THE UNEQUAL CONSEQUENCES OF JOB LOSS ACROSS COUNTRIES

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Antoine Bertheau, Edoardo Maria Acabbi, Cristina Barceló, Andreas Gulyas, Stefano Lombardi and Raffaele Saggio

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Antoine Bertheau

UNIVERSITY OF COPENHAGEN

Edoardo Maria Acabbi

UNIVERSIDAD CARLOS III DE MADRID

Cristina Barceló

BANCO DE ESPAÑA

Andreas Gulyas

UNIVERSITY OF MANNHEIM

Stefano Lombardi

VATT INSTITUTE FOR ECONOMIC RESEARCH HELSINKI, IFAU UPPSALA, IZA AND UPPSALA CENTER FOR LABOR STUDIES

Raffaele Saggio

UNIVERSITY OF BRITISH COLUMBIA AND NBER

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Abstract

We document the consequences of losing a job across countries using a harmonized research design applied to seven matched employer-employee datasets. Workers in Denmark and Sweden experience the lowest earnings declines following job displacement, while workers in Italy, Spain, and Portugal experience losses three times as high. French and Austrian workers face earnings losses somewhere in between. Key to these differences is that Southern European workers are less likely to find employment following displacement. Loss of employer-specific wage premiums explains a substantial portion of wage losses in all countries.

Keywords: job loss effects, wage dynamics, labor turnover, layoffs, matched employer-employee dataset.

JEL classification: J30, J63, J64.

Resumen

En este artículo se estudian y se comparan las consecuencias de perder el empleo en distintos países, utilizando un diseño de investigación armonizado y coordinado aplicado a datos administrativos de la Seguridad Social en siete países europeos. Tras la pérdida del empleo, son los trabajadores de Dinamarca y Suecia los que experimentan las disminuciones de ingresos más bajas, mientras que los trabajadores de Italia, España y Portugal sufren pérdidas tres veces más altas. Los trabajadores de Francia y Austria se enfrentan a pérdidas de ingresos intermedias entre ambos grupos de países. La clave para estas diferencias es que los trabajadores en el Sur de Europa son menos proclives a encontrar un empleo tras una terminación involuntaria del empleo. La pérdida de las primas salariales específicas que pagan los empleadores a todos sus trabajadores explica una parte sustancial de las pérdidas salariales en todos los países.

Palabras clave: impacto de la pérdida de empleo, dinámica de los salarios, rotación laboral, despidos, datos administrativos.

Códigos JEL: J30, J63, J64.

1 Introduction

Losing a job entails lasting negative consequences for a worker (Jacobson et al., 1993). This finding is among the most influential in labor economics because it provides a simple test of how well labor markets are functioning. More efficient labor markets reallocate workers more quickly and generate lower earnings losses after job displacement. Comparing the consequences of job loss across labor markets might therefore reveal which ones are functioning better than others and why.

However, such comparisons remain challenging. Meta-analyses from existing research are often clouded by differences in the sample selection, the definition of the displacement event, and the econometric specifications. These discrepancies tend to deliver different estimates on the impact of job loss and thus complicate the interpretation of competing results reached by different studies.

This paper addresses these challenges by building a harmonized dataset that combines matched employer-employee administrative registers from almost three decades and seven countries characterized by a wide range of labor market institutions (Austria, Denmark, France, Italy, Portugal, Spain, and Sweden). Our focus is on assessing the labor market effects of job displacements, defined as the permanent loss of a long-term job due to mass layoffs or establishment shutdowns for economic reasons. By adopting a common research design, a common definition of the displacement event and identical sample selection criteria, this work provides the first comparable estimates on the labor market consequences of job displacement across countries. These harmonized data and empirical methods are then used to disentangle the sources of displaced workers' pay losses both within and between countries.

The key insight of this paper is that the labor market consequences of losing a job are vastly different across Europe. Scandinavian countries experience the lowest earnings losses: five years after job displacement, earnings are about 10% lower than their pre-displacement level. By contrast, the earnings of displaced workers from Southern Europe (Italy, Spain, and Portugal) are around 30% lower than their pre-displacement levels. Austrian workers experience earnings losses in between those of the Scandinavian and Southern European countries, while French workers experience losses more similar to those of Scandinavian workers.

Interestingly, existing evidence leads to drastically different conclusions from ours. For instance, by comparing Leombruni et al. (2013) to Bennett and Ouazad (2019), one would conclude that Italian displaced workers suffer lower earnings losses than Danish ones. This highlights the importance of using a harmonized research design when conducting a cross-country analysis on the consequences of job loss.

Next, we show that a large part of the cross-country differences in earnings losses is due to different responses on the extensive margin. The probability of being non-employed five years following displacement is 20 percentage points larger for displaced workers than for non-displaced ones in Spain, Portugal, and Italy. The same estimate is only around 5 percentage points in Sweden, Denmark, and France, while it is roughly 9 percentage points in Austria. A key explanation for our findings is that a significant fraction of displaced workers from Italy, Portugal, and Spain permanently withdraws from the labor market following the displacement event. This effect appears more pronounced among women, a result that echoes the enormous differences in female employment rates observed within Europe (e.g., Christiansen et al., 2016).

After conditioning on re-employment, we find that losses in daily wages for displaced workers are less dispersed when compared to earnings, but still relatively heterogeneous, ranging from about 4% (Denmark) to 17% (Spain) five years after displacement. We then analyze the extent to which transitions from better- to worse-paying firms contribute to displaced workers' wage losses and whether these transitions differ across nations. We find that employer-specific wage policies explain a remarkably large share of the observed wage losses for all countries. The share ranges from around 35% for Spain to more than 95% for Portugal. These results are thus in line with Schmieder et al. (2020) and Gulyas and Pytka (2020), who point to the importance of changes in employers' wage premiums in driving long-term wage losses from job displacement.

The remainder of the paper is structured as follows. Section 2 describes the data and the empirical methods used in the main analysis. Section 3 presents evidence on the heterogeneous impact of job loss across countries. Section 4 analyzes potential factors that can account for the cross-country differences depicted in Section 3. Section 5 concludes.

2 Harmonized Research Design

Do earnings losses due to job displacement differ across countries, and if so, by how much? Table A.1, which summarizes selected papers on job displacement, shows that this question is not readily answered by comparing existing studies. In particular, earnings loss estimates for a specific country tend to vary across papers. For example, available earnings loss estimates for France vary from 16% to 36%. The reason for these different estimates is that studies on the effects of job loss use different definitions of the displacement event, sample restrictions, control group, and time periods.

These differences in the research design cloud cross-country comparisons. For ex-

ample, by comparing Leombruni et al. (2013) to Bennett and Ouazad (2019), one would conclude that Danish displaced workers face higher earnings losses than Italian workers. But the use of different sample restrictions (displaced workers' employers must have at least 30 employees versus no restriction on firm size) and different definitions of the mass layoff event (plant closure versus decline in firm size by over 30%) could also be driving the differences in the estimates. The definition of the control group is another important feature that tends to differ across papers. Some studies, like Jacobson et al. (1993) and Lachowska et al. (2020), impose that control workers remain *always* employed at the same employer. Table A.2 shows that imposing this tenure restriction on control workers in our analysis can double the estimated earnings losses from job displacement.

To overcome these limitations, we build a harmonized cross-country-matched employer-employee dataset by combining high-quality administrative registers from Austria, Denmark, France, Italy, Portugal, Spain, and Sweden. In our analysis we make sure to use the same variable definitions, sampling restrictions, and research design for each country. We use the resulting dataset to study job loss events due to mass layoffs occurring between at least the 1990s and the 2010s.[1] Specifically, we adopt an event study design akin to Schmieder et al. (2020) where workers displaced through a mass layoff are matched to similar workers who do not experience such an event. As detailed below, we select comparison (control) workers through propensity score matching and compute dynamic job loss effects by following workers up to five years before and after the job displacement event.

2.1 Sample Selection and Definition of Main Outcomes

Sample selection. To limit the influence of early retirement programs, we select workers who are at most 50 years old in the year preceding the job displacement event. We consider stable jobs by sampling workers with at least three years of tenure with their main employer in the year preceding the job displacement event. The unit of analysis for the employer is the establishment.[2] Moreover, to identify exogenous job separations due to mass layoffs, we further restrict our sample to workers employed in establishments with at least 50 employees at the end of the pre-displacement year. Identical sampling restrictions are applied to the control workers as described below.

[1] For Spain, data on job displacements are available from 2007 onward. Table A.4 shows that the extent of information available is comparable across countries. Country-specific details concerning the construction of the matched employer-employee dataset are reported in Appendix C.

[2] The main employer is the establishment at which the worker's annual earnings are largest.

Definition of main outcomes. We define earnings, deflated to 2010 EUR, as the sum of yearly labor earnings (possibly from different employers) before taxation. Labor earnings include overtime, bonuses, and severance payments when available. Wages are defined as daily earnings from the main employer and are computed as labor earnings over days worked. We do not have information on hours worked for all countries (see Table A.4). A person is defined as employed if they have any positive labor earnings during the year. If the person is non-employed in a given year, we impute zero earnings for that particular year as is typically done in the job displacement literature (e.g., Schmieder et al., 2020).

2.2 Definition of Treated and Control Workers

Treatment group. Let t^* be the year of a job displacement event. We define displaced/treated workers as those satisfying the following two conditions that seek to capture exogenous and permanent job separations: (i) workers separate from their main employer in t^*, and (ii) employment at the current establishment drops by at least 30% in t^*.[3]

Restriction (ii) is aimed at alleviating concerns about mischaracterizing voluntary separations as layoffs.[4] The 30% threshold is standard in the mass layoff literature (see, e.g., Davis and Von Watcher, 2011; Flaaen et al., 2019) and includes plant closures. We additionally use explicit information on the reason for job separation (layoff versus voluntary resignation) whenever the information is available.[5]

Control group. A potential control worker is someone who does not *concurrently* satisfy both the conditions described above that are used to define a treated worker. To match each displaced worker to one worker selected from the pool of potential control workers, we partition the data by cells defined by calendar year, gender, and industry of the displaced workers. Within each cell, we then estimate a propensity score model

[3] To focus on permanent job separations, we drop from the analysis (i.e., from both treatment and control group) workers who are recalled by their main employer within five years from displacement. Moreover, to avoid classifying mergers or domestic outsourcing events as mass layoffs, we also exclude displacement events where more than 20% of workers jointly move to another firm.

[4] An analysis based on mass layoffs permits us to study plausibly exogenous separations but has the drawback that it selects only a subset of involuntary separations. However, we find that in general the share of workers subject to a mass layoff is relatively comparable across countries (see Table 1), suggesting that the differential representativeness of mass layoff workers across countries is not a primary concern for our results.

[5] This information is available for Spain and Italy. The main results are unaffected when we do not use the reason for job separation for these countries, and thus we only focus on mass layoffs identified from administrative data (see Figure A.4). This result further suggests that focusing only on separations generated from mass layoffs measured from administrative data delivers representative estimates on the effects of job displacement (see the previous footnote and Flaaen et al., 2019).

via probit on the likelihood of being displaced. The model includes earnings measured in $t^* - 2$ and $t^* - 3$, age, tenure, and employer size in $t^* - 1$. We also match control and treated workers by contract type (temporary versus permanent) and full-time status, both measured at $t^* - 1$, whenever this information is available. We then apply a 1:1 nearest neighbor matching algorithm without replacement to assign one control worker to each treated worker. As is standard in the literature (e.g., Schmieder et al., 2020), the chosen control workers might be employed at a mass layoff firm but cannot experience a job displacement event themselves. See Appendix B for further details.

2.3 Summary Statistics

Table 1 presents descriptive statistics of the matched sample along with sample sizes.[6] For each country in the study, the matching algorithm returns treated and comparison workers with well-balanced observable characteristics. In our sample, workers are, on average, between 33 and 38 years old, and between 35% and 48% are women. Treated and control workers are employed at the same employer for an average 5 to 10 years, depending on the country. Most workers work full time (81% to 89%) and on a permanent employment contract (6% to 15% have a fixed-term employment contract).

