	

Notes: t-statistics in parenthesis. Point estimates are the coefficients β_m from (1). The effect is given by $(1+g_2^{20,19})(\vartheta_m - 1)$. Please refer to Appendix A for more information.

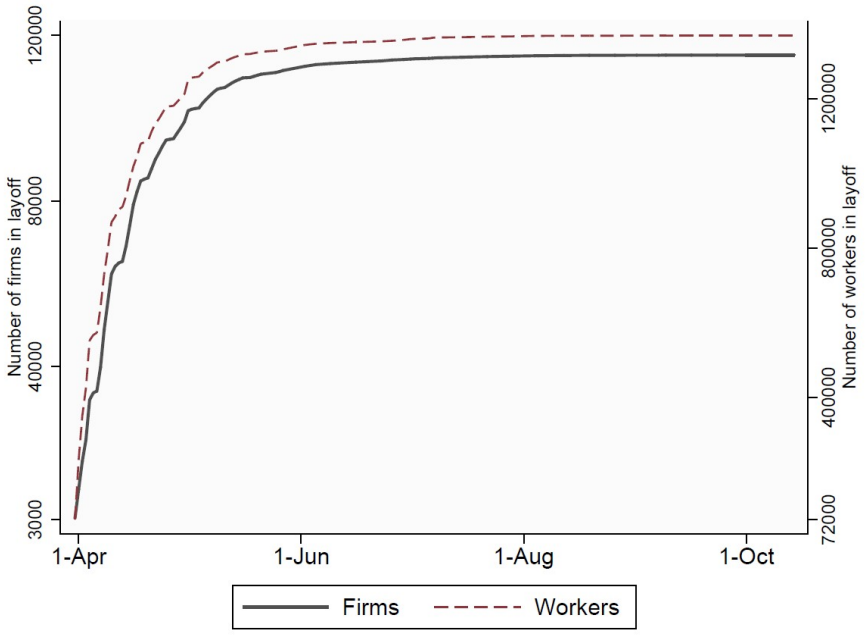
C Additional Figures

Figure C.1: Share of temporary employment (% of dependent employment) by gender, 2018