Comparing across countries, we observe that most variables are relatively balanced. However, some differences exist, such as in length of tenure. Table 1 further shows the percentage of workers involved in a mass layoff in a given year across the countries analyzed. According to this measure, the share of workers undergoing mass layoffs and fulfilling our sample restrictions is around 2% per year for most countries in our sample. Given that the definition of mass layoffs is common across countries, the fact that treated workers represent very similar shares of our samples further supports the validity of our analysis.

[6] In France, Italy, and Spain we do not have access to the universe of administrative records but rather to a random sample of individuals with all their employment spells.

Table 1: Descriptive Statistics, Matched sample

	Denmark		Sweden		Italy		Spain		Austria		France		Portugal	
	treated	control	treated	control	treated	control	treated	control	treated	control	treated	control	treated	control
Panel A: Data structure														
Years of job loss	1983–2017		1994–2016		1993–2016		2007–2019		1987–2018		1994–2016		1992–2017	
Universe of Data	YES		YES		NO (6.5%)		NO (4%)		YES		NO (8%)		YES	
Panel B: Worker characteristics														
Earnings in $t^* - 3$ (EUR Th.)	40.3 (23.9)	40.2 (23.7)	32.8 (15.9)	32.8 (15.8)	23.1 (16.3)	23.3 (16.2)	22.2 (9.2)	22.1 (8.9)	29.3 (11.3)	29.3 (11.6)	28.6 (17.0)	28.8 (18.1)	14.6 (10.8)	14.7 (11.2)
Age	33.7 (9.0)	34.2 (9.0)	36.6 (7.9)	36.7 (7.9)	37.7 (7.6)	37.7 (7.8)	38.2 (6.8)	38.0 (6.9)	38.2 (7.8)	38.1 (7.8)	37.3 (7.5)	37.5 (7.6)	35.8 (7.6)	35.8 (7.7)
Female	0.37	0.37	0.35	0.35	0.40	0.40	0.41	0.41	0.42	0.42	0.36	0.36	0.48	0.48
Tenure	5.8 (3.8)	5.8 (3.8)	7.3 (4.9)	7.3 (4.9)	4.7 (1.4)	4.7 (1.3)	6.7 (3.9)	6.6 (3.8)	7.3 (4.3)	7.3 (4.3)	6.6 (5.1)	6.6 (5.0)	10.4 (7.1)	10.4 (7.2)
Temporary contract	–	–	–	–	0.06	0.06	0.14	0.15	–	–	0.09	0.09	0.13	0.13
Full time	0.81	0.81	–	–	0.86	0.85	0.87	0.86	–	–	0.88	0.88	0.89	0.89
Panel C: Employer characteristics														
Industry:														
Manufacturing	0.38	0.38	0.42	0.42	0.36	0.36	0.26	0.26	0.47	0.47	0.44	0.44	0.53	0.53
Services	0.34	0.34	0.32	0.32	0.31	0.31	0.59	0.59	0.13	0.13	0.33	0.33	0.38	0.38
Other	0.28	0.28	0.25	0.25	0.33	0.33	0.15	0.15	0.41	0.41	0.23	0.23	0.09	0.09
Establishment size	369 (603)	344 (635)	387 (651)	382 (849)	364 (284)	359 (291)	342 (789)	361 (812)	323 (372)	308 (510)	320 (434)	342 (540)	334 (489)	322 (593)
% of workers involved in a displacement event	2.84		1.12		3.42		1.80		2.59		0.70		1.88	
No. Workers (th.)	201.91	201.91	97.36	97.36	66.28	66.28	14.71	14.71	55.89	55.89	28.66	28.66	170.79	170.79
No. Firms (th.)	7.09	10.04	6.04	15.04	22.64	28.22	13.25	13.70	1.14	5.85	8.66	19.31	7.96	44.98

Notes: Averaged worker and employer characteristics in the matched sample, with t^* denoting the year of job loss for the treated group. Earnings are measured in $t^* - 3$, and all other variables in $t^* - 1$. The industry groups were matched at more disaggregated country-specific level but have been re-aggregated in the table for presentation purposes. Earnings are deflated and reported in 2010 Thousand Euros. Standard deviation in parentheses. *% of workers involved in a displacement event* reports the average share of displaced workers in relation to the overall number of workers in a given year.

3 The Consequences of Job Loss across Countries

This section documents the consequences of job loss across Europe in terms of total yearly earnings, employment, and log daily wages.

3.1 Event Study Model

Let i index a treated or matched control worker, t_i^* be the calendar year when the displacement event occurs, and k be the number of years since displacement. We estimate the following event study model separately for each country:

$$y_{it} = \alpha_i + \lambda_t + \sum_{k=-5}^{k=5} \gamma_k \mathbf{1}\{t = t_i^* + k\} + \sum_{k=-5}^{k=5} \theta_k \mathbf{1}\{t = t_i^* + k\} \times \text{Displaced}_i + X_{it}'\beta + r_{it}, \tag{1}$$

where y_{it} measures our dependent variable, which are total yearly earnings, employment status, or log daily wages in year t; $Displaced_i$ is an indicator variable equal to one for treated workers who lose their job in a displacement event; and X_{it} includes age squared. The worker fixed effects α_i control for time-invariant worker characteristics, and λ_t are calendar year fixed effects. Under the assumption of parallel trends between the treated and control units, the coefficients of interest, θ_k, capture the causal effect of job loss at event time k. The coefficients $\{\theta_k\}$ are normalized relative to θ_{-3}. Standard errors are clustered at the worker level.

3.2 The Unequal Consequences of Job Loss across Countries

Figure 1 shows the effects of job displacement across countries, while Table 2 reports the point estimates and standard errors observed at $k = 1$ and $k = 5$. The figure reveals substantial cross-country heterogeneity regarding the impact of job loss. Starting from labor market earnings, Panel (a) shows that despite large and persistent effects of job displacement in all countries, workers displaced in Northern European countries suffer substantially lower losses in total earnings. One year after displacement, post-displacement earnings are 20% lower compared to earnings measured in the pre-displacement years. Remarkably, this effect is twice as large in Southern Europe. Five years after displacement, Northern European workers still suffer a 10% loss in total earnings compared to a 30% loss for their Southern European counterparts. Austrian workers face earnings losses somewhere in between, while French workers have earnings losses more similar to what observed in the Scandinavian countries.

Panel (b) further highlights that a large part of the cross-country differences is driven by different responses on the extensive margin. Five years after displacement,

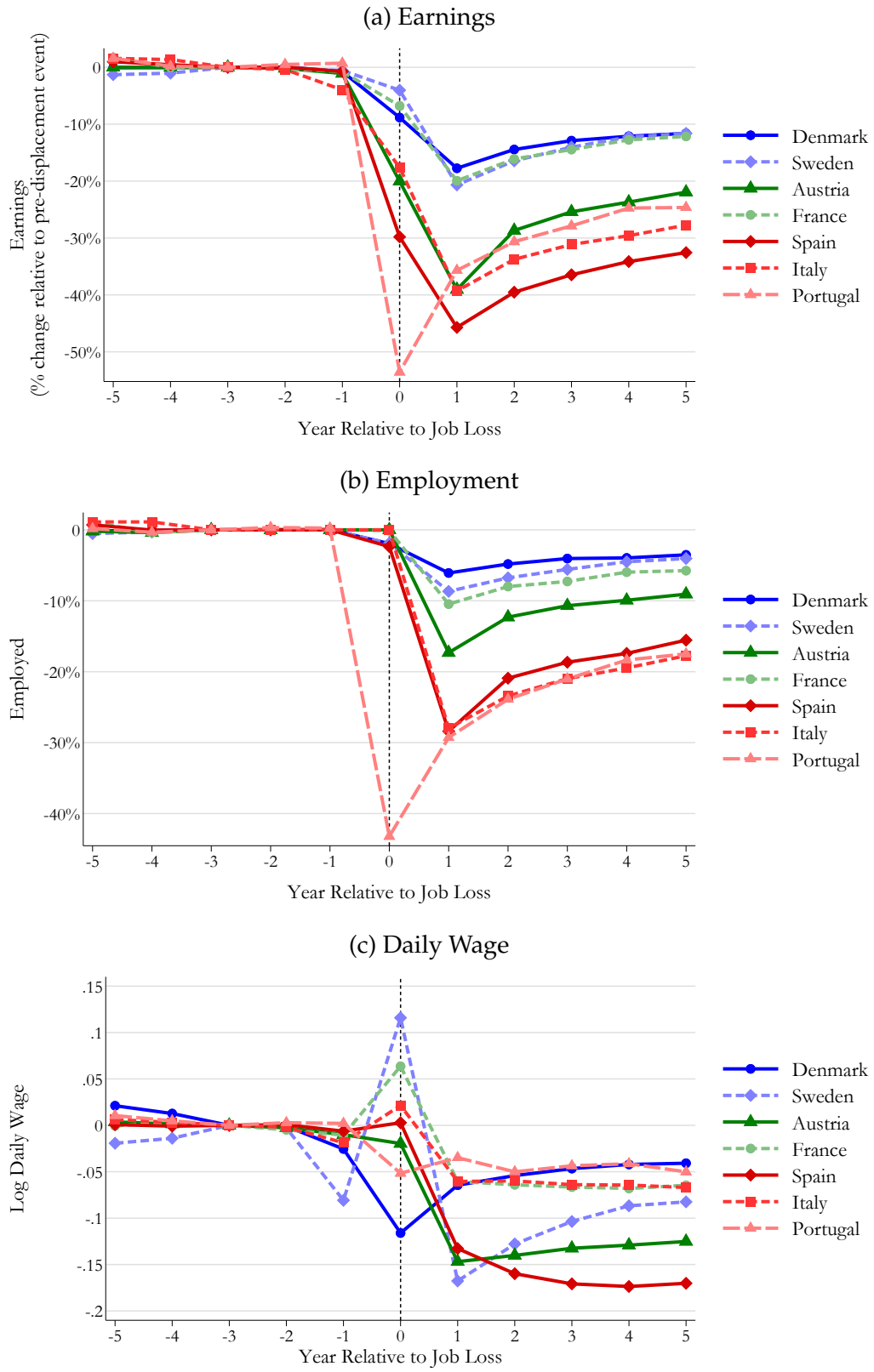
the probability of being non-employed is approximately 20 percentage points higher for displaced workers in Italy, Spain, and Portugal relative to their respective control group.[7] Conversely, the effect on employment is much more attenuated and amounts to roughly 5 percentage points in Scandinavian countries as well as France. The employment effect in Austria is somewhere in the middle and amounts to about 10 percentage points. More generally, these estimates on employment align with an older literature that has found very heterogeneous employment dynamics across countries (see, e.g., Blanchard and Portugal, 2001; Nickell et al., 2005).

By contrast, wage losses, which are computed only for the subset of employed workers, are less dispersed across countries relative to what is observed for earnings. Yet, we still find a fair degree of heterogeneity also regarding the impact of job loss on wages.[8] Losses in wages are lowest in Denmark (around 4%) and largest in Spain with an effect that is about four times larger compared to what we observe in Denmark. In Table A.9 we find that, after accounting for selection on re-employment using insights from Lee (2009), the cross-country heterogeneity in wage losses appears consistent with our main results on earnings displayed in Figure 1a.

[7] The pattern of the event study coefficients for employment in Portugal looks slightly different because its underlying matched employer-employee dataset (*Quadros de Pessoal*) only provides a snapshot of the labor market in October. Given our definition of displacement event, displaced workers in this country are thus employed by the long-term employer up to October of $t^* - 1$ but are always either non-employed or employed by a different employer in t^*. Shifting the event time for Portugal by one year does not qualitatively affect our main results.

[8] Panel (c) shows a spike in the wages during the job displacement year for some countries. This happens when the drop in days worked is larger than the relative loss in earnings, which typically occurs due to extra payments received by workers upon job displacement such as severance payments or accumulated leave time (see, e.g., Lachowska et al., 2020 for a similar pattern).

Figure 1: The Effect of Job Loss across Countries



Notes: The figure shows event study estimates of the job loss effects from equation (1). Estimates are relative to $t^* - 3$, where t^* is the job loss year. The coefficients in Panel (a) are re-scaled using average pre-displacement labor earnings. The outcome in Panel (b) is an indicator equal to one if a worker has at least one day of work in the corresponding year. See Appendix C for further details. Point estimates and standard errors are displayed in Table 2.

Figure A.1 shows that Italy is the only country with a remarkable time trend in the job loss effects, while Figure A.2 shows that, when estimating the effects of job displacement separately by men and women, the remarkable differences in earnings losses across countries remain unaltered.[9] Finally, using the estimates from Schmieder et al. (2020), Table A.6 shows that earnings losses in Germany are comparable to those observed in France and Austria.

All in all, when interpreting earnings losses as a proxy for how well labor markets are functioning, we obtain the clear conclusion that Northern European labor markets are more efficient in reallocating workers to new jobs, with limited earnings losses five years following the displacement event. By contrast, workers in Spain, Portugal, and Italy face significantly higher earnings losses due to displacement, which persist well after the job displacement event. Finally, wage losses, despite being less dispersed compared to earnings losses, are still quite diverse across Europe but without a clear north-south divide as the one observed for earnings.

4 Understanding the Effects of Job Loss across Countries

This section addresses the following questions that arise in light of the evidence shown in Section 3. First, are the differences in re-employment probabilities of displaced workers across countries driven by permanent withdrawals from the labor market or by the fact that displaced workers reallocate to very unstable jobs? Second, what is the role of employer-specific wage premiums in driving wage losses due to displacement, and is this role different across countries? Section 4.1 provides evidence concerning the first question, while Section 4.2 answers the last two.

4.1 Explaining Differences in Employment

Figure 2 displays the percentage of displaced workers who remain non-employed in a given year following the displacement event. To maximize comparability across countries, we focus on the cohort of workers displaced in the year 2010.[10] The results are also presented in table format in Table A.7. Figure 2a shows remarkably different patterns across countries. Only about 20% of displaced workers in Sweden, Denmark, and France were not able to find a new job in the year right after the displacement event. This fraction is much higher, between 30% and 40% for workers in Italy and

[9] Italian workers suffered earnings losses of around 25% in the 1990s but of 40% in the 2010s. Appendix C.4 shows that these larger earnings losses observed over time for Italy appears to be due to displaced workers being increasingly more likely to obtain lower-paying temporary jobs following job displacement, consistent with the findings of Woodcock (2020) for Germany.

[10] The results based on the full set of available mass layoff years are qualitatively similar.

Table 2: Job Loss Effects on Earnings, Employment, and Wages

	Earnings		Employment		Log daily wages	
Denmark						
$k = 1$	-17.74	(0.156)	-6.08	(0.074)	-0.06	(0.002)
$k = 5$	-11.61	(0.197)	-3.52	(0.092)	-0.04	(0.002)
Observations (th.)	4,295		4,295		3,701	
Sweden						
$k = 1$	-20.66	(0.244)	-8.67	(0.112)	-0.17	(0.003)
$k = 5$	-11.61	(0.342)	-4.04	(0.125)	-0.08	(0.004)
Observations (th.)	2,011		2,011		1,939	
Austria						
$k = 1$	-39.05	(0.246)	-17.31	(0.186)	-0.15	(0.002)
$k = 5$	-21.95	(0.297)	-9.07	(0.217)	-0.13	(0.002)
Observations (th.)	1,194		1,194		1,120	
France						
$k = 1$	-19.94	(0.434)	-10.47	(0.235)	-0.06	(0.003)
$k = 5$	-12.14	(0.630)	-5.75	(0.317)	-0.06	(0.004)
Observations (th.)	577		577		542	
Italy						
$k = 1$	-39.29	(0.384)	-27.97	(0.223)	-0.06	(0.002)
$k = 5$	-27.74	(0.503)	-17.74	(0.273)	-0.07	(0.003)
Observations (th.)	1,531		1,531		1,309	
Spain						
$k = 1$	-45.71	(0.551)	-28.40	(0.429)	-0.13	(0.005)
$k = 5$	-32.56	(0.672)	-15.55	(0.514)	-0.17	(0.006)
Observations (th.)	302		302		277	
Portugal						
$k = 1$	-35.67	(0.286)	-29.28	(0.156)	-0.03	(0.002)
$k = 5$	-24.63	(0.332)	-17.48	(0.176)	-0.05	(0.002)
Observations (th.)	3,484		3,484		2,688	

Notes: The table reports the coefficients θ_1 and θ_5 from the event study model (1) for each country. k denotes the years since displacement. The point estimates on earnings are re-scaled by the average earnings measured in the pre-displacement years, and the coefficients on earnings and employment are multiplied by 100. Standard errors are reported in parentheses and are clustered at the individual level. The number of person-year observations is in thousands.

Spain, and is even higher in Portugal. Over time, these differences do not converge. The figure highlights that between 15% and 25% of workers in Spain, Italy, and Portugal never re-entered the labor market five years post displacement.

Interestingly, we detect a similar pattern while computing the hazard rates for the sample of displaced workers who *eventually* found a job within five years from displacement (see Figure 2b). For instance, while in France only 5% of returning displaced workers did not enter the labor market within two years from displacement, in Portugal this fraction is almost 30%. More generally, according to Figure 2b, the non-employment duration among displaced workers who eventually returned to the labor market remains significantly longer among Southern European displaced workers.

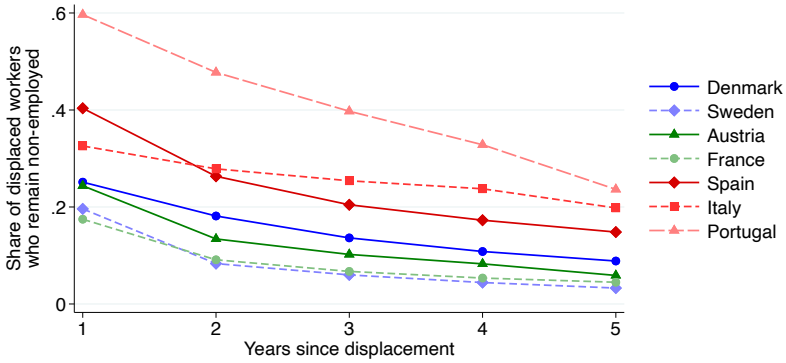
To quantify the overall importance of permanent displacement from the labor market in driving our effects on employment, we estimate equation (1) using as an outcome a dummy equal to one if worker i is not employed in year t and remains non-employed in all subsequent periods (Figure A.8). Withdrawals appear to explain a significant fraction of the overall employment effects (e.g., they account for about 75%–80% of the employment effect observed for Italy, Spain, and Portugal). Table A.8 additionally shows that permanently displaced workers are systematically more likely to be women and that this gender gap is particularly large in Southern European countries.[11]

In conclusion, the evidence presented here shows that a key explanation for our effects on employment is that displaced workers from Southern European countries have a greater chance of being *permanently* displaced from the labor market following displacement. This effect appears to be more pronounced among women. Even after conditioning on re-employment, workers from Italy, Portugal, and Spain still experience significantly longer non-employment durations following displacement.

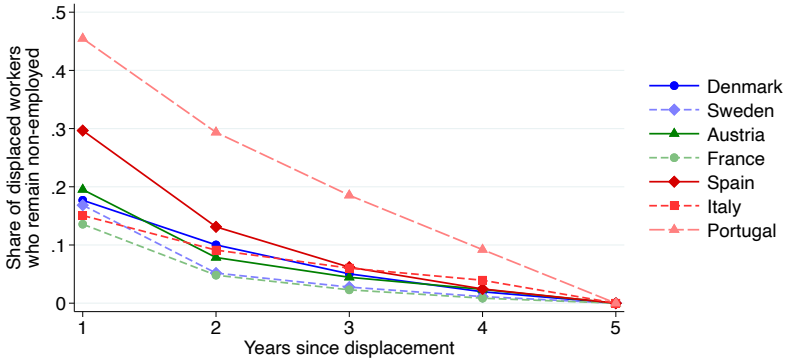
Differences in observed characteristics, employment coverage, and institutions. Appendix B.2 shows that the cross-country differences in observed characteristics do not explain much of the heterogeneous effects of job displacement depicted in Figure 1a. In Appendix B.4, we also show that differences in coverage of self-employment or public jobs across countries are unlikely to account for the bulk of the different employment responses displayed in Figure 1b. Finally, additional analyses on the potential role of institutions are reported in the working paper version of this article (see Bertheau et al., 2022).

[11] For instance, in Italy the permanently displaced workers are 10 percentage points more likely to be women, whereas this number is around 2 percentage points in Sweden and Denmark.

Figure 2: Share of Displaced Workers Who Remain Non-Employed



(a) All Displaced Workers



(b) Conditioning on Re-Employment

Notes: In Panel (a), we take the set of workers who suffered a displacement event in 2010 and plot the fraction of them who remain non-employed (i.e., have not entered the labor market yet) in each of the five years that followed the job displacement event. Panel (b) reports the same fraction among those displaced workers who eventually find a job within five years from the displacement event. Table A.7 shows the numbers reported in each panel.

4.2 The Role of Employer-Specific Wage Premiums

We now focus on the extent to which transitions from better- to worse-paying firms contribute to displaced workers' wage losses and whether these transitions differ across countries. Two recent studies indicate large cross-country differences in workers' ability to find similarly well-paying firms after job displacement. Lachowska et al. (2020) show that displaced workers in Washington State during the Great Recession did not face a particularly significant loss of employer-specific wage premiums. In contrast, Schmieder et al. (2020) show that in Germany many displaced workers move to worse-paying firms, which explains a large fraction of their wage losses.

Despite Schmieder et al. (2020) partly reconciling the different results found for Germany and Washington State, the fact that these two studies use somewhat different sample restrictions and econometric specifications, as illustrated in Table A.1, makes it hard to draw firm conclusions on the importance of employer quality in explaining wage losses. Does the ability of displaced workers to find similarly well-paying jobs significantly differ across countries? To answer this question, we exploit our harmonized research design to perform a cross-country comparison of the fraction of wage losses that can be attributed to transitions to worse-paying firms after job loss.

4.2.1 Calculating Employer Fixed Effects

For each country, we focus on the sample of workers with positive earnings and estimate an Abowd-Kramarz-Margolis (AKM) model (Abowd et al., 1999) for log daily wage as follows:

$$y_{it} = \alpha_i + \psi_{J(i,t)} + \lambda_t + X'_{it}\beta + u_{it}, \tag{2}$$

where $J(i,t)$ is the main employer of worker i in year t, α_i and $\psi_{J(i,t)}$ are worker and establishment fixed effects, λ_t are year indicators to adjust for macroeconomic conditions, and X_{it} is a cubic polynomial in age. To alleviate the concern that job loss might directly contribute to the estimates of the establishment effect in the AKM model, when estimating equation (2) we exclude treated and control workers defined in Section 2.2. Our focus is on the estimates of $\psi_{J(i,t)}$, which captures the time-invariant wage policy component for a given employer, which we denote as the employer-specific wage premium. As the employer-specific wage premiums correlate with productivity, they can be interpreted as capturing rents accrued by the worker from the current job (Card et al., 2016).

After estimating the AKM model, we first re-estimate the event study model (1) by using $\hat{\psi}_{J(i,t)}$ as an outcome. The interaction terms in the event study model return the change in the employer-specific wage premiums for displaced workers relative to their

matched control workers, k years following displacement. Next, following Lachowska et al. (2020), we take the ratio of the job displacement effect on the employer-specific wage premium relative to the overall job displacement effect on log wages. This gives a measure of the share of wage losses explained by changes in employer-specific wage premiums.[12]

4.2.2 Job Displacement Effects Due to Loss of Employer-Specific Wage Premiums

Table 3 shows the estimated loss of employer-specific wage premiums (Column 1), the total job loss effects on wages (Column 2), and the resulting share explained by employer-specific wage premiums (Column 3). The results highlight that the loss of employer-specific wage premiums is very important in explaining overall wage losses across all countries. Five years after displacement, the change in employer-specific premiums explains between 35% and 60% of wage losses in Austria, Denmark, Italy, Spain, and Sweden. In France this share is almost 70%, and in Portugal it reaches more than 95%. Table A.5 additionally shows that changes in employer-specific wage premiums matter in explaining the cyclicality of job loss effects (see Appendix B.3.2).