Source: OECD

Figure C.2: Total number of firms and workers under temporary *layoff*



Source: GEP/MTSSS

Figure C.3: Covid-19 pandemic in Portugal: timeline of main events

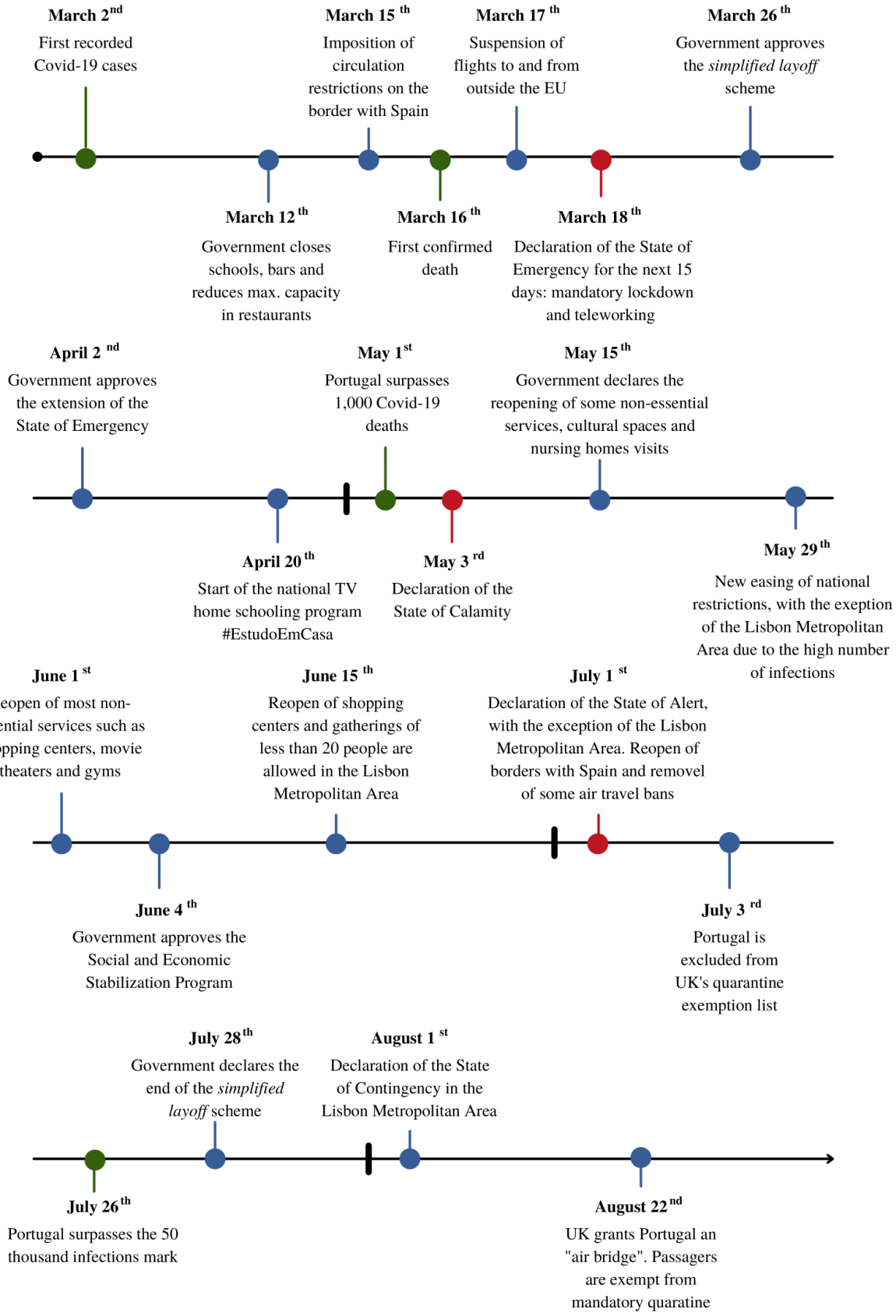
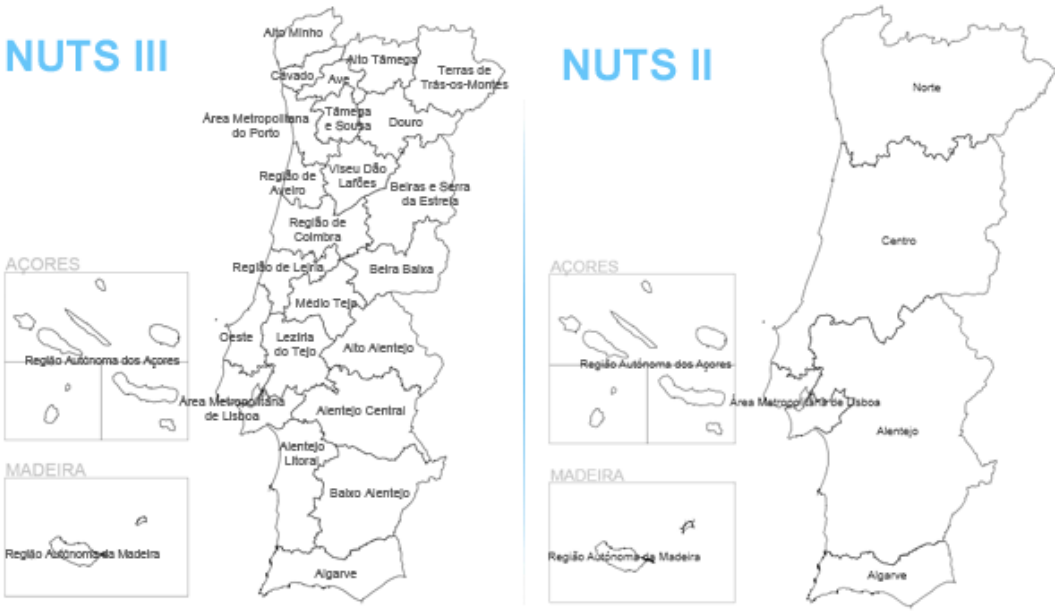
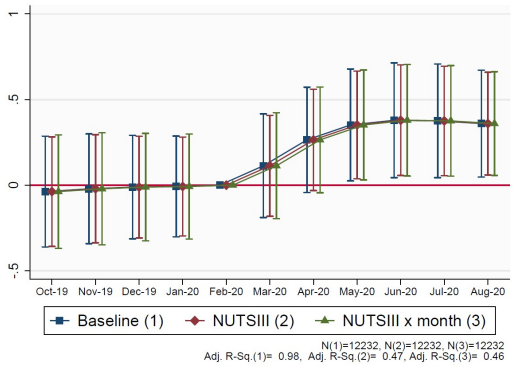