Overall, these results suggest that the transition of displaced workers from better- to worse-paying employers is an important factor in explaining the wage losses due to displacement observed within each country. This result echoes the seminal work of Jacobson et al. (1993), who hypothesize that a potential factor behind permanent wage losses following displacement is the loss of firm-specific rents that displaced workers accumulated with their employer before experiencing a layoff. Table 3 thus confirms this original conjecture and provides a quantitative assessment on the importance of firm-specific rents in driving the wage losses of displaced workers across very diverse labor markets. The importance of firms in driving wage losses of displaced workers highlighted by Table 3 is consistent with recent evidence that has shown that firm wage policies represent an important feature of today's labor markets in several countries (Card et al., 2018; Song et al., 2019).

[12] To compute the share of wage losses explained by losses in employer-specific pay premiums, we re-estimate the effect of job loss on log wages within the subsample of person-year observations where the associated employer belongs to the so-called largest connected set associated to equation 2 (see, e.g., Card et al., 2013).

Table 3: Loss of Employer-Specific Wage Premiums

	AKM employer wage premium (1)		Log Daily Wage (2)		Ratio (3)
Denmark					
$k = 1$	-0.025	(0.001)	-0.062	(0.002)	0.40
$k = 5$	-0.018	(0.001)	-0.039	(0.002)	0.46
Observations (th.)	3,674		3,674		
Sweden					
$k = 1$	-0.031	(0.001)	-0.104	(0.003)	0.29
$k = 5$	-0.029	(0.001)	-0.055	(0.004)	0.52
Observations (th.)	1,732		1,732		
Austria					
$k = 1$	-0.061	(0.001)	-0.105	(0.002)	0.58
$k = 5$	-0.064	(0.001)	-0.112	(0.002)	0.57
Observations (th.)	1,048		1,048		
France					
$k = 1$	-0.024	(0.002)	-0.041	(0.003)	0.60
$k = 5$	-0.030	(0.002)	-0.044	(0.004)	0.68
Observations (th.)	488		488		
Italy					
$k = 1$	-0.022	(0.001)	-0.052	(0.002)	0.42
$k = 5$	-0.027	(0.002)	-0.057	(0.003)	0.47
Observations (th.)	1,266		1,266		
Spain					
$k = 1$	-0.025	(0.003)	-0.098	(0.004)	0.26
$k = 5$	-0.046	(0.003)	-0.130	(0.006)	0.35
Observations (th.)	258		258		
Portugal					
$k = 1$	-0.030	(0.001)	-0.030	(0.002)	0.98
$k = 5$	-0.044	(0.001)	-0.045	(0.002)	0.98
Observations (th.)	2,521		2,521		

Notes: The table reports estimates from the event study model (1) , with k denoting the time since the job displacement event. Column 1 reports results where the AKM employer fixed effects is used as the dependent variable. Column 2 reports results where the log daily wage is used as the dependent variable. The resulting share of losses in log daily wages due to losess in employer-specific wage premiums is shown in Column 3. Effects on log daily wages are calculated with the subsample of displaced (and matched control) workers whose employer at time t belongs to the within-country largest connected set of firms associated with equation (2). Standard errors, clustered at the individual level, are reported in parentheses.

5 Conclusion

Using a harmonized research design applied to matched employer-employee datasets, we document striking differences of the impact of job loss across seven European countries. While earnings losses five years after job displacement are around 10% in Northern European countries, they are almost 30% in Southern European countries, with Austrian workers facing losses in between, and French workers' losses being more similar to those of Northern European workers. Crucially, these earnings differences appear to be driven by differences in re-employment probabilities since a significant fraction of displaced workers from Italy, Portugal, and Spain are unable to re-enter the labor market post displacement. This effect is more pronounced among women.

Focusing on wages, a key factor in driving wage losses following job displacement is reallocation to worse-paying employers. Specifically, the share of wage losses explained by losses in AKM employer-specific wage premiums ranges from 35% for Spain to more than 95% for Portugal. This result thus enriches a recent but still inconclusive literature that has analyzed the role of employer-specific wage policies in driving the wage losses following displacement (Lachowska et al., 2020; Schmieder et al., 2020; Gulyas and Pytka, 2020).

What can these results tell us about welfare? While an analysis on earnings losses is not equivalent to an analysis on income or consumption losses (e.g., Dobkin et al., 2018; Fadlon and Nielsen, 2021), we note that the countries where the earnings losses due to displacement tend to be the lowest (Denmark, Sweden) are also those where the welfare state tends to be the most generous. Conversely, the largest earnings losses are observed in countries (Italy, Spain, Portugal) where the generosity of the welfare state tends to be the lowest (Boeri, 2011). This suggests that our ranking of countries in terms of earnings losses might be preserved when also looking at income or consumption losses. However, this is clearly only speculative, and a rigorous analysis on the effects of job loss on comparable measures of consumption and income across countries represents an interesting avenue for future research.

All in all, the vastly different earnings trajectories following a job loss documented in this paper should be informative for policy makers and academics alike. Our results reveal that labor markets appear to function better in some countries than others. European policy makers should thus focus on policies that could reduce these differences, which appear even more striking when focusing on particular groups of workers, like women.

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Appendix

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A Additional Tables and Figures

A.1 Tables

Table A.1: Review of Research Designs and Estimates from the Job Loss Literature

Paper	Country	Year	Tenure	Type of Event	Firm size	Gender	Control group: same employer	Earnings in year 5
Gulyas and Pytka (2020)	Austria	1984-2017	2	Mass layoff $\geq$ 30%	30	Male	No	-16%
Halla et al. (2020)	Austria	1990-2007	1	Mass layoff	10	Male	No	-20%
Bennett and Ouazad (2019)	Denmark	1990-1994	3	Mass layoff $\geq$ 30%	30	Male	No	- 23%
Roulet (2021)	Denmark	2001-2006	5	Plant closure	5	Both	No	- 12%
Royer (2011)	France	1995-1999	2	Plant closure	10	Both	No	-16%
Brandily et al. (2020)	France	2002-2012	2	Reason for Separation	–	Both	No	-36%
Schmieder et al. (2020)	Germany	1975-2005	3	Mass layoff $\geq$ 30%	50	Male	No	-20%
Fackler et al. (2021)	Germany	2002-2014	3	Reason for Separation	–	Male	No	-12%
Leombruni et al. (2013)	Italy	1989-1994	3	Plant closure	–	Both	No	-9%
Mossucca (2016)	Italy	2005-2010	6	Mass layoff	–	Both	Yes	-9%
Carneiro and Portugal (2006)	Portugal	1991-1998	3	Plant closure	–	Both	Yes	-6%
Raposo et al. (2021)	Portugal	1988-2014	2	Plant closure	20	Both	No	-27%
Garcia-Cabo (2018)	Spain	2005-2015	1.5	Reason for separation	–	Both	Yes	-32%
Garda (2012)	Spain	1999-2004	3	Reason for separation	5	Male	No	-25 %
Eliason and Storrie (2006)	Sweden	1987-1988	–	Plant closure	10	Both	No	-11%
Seim (2019)	Sweden	2002-2004	1.5	Reason for separation	5	Male	No	-15%
Jacobson et al. (1993)	USA	1974-1986	6	Mass layoff $\geq$ 30%	50	Both	Yes	-25%
Lachowska et al. (2020)	USA	2002-2014	6	Mass layoff $\geq$ 30%	50	Both	Yes	-17%

Notes: Selection of papers studying the labor market consequences of job loss in the US and in Europe (the countries in our sample plus Germany). *Year* denotes the years of the displacement. *Tenure* (in years) report the minimum number of years that displaced workers must have worked with their employer up to the moment of displacement; *Firm size* is the minimum firm-size of the employer of displaced workers before displacement; *Type of event* distinguishes how a paper defines a displacement event; *Mass layoff* $\geq$ *30%* defines a displacement event when a firm is laying off more than 30% of the its workforce. *Plant-Closure* means that the paper is considering displacement event only when an employer permanently shut-down. *Reason for Separation* means that the paper is using administrative information to determinate the job displacement event. *Control group: same employer* specifies whether the comparison group comprises workers that are restricted to stay with the same employer after the displacement of the treated workers. *Earnings in year 5* reports the job loss effects on earnings 5 years after job displacement in terms of the percent change from the pre-displacement earnings level.

Table A.2: Earnings Effects with Alternative Control Groups

	Earnings Effect in $t^* + 5$		Earnings Effect in $t^* + 1$	
	Baseline	Continuously employed	Baseline	Continuously employed
Austria	-0.219	-0.360	-0.390	-0.461
Denmark	-0.116	-0.253	-0.177	-0.255
France	-0.121	-0.255	-0.199	-0.253
Italy	-0.277	-0.772	-0.392	-0.635
Portugal	-0.246	-0.272	-0.357	-.447
Spain	-0.325	-0.512	-0.457	-0.537
Sweden	-0.116	-0.171	-0.206	-0.233

Notes: Earnings losses 1 and 5 years after job displacement for different definitions of the control group (expressed in proportions with respect to the average pre-displacement labor earnings). t^* denotes year of job displacement. The *Continuously employed* control group is similar to that in Lachowska et al. (2020). It is defined by selecting workers who stay employed at the same establishment at which they had at least 3 years of pre-displacement tenure for the entirety of the post-period time window (up to 9 years in total). The *Baseline* control group does not impose the post-displacement restriction and is the control group used in our main analyses.

Table A.3: Decomposition of Job Loss Effect on Total Earnings

	Overall gap	Composition part					Unexplained part
		Worker	Employer	Business cycle	Time trend	Total	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sweden	-0.011	-0.049	-0.003	-0.000	-0.000	-0.053	0.042
Austria	-0.098	-0.025	-0.052	-0.001	-0.003	-0.081	-0.017
France	-0.009	-0.020	-0.013	0.001	0.002	-0.030	0.021
Italy	-0.166	0.023	-0.012	0.003	-0.005	0.009	-0.173
Spain	-0.207	-0.030	0.019	-0.000	-0.000	-0.011	-0.195
Portugal	-0.145	-0.022	-0.002	-0.011	0.002	-0.032	-0.113

Notes: Oaxaca-Blinder decompositions by separately comparing each country to Denmark. Column (1) reports the total gap in the job loss effect calculated three years after displacement. Columns (2)-(6) show the part of the gap explained by the following characteristics measured at displacement: worker characteristics (quintiles of worker fixed effects, gender, tenure, age); employer characteristics (quintiles of employer fixed effects, employer size, industry); business cycle conditions (unemployment rate); and timing of separation (quadratic time trend). Column (7) shows the gap part unexplained by the average differences in the observables.

Table A.4: Characteristics of Data Sources by Country

	Italy	Portugal	Spain	France	Austria	Denmark	Sweden
Population of Workers and Firms							
Year of job loss	1993-2016	1992-2017	2007-2019	1994-2016	1987-2018	1983-2017	1994-2016
Individuals: % employees	6.5	100	4	8	100	100	100
Employers:							
Establishment ID and Firm ID	YES	YES	YES	YES	NO	YES	YES
Public sector employers	YES	YES	YES	YES	YES	YES	YES
Main Variables							
Earnings include income from...							
all jobs	YES	NO	YES	YES	YES	YES	YES
severance payments	NO	NO	NO	YES	NO	YES	YES
self-employment	NO	NO	NO	NO	NO	NO	YES
Days worked	YES	YES	YES	YES	YES	YES	NO
Full time/Part time	YES	YES	YES	YES	NO	YES	YES
Temporary/Permanent contract	YES	YES	YES	YES	NO	NO	NO
Reasons for job separation	YES	NO	YES	NO	NO	NO	NO

Notes: The table summarizes the main characteristics of the datasets. See Appendix C for explanations for each country. *Year of Job loss*: time range of the event-study. *% employees*: the data contains the full population or a sample of X % workers. *Establishment ID and Firm ID*: the data contains both identifiers. *Public sector employer*: the data records *some* jobs in the public sector. See coverage by country in Appendix C. *All jobs*: earnings include all jobs, and not a snapshot in a given month. *Severance payments*: the data contains severance pay or redundancy compensation. *Self-employed*: the data contains labor earnings from non-salaried labor earnings. *Annual days worked*: the data contains the exact number of days covered by an employment contract. *Full time/Part time*: the data contains an indicator to measure whether the job is full-time or part-time. *Temporary/Permanent contract*: the data contains a variable to distinguish between temporary employment contracts and permanent contracts. *Reasons for job separation*: the data contains a variable to identify separation due to a layoff.

Table A.5: Cyclicality of Job Loss Effects on Wage and Earnings

	Sweden		Denmark		Austria		France		Italy		Spain		Portugal	
Panel A: Log-daily wage														
Δ in unempl. rate	-0.022	-0.008	-0.005	0.001	-0.007	-0.009	-0.017	-0.010	-0.039	-0.020	-0.010	-0.005	-0.012	-0.007
	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.007)	(0.007)	(0.020)	(0.019)	(0.004)	(0.003)	(0.002)	(0.002)
Employer FE	-0.032	0.555	-0.355	0.106	-0.500	0.051	-0.042	0.207	-0.178	0.038	-0.261	0.120	-0.118	0.142
	(0.036)	(0.036)	(0.008)	(0.009)	(0.015)	(0.015)	(0.022)	(0.022)	(0.011)	(0.011)	(0.024)	(0.024)	(0.012)	(0.012)
Worker FE	0.019	-0.040	-0.359	-0.408	-0.192	-0.326	0.030	-0.076	-0.086	-0.178	-0.081	-0.221	-0.058	-0.166
	(0.010)	(0.010)	(0.006)	(0.005)	(0.008)	(0.008)	(0.012)	(0.012)	(0.009)	(0.009)	(0.019)	(0.017)	(0.006)	(0.006)
Δ in employer FE		1.280		0.727		0.840		0.599		0.563		0.829		0.912
		(0.023)		(0.007)		(0.010)		(0.017)		(0.010)		(0.022)		(0.011)
No. of observations	52,479	52,479	80,868	80,868	26,885	26,885	13,122	13,122	25,688	25,688	5,581	5,581	47,264	47,264
Mean dep. var.	-0.058	-0.058	-0.053	-0.053	-0.127	-0.127	-0.052	-0.052	-0.056	-0.056	-0.137	-0.137	-0.034	-0.034
Panel B: Yearly earnings														
Δ in unempl. rate	-0.021	-0.010	-0.016	-0.013	-0.004	-0.006	0.000	0.007	-0.081	-0.068	-0.012	-0.007	-0.015	-0.009
	(0.004)	(0.004)	(0.003)	(0.003)	(0.007)	(0.007)	(0.008)	(0.008)	(0.026)	(0.026)	(0.005)	(0.005)	(0.007)	(0.007)
Employer FE	0.071	0.549	-0.030	0.206	-0.603	-0.055	0.088	0.300	-0.149	0.009	-0.262	0.081	-0.026	0.299
	(0.033)	(0.034)	(0.007)	(0.008)	(0.022)	(0.023)	(0.026)	(0.027)	(0.015)	(0.015)	(0.031)	(0.032)	(0.035)	(0.036)
Worker FE	0.095	0.047	-0.076	-0.100	-0.167	-0.301	0.173	0.083	0.005	-0.062	-0.091	-0.218	-0.127	-0.263
	(0.009)	(0.009)	(0.005)	(0.005)	(0.012)	(0.012)	(0.014)	(0.014)	(0.012)	(0.012)	(0.024)	(0.023)	(0.018)	(0.018)
Δ in employer FE		1.041		0.369		0.834		0.509		0.412		0.746		1.140
		(0.021)		(0.006)		(0.015)		(0.021)		(0.014)		(0.029)		(0.032)
No. of observations	52,480	52,480	85,161	85,161	26,886	26,886	13,152	13,152	25,688	25,688	5,581	5,581	47,257	47,257
Mean dep. var.	-0.067	-0.067	-0.069	-0.069	-0.147	-0.147	-0.061	-0.061	-0.091	-0.091	-0.195	-0.195	-0.055	-0.055

Notes: The dependent variable is the wage loss (Panel A) and earnings loss from the pre-displacement level (Panel B) 3 years after job displacement. The baseline controls are: change in unemployment rate, quadratic time trends, firm size, worker's demographics, and employer and worker fixed effects. The individual fixed effects are obtained by subtracting the employer fixed effects from the average pre-displacement wages. The change in the unemployment rate is measured in percentage points. For each country, the second column includes as additional control the change in establishment effect. Section 4.2 discusses the results. Standard errors in parentheses.

Table A.6: Effects of Job Loss on Earnings by Country and Gender

	Men		Women	
Denmark				
$k = 1$	-17.29	(0.192)	-18.77	(0.260)
$k = 5$	-12.03	(0.244)	-10.55	(0.324)
Sweden				
$k = 1$	-21.42	(0.295)	-18.81	(0.432)
$k = 5$	-12.22	(0.421)	-10.07	(0.564)
Austria				
$k = 1$	-38.47	(0.294)	-39.77	(0.439)
$k = 5$	-22.24	(0.348)	-19.93	(0.549)
France				
$k = 1$	-19.26	(0.530)	-21.42	(0.750)
$k = 5$	-11.99	(0.780)	-12.42	(1.050)
Italy				
$k = 1$	-38.14	(0.471)	-41.65	(0.655)
$k = 5$	-26.78	(0.627)	-29.78	(0.821)
Spain				
$k = 1$	-44.90	(0.671)	-47.12	(0.954)
$k = 5$	-31.50	(0.813)	-34.38	(1.178)
Portugal				
$k = 1$	-34.69	(0.382)	-37.16	(0.415)
$k = 5$	-25.12	(0.449)	-23.77	(0.471)
Germany				
$k = 1$	-22.24	(0.19)	-35.49	(0.35)
$k = 5$	-16.25	(0.42)	-22.35	(0.70)

Notes: The table shows the coefficients θ_1 and θ_5 from equation (1) for earnings separately estimated by gender within each country. Point-estimates are re-scaled by the average earnings measured in the pre-displacement years and multiplied by 100. Standard errors reported in parentheses and clustered at the individual level. Results from Germany are taken from Schmieder et al. (2020) and in particular from Figure 1(a), Figure 2(a) (men) and Figure A15(a) and Figure A16(a) (women).

Table A.7: Share of Displaced Workers Who Remain Non-Employed after Displacement

	Years since displacement				
	$k=1$	$k=2$	$k=3$	$k=4$	$k=5$
Panel A: All displaced workers					
Denmark	0.251	0.181	0.136	0.108	0.089
Sweden	0.196	0.083	0.060	0.044	0.033
Austria	0.244	0.134	0.102	0.083	0.059
France	0.175	0.091	0.067	0.053	0.045
Spain	0.404	0.263	0.205	0.173	0.148
Italy	0.326	0.279	0.254	0.238	0.198
Portugal	0.597	0.477	0.397	0.328	0.236
Panel B: Displaced workers who eventually find a job					
Denmark	0.177	0.100	0.050	0.020	0.000
Sweden	0.168	0.052	0.028	0.011	0.000
Austria	0.195	0.078	0.044	0.024	0.000
France	0.136	0.048	0.023	0.009	0.000
Spain	0.297	0.131	0.062	0.024	0.000
Italy	0.151	0.091	0.060	0.039	0.000
Portugal	0.455	0.294	0.185	0.092	0.000

Notes: Share of workers displaced in 2010 who are still non-employed, by years since displacement (k). Panel A reports numbers for all displaced workers; in Panel B the sample of displaced workers is conditional on those who eventually find a job within five years from the displacement event.

Table A.8: Comparing displaced workers who eventually find a job within five years of displacement to those who don't

	Denmark		Sweden		Austria		France		Spain		Italy		Portugal	
Permanently displaced	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Panel A: Worker characteristics														
Earnings in $t^* - 2$	42,172	42,718	33,829	33,056	28,433	30,090	27,585	29,936	23,233	22,241	25,217	23,724	14,578	14,572
Earnings in $t^* - 3$	39,364	40,323	35,618	32,688	27,927	29,454	26,633	28,687	23,280	22,049	24,582	22,654	15,371	14,498
Age	31.82	33.78	38.38	36.51	40.28	37.99	34.56	37.38	39.71	38.01	39.25	37.24	37.09	35.31
Female	0.39	0.37	0.37	0.35	0.45	0.42	0.41	0.36	0.46	0.40	0.47	0.37	0.52	0.46
Tenure	5.74	5.80	7.63	7.26	7.08	7.32	7.16	6.60	6.47	6.75	4.65	4.66	11.69	9.87
Panel B: Employer characteristics														
Establishment size	376	369	362	389	314	324	258	322	383	337	439	340	326	337
Manufacturing	0.38	0.38	0.43	0.42	0.45	0.47	0.54	0.45	0.27	0.25	0.30	0.38	0.57	0.52
Services	0.34	0.34	0.36	0.32	0.18	0.12	0.25	0.33	0.58	0.59	0.47	0.25	0.34	0.40
No. Workers (th.)	5.79	196.12	5.06	92.30	5.03	50.87	1.16	27.51	1.62	13.09	16.29	49.99	45.47	125.32

Notes: This table compares the characteristics of displaced who eventually find a job within five years from displacement (not permanently displaced workers) to those workers who instead are unable to get a job within five years from displacement (permanently displaced workers).

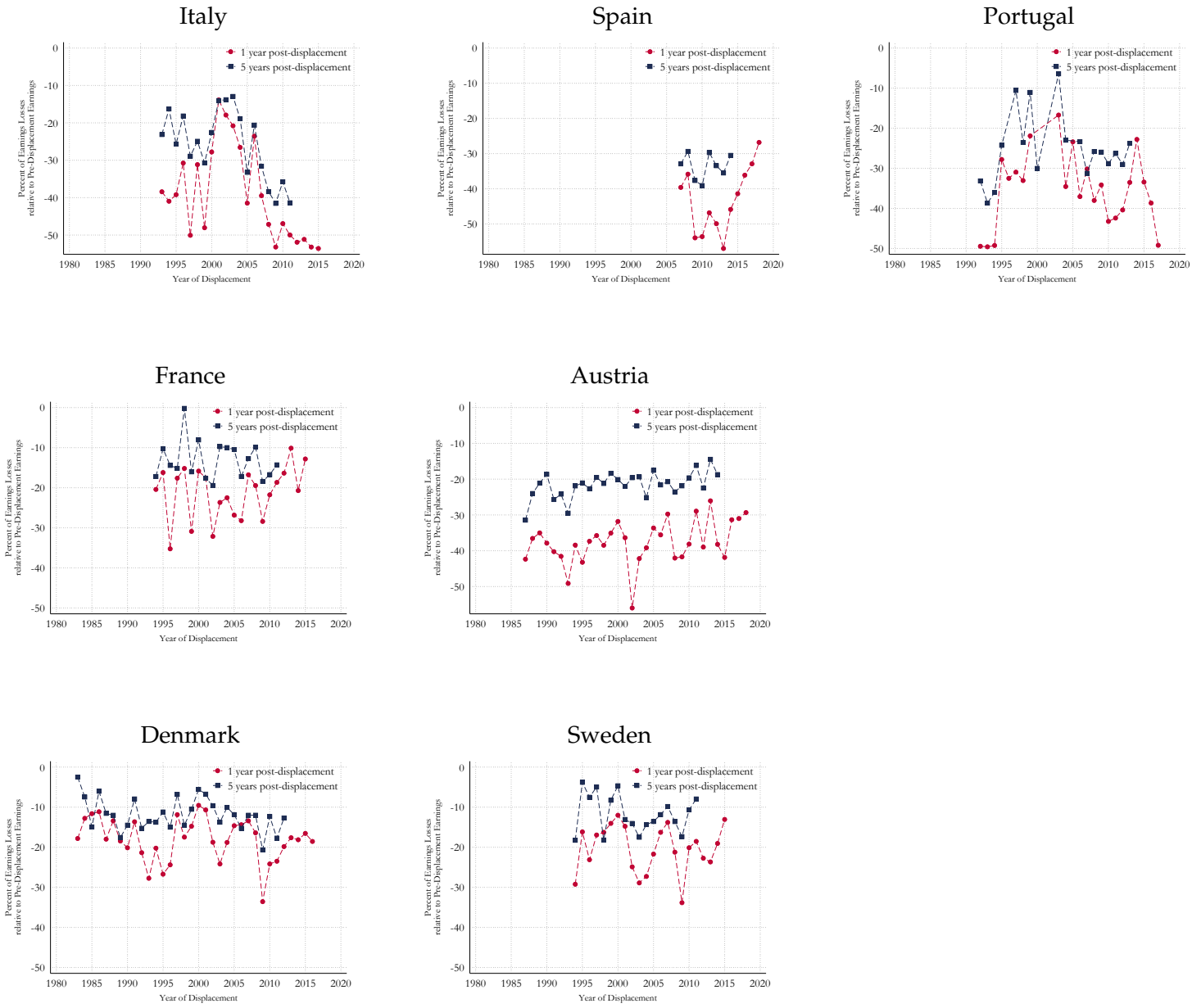
Table A.9: Bounds on Wage Losses Five Years after Displacement