Figure C.4: Portuguese territory division – NUTS II and NUTS III

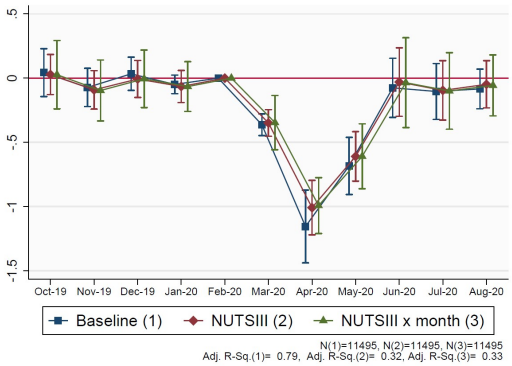


Source: PORDATA

Figure C.5: Event study aggregate effects: different fixed effects

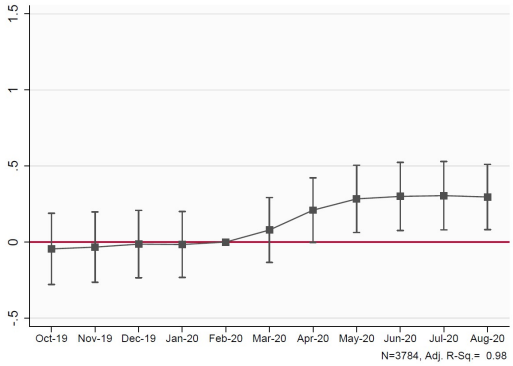


(a) Unemployment

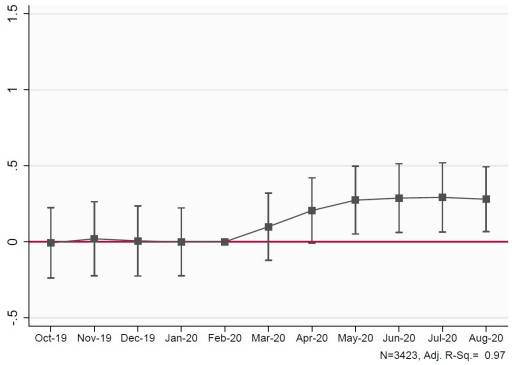


(b) New Job Placements

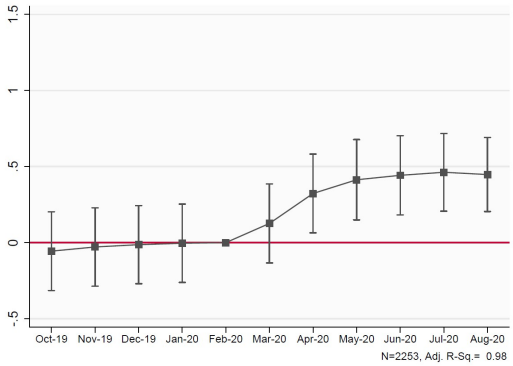
Figure C.6: Event study aggregate effects: unemployment by NUTS II region



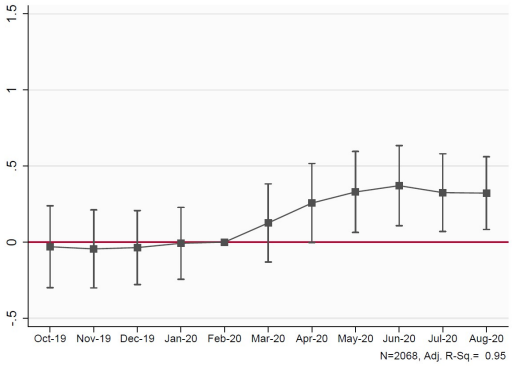
(a) Norte



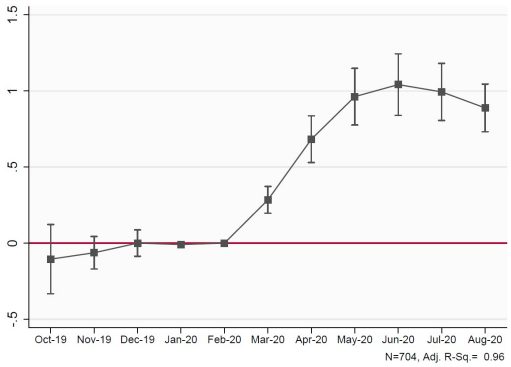
(b) Centro



(c) Lisboa e Vale do Tejo



(d) Alentejo



(e) Algarve

Notes: Standard errors are clustered at the municipality (instead of NUTS II) and time period level.

Figure C.7: Average new unemployment between March and August (% of total new registrations) by motive of registration