	Employ-ment effect	Share compliers among employed control workers	Mean wage treated	Mean wage control, excluding compliers	Bound on wage effect
	(1)	(2)	(3)	(4)	(5)
Denmark	-0.035	4%	4.761	4.878	-0.117
Sweden	-0.040	4%	4.400	4.579	-0.179
Austria	-0.091	10%	4.322	4.535	-0.212
France	-0.057	6%	4.343	4.471	-0.128
Spain	-0.156	18%	3.909	4.248	-0.339
Italy	-0.177	23%	4.354	4.623	-0.269
Portugal	-0.175	25%	3.881	4.156	-0.276

Notes: Column 1 displays the employment effects due to displacement observed five years following displacement. Column 2 uses the estimates from Column 1 to estimate the counterfactual share of compliers among the control group, that is, workers that in the presence of displacement would be non-employed five years from displacement. Column 4 then displays the mean wage among control workers assuming that these compliers all belong to the left tail of the wage distribution observed among control workers. This monotone selection pattern therefore provides an upper bound on the wage effects, computed as the difference between Column 3 and Column 4 and displayed in Column 5, as originally suggested by Lee (2009). See Appendix B.5 for additional details.

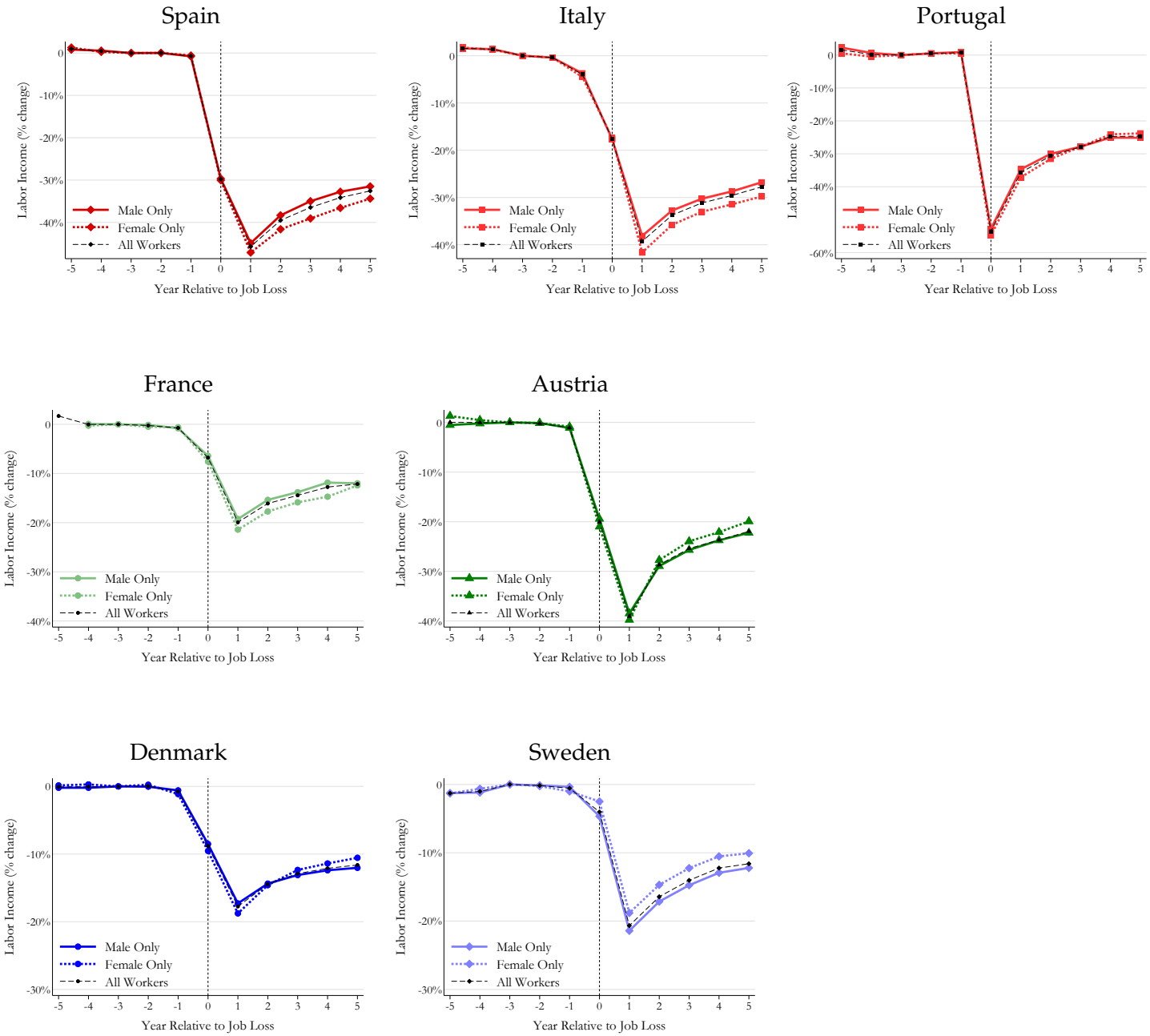
A.2 Figures

Figure A.1: The Effect of Job Loss on Earnings: Evolution for the last 25 years



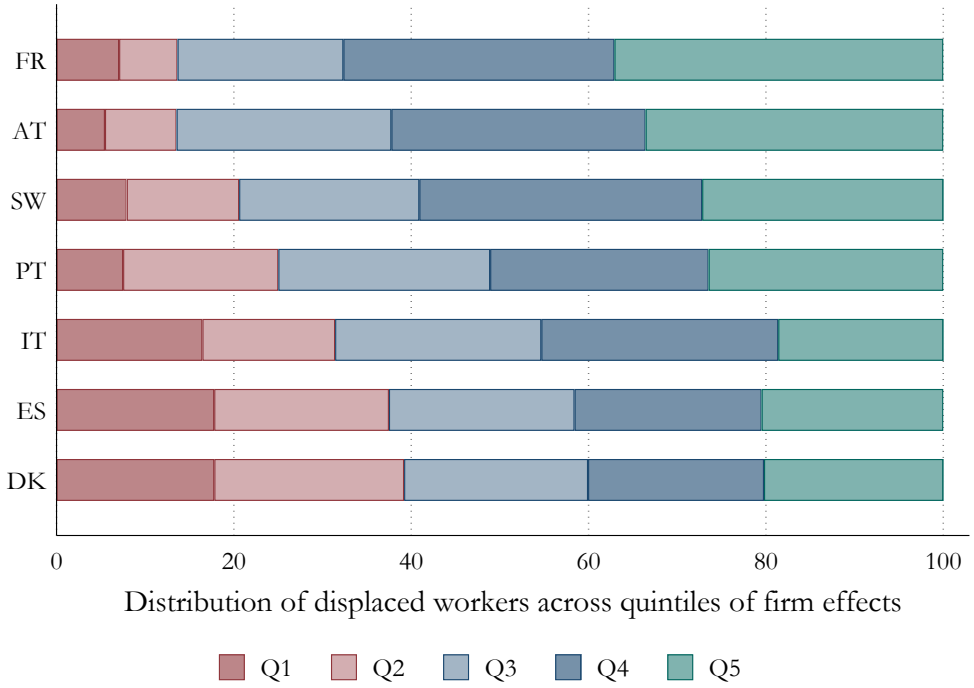
Notes: The figure shows estimates of earnings losses spanning three decades (1990s-2010s) following job loss as defined in section 2. Each plot reports the point estimate – by year of job displacement – of labor earnings losses for the first and the fifth year following involuntary job loss, i.e. θ_1 and θ_5 of the difference-in-difference model (1). Section 3.2 discusses the results.

Figure A.2: Job Loss on Earnings: by Gender



Notes: The figures shows the event-study coefficients θ_k after fitting equation (1) separately by country and gender. The outcome variable is total earnings within the year (rescaled by pre-displacement earnings). Standard errors along with point estimates at $k = 1$ and $k = 5$ years from displacement are reported in Table A.6.

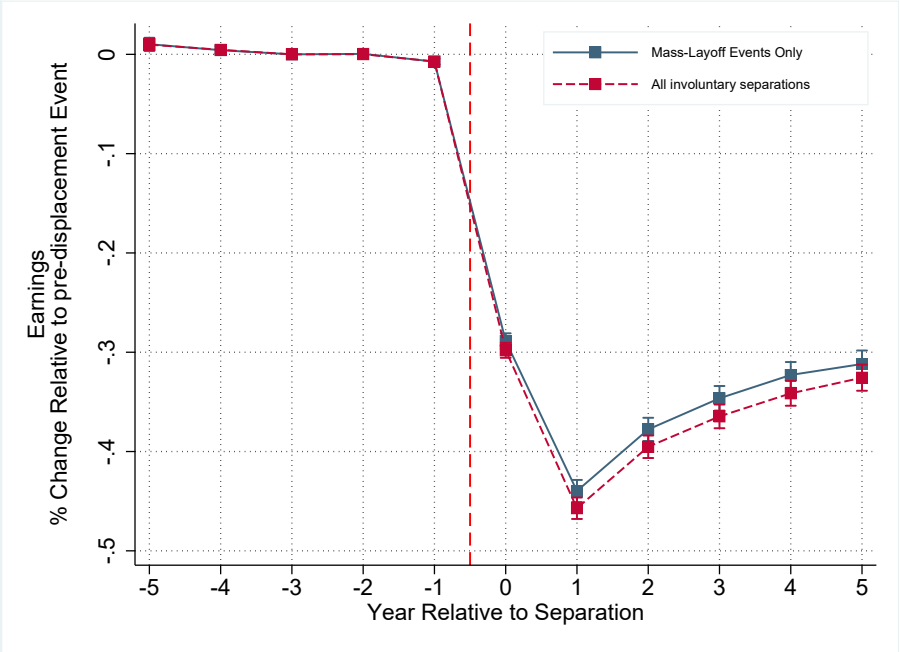
Figure A.3: Distribution of displaced workers across quintiles of firm effects before job displacement



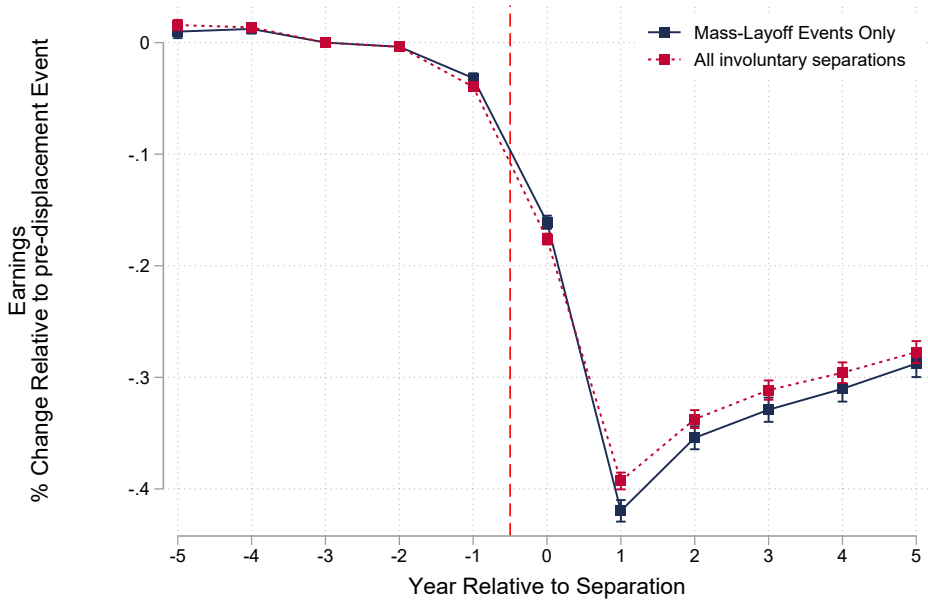
Notes: Share of workers by quintiles of wage AKM employer fixed effects measured right before displacement.

Figure A.4: Representativeness of Mass Layoffs Workers for Spain and Italy

(a) Spain

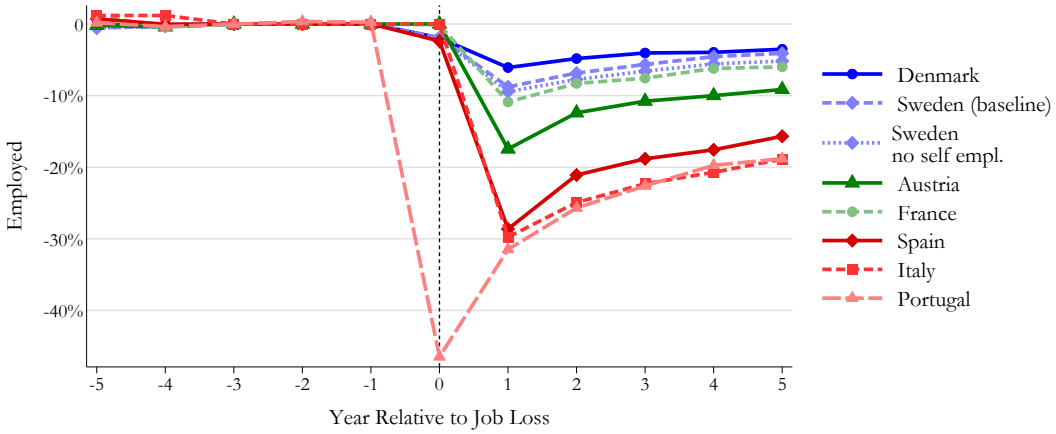


(b) Italy



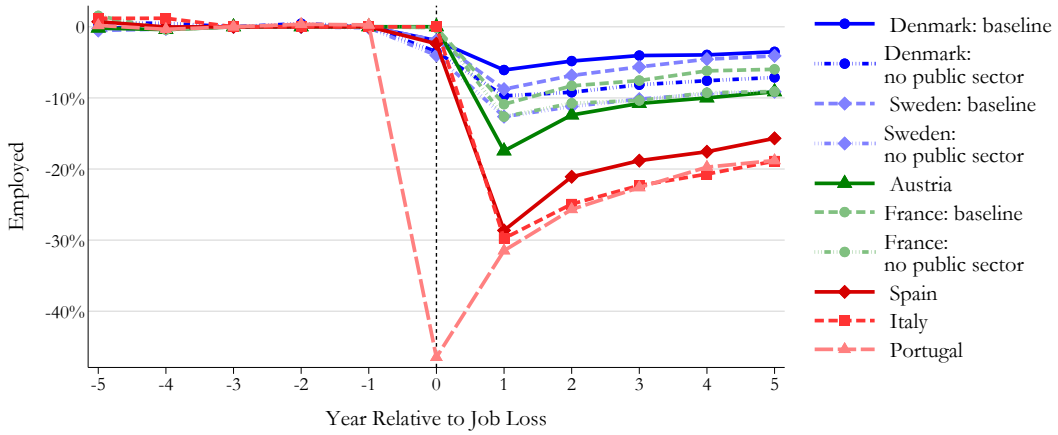
Notes: In Spain and Italy, matched employer-employee data provide a reason behind a job separation, see section C.4 and section C.6 for details. We use this information to contrast the effects of job displacement on earnings that one would obtain when defining displaced workers to be only those involved in mass-layoff events captured in administrative data— see label "Mass-Layoff Events Only" — to the ones obtained when using the entire set of involuntary separations due to economic reasons that one could measure in the Spanish and Italian context. Specifically, "involuntary separations" due to economic reasons represent all job separations that occurred as a result of the employer facing some economic distress. 95% confidence intervals based on standard errors clustered at the individual level are displayed in the figure.

Figure A.5: Classifying self-employment as non-employment in Sweden

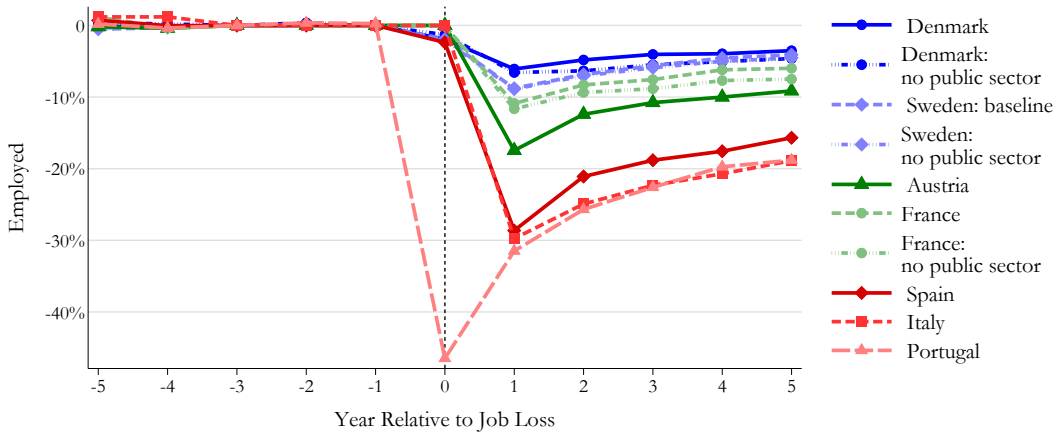


Notes: This figure computes our baseline event-study estimates from equation (1) on employment while setting self-employed jobs recorded in Sweden as non-employment spells. See Appendix B.4 for details.

Figure A.6: Classifying public sector jobs as non-employment in Denmark, Sweden and France



(a) Classifying as non-employment all public sector jobs

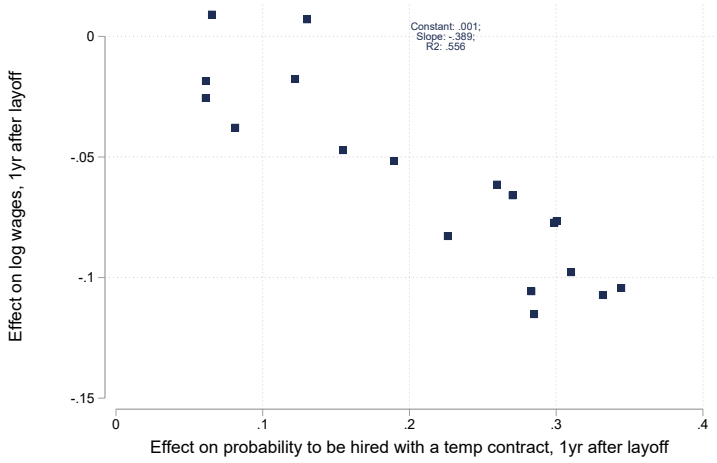


(b) Classifying as non-employment a selection of public sector jobs not covered in Southern European countries.

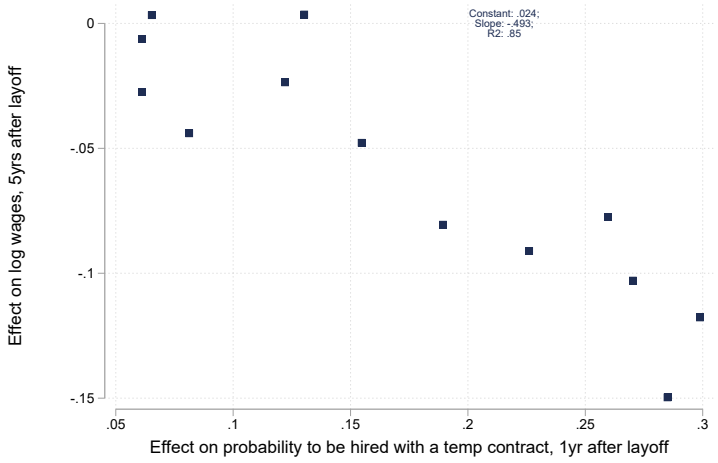
Notes: Panel (a) computes our baseline event-study estimates from equation (1) on employment while setting *all* jobs in the public sector Denmark, France and Sweden as non-employment spells. Panel (b) is similar but records as non-employment spells only a subset of public jobs from Denmark, France and Sweden that are particularly unlikely to be recorded in administrative registries from Southern European countries. See Appendix B.4 for details.

Figure A.7: Explaining Trends in Pay Losses for Italian Displaced Workers

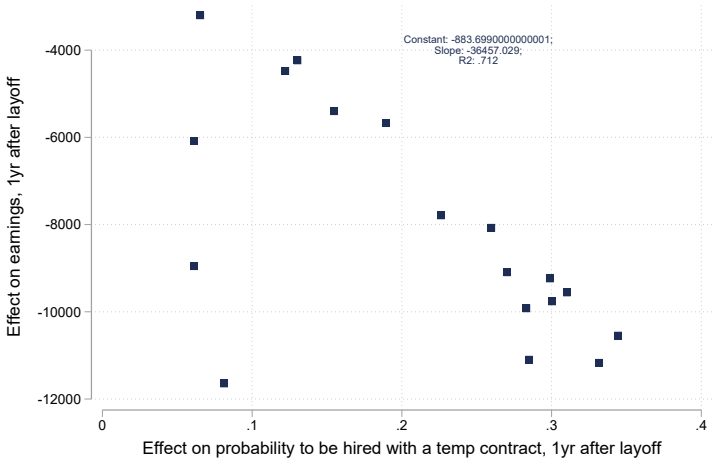
(a) Loss in Log Wages, 1 Year Following Layoff



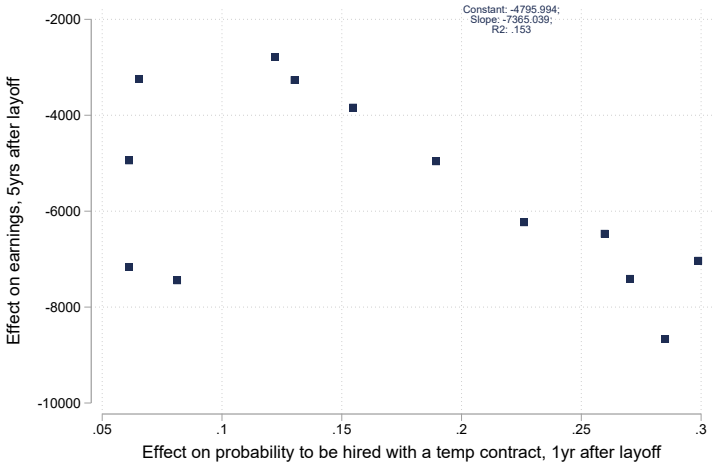
(b) Loss in Log Wages, 5 Years Following Layoff



(c) Loss in Earnings, 1 Year Following Layoff

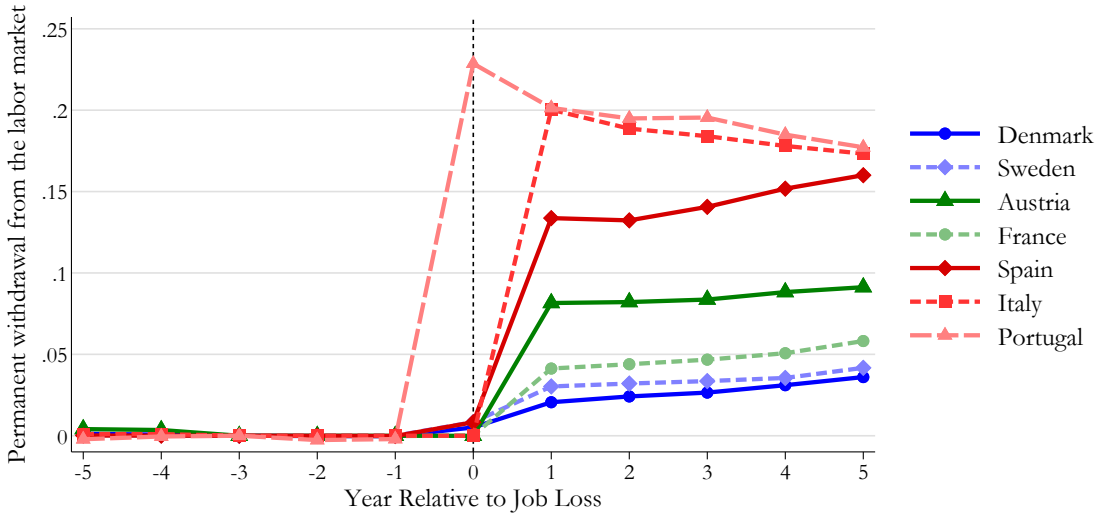


(d) Loss in Earnings, 5 Years Following Layoff



Notes: Each panel shows the displacement effects on either log wage or earnings, 1 or 5 years following the layoff for different cohorts of displaced Italian workers. We overlay to these coefficients the estimates that we obtain on the probability that the first job after displacement is on a temporary job: Finally, we display the results from a simple linear fit for each panel, weighting each square in the scatter-plot by the number of displaced workers observed in a given year. Section C.4 provides details on the institutional Italian context.

Figure A.8: Permanent withdrawal from the labor market



Notes: The figure reports the event-study coefficients from equation (1). The outcome in the regression is a dummy equal to 1 if worker i in period t is non-employed in t and all the subsequent periods up to year $t+5$. Thus, the event-study coefficients captures changes in the probability of displaced workers to permanently withdraw from the labor market relative to their matched control group across countries. The resulting effects displayed in the figure are not necessarily monotonically increasing over time since workers in the comparison group are also allowed to withdraw from the labor market.

B Sample Construction and Analyses

This section provides additional information on the construction of the main sample (Section 3) and on the analyses aimed at understanding the heterogeneous job loss effects across countries (Section 4).

B.1 Main Sample

We do not restrict workers from the control group and the treated group to be observed from t^* onwards in order to avoid conditioning on future outcomes. We connect all employment spells at the same establishment in case workers have multiple employment spells during the year.

Treated group. We do not consider workers that find a job in the same firm to be displaced. We control for transitions that follow from change of establishment identifiers due to mergers, split-ups etc. Specifically, we do not allow more than 20 percent of the displaced workers to be reemployed together at the same establishment in the following year. Leaving workers are either non-employed or dispersed to different establishments. Mass-layoff events do not include a "stability" requirement, i.e., employment can increase before or after the drop in mass-layoff event. Treated workers can be treated only once. In order to focus on permanent job separations, treated workers who return to their firm up to $t^* + 5$ are dropped from the sample (from both the treated and the comparison group). To avoid classifying mergers and domestic outsourcing as mass layoffs, we create a cross flow matrix of worker flows across firms each year, and exclude mass layoffs from our sample where we observe more than 20 percent of workers jointly moving to another firm.

Control group. Control workers are never treated, to avoid bias induced by control units treated later (see, e.g., de Chaisemartin and D'Haultfoeuille, 2020). However, they are allowed to be coworkers of employees displaced due to a mass layoff, or can be laid off in a given year but not during a mass layoff. Control workers can be used as control only once.

B.2 Differences in Observed Characteristics across Countries

According to Table 1, the composition of displaced workers differs somewhat across countries. To quantify the role of different observable characteristics of displaced workers in driving the heterogeneous effects of job displacement across countries shown in Figure 1, we perform pairwise Oaxaca–Blinder decompositions between each country c and a reference country r (Denmark).[13] For each country, we regress the individual-level job loss effects on earnings measured in $t^* + 3$ (relative to $t^* - 3$) on a vector of worker- and employer-level characteristics X.[14] Individual-level job loss effects are individual-level difference-in-differences effects computed for each treated-matched control worker pair, see Schmieder et al. (2020) for a similar approach and Appendix B.3.2. We use the estimated coefficients from each country-level regression

[13] We choose Denmark because job loss effects are the smallest there. Choosing Sweden as an alternative reference country yields virtually identical results.

[14] We pick three years after job displacement as this permits us to maximize the set of overlapping years where we have data for all the countries without having to rely on very short-run effects.

to decompose Δ_c, which denotes the average gap in the job loss effect between country c and r as follows:

$$\Delta_c = \sum_{x \in X} \underbrace{(E[x_{i,c}] - E[x_{i,r}])\beta_x^c}_{\text{Composition}} + \sum_{x \in X} \underbrace{E[x_{i,r}](\beta_x^c - \beta_x^r)}_{\text{Unexplained}} \tag{A.1}$$

The "compositional" part quantifies the differences on the impact of job loss attributable to differences in observables, where the impact of each characteristic x is estimated using the regression coefficients β_x^c of the comparison country. The "unexplained" part quantifies the importance of structural differences between the two countries (unexplained by differences in the observables, which are kept fixed at the reference country's average observed levels).

We focus on the composition part of the cross-country differences by measuring the following characteristics measured right before job displacement: gender, tenure, age, quintiles of worker and employer AKM fixed effects, employer size, economic sector, change in unemployment rate, and quadratic time trends. [15] These characteristics thus capture potential differences in observable characteristics at the worker and employer level, and the macroeconomic conditions. To facilitate the interpretation of each pairwise comparison, we focus on the job displacement years available for both country c and Denmark. Both individual- and worker-level fixed effects are estimated through AKM models and aggregated into country-specific quintiles based on the corresponding AKM sample that excludes displaced workers and their matched control workers.

Table A.3 reports the results of this decomposition exercise.[16] The table shows that compositional differences typically explain only a small part of the total gap in earnings losses between the different countries and Denmark. Figure A.3 provides further visual confirmation of this finding by showing the distribution of the AKM employer-specific wage premium of displaced workers across countries.

B.3 The Role of Employers

B.3.1 Sample to estimate employer fixed effects

To limit the extent of noise in the fixed effects estimation, we restrict the samples to workplaces with at least three employees at least once in their histories. Also, to limit the concern that job loss itself contributes directly to the estimates of establishment effect in the AKM model, we exclude treated and control workers from the AKM estimation. Limited mobility of workers across employers can lead to imprecise estimates of establishment fixed effects. This is a first-order concern when performing variance decomposition exercises, which we do not do (see, e.g., Kline et al., 2020; Bonhomme et al., Forthcoming). We estimate establishment fixed effects for most of the main jobs before and after the relative year of the event t^*.[17]

[15] The worker fixed effects are obtained by subtracting the employer fixed effects from the average pre-displacement wages.

[16] The sample is restricted until 2015, which is the last year with available information on the OECD indicators of interest (generosity of unemployment benefits, employment protection legislation, active labor market policies, among others).

[17] For Spain, due to the relatively small sample size, we estimate firm fixed effects.

B.3.2 The cyclicality of wage losses and employer quality

To further investigate the importance of employers in explaining the consequences of job loss, we follow Schmieder et al. (2020). First, we compute individual-level job loss effects before and after job displacement for each treated–matched control worker pair (between $t^* - 3$ and $t^* + 3$) as follows:.

$$\Delta_{dd} y_{it^*} = (y_{i,T,t^*+3} - y_{i,T,t^*-3}) - (y_{i,C,t^*+3} - y_{i,C,t^*-3}),$$

where $\Delta_{dd} y_{it^*}$ is an estimate of the individual treatment effect from job loss.

Then, we regress the difference in the individual-level job loss effect on the unemployment rate and on additional displaced workers' controls. The set of control characteristics is: female, tenure, age, employer size, quadratic time trends, worker fixed effects, and employer fixed effects. The individual fixed effects are obtained by subtracting the employer fixed effects from the average pre-displacement wages. The impact of the aggregate annual change in the unemployment rate (from $t^* - 1$ to t^*) on wage losses is captured by β. As the mean of the dependent variable, $\Delta_{dd} y_{it^*}$ is negative (ranging from -0.035 in Portugal to -0.137 in Spain, see Table A.5), a negative estimated coefficient indicates that a one percentage point increase in the unemployment rate *increases* wage losses, i.e.:

$$\Delta_{dd} w_{it^*} = \beta \Delta UR_{t^*} + \gamma \hat{\psi}_{J(i,t^*)} + \delta \hat{\alpha}_i + X_i \theta + t^* \pi_1 + t^{*2} \pi_2 + \varepsilon_{it^*} \tag{A.2}$$

Table A.5 shows that a positive variation in unemployment rate is strongly associated with the size of wage losses. This result holds for all countries with the exception of Austria, and is in line with Schmieder et al. (2020) for Germany.[18]

Once we include the change in employer fixed effects as additional control, $\Delta_{dd} \hat{\psi}_J$, as in model A.3, the conclusion is drastically different.

$$\Delta_{dd} w_{it^*} = \beta \Delta UR_{t^*} + \gamma \hat{\psi}_{J(i,t^*)} + \delta \hat{\alpha}_i + \xi \Delta_{dd} \hat{\psi}_J + X_i \theta + t^* \pi_1 + t^{*2} \pi_2 + \varepsilon_{it^*} \tag{A.3}$$

In all countries but Austria, the magnitude of the effect halves. And, in most cases, the effect is not statistically significant anymore. This finding clearly indicates that across Europe the reallocation of workers to worse paying-employers in recessions explains the cyclicality of job loss. Even if post-displacement establishment characteristics are endogenous, this correlation, which is empirically verified in many European economies, provides useful information to understand the cyclicality of wages over the business cycle.

B.4 Employment Coverage

Figure 1 displays remarkably different employment and earnings trajectories across countries following a job displacement event. A potential concern is that this finding is driven by differences in employment coverage across countries. For instance, as displayed in Table A.4, in Sweden self-employed jobs are covered by the data whereas in all the other countries this does not happen to be the case. Yet, this discrepancy does

[18] We do not find that variation in the employment rate affects wage losses in Austria. This result can be explained by the fact that there has been little variation in the unemployment rate, ranging from 4% to 6%, in the past 20 years.

not appear to drive our results. Re-estimating our baseline effects on employment treating self-employed job spells in Sweden as non-employment spells—as it would occur in all the other countries, returns virtually identical results, see Figure A.5.

Another potential source of discrepancy is due to different coverages in public jobs. All our datasets record *some* public jobs. However, coverage of public jobs tends to vary. Denmark, France and Sweden are for instance countries where all public jobs are recorded in their corresponding administrative registers whereas this not occur in countries like Italy, Portugal and Spain where most jobs in public administration (e.g. teachers) are usually not present. To understand the importance of these discrepancies on public jobs for our employment results, we take our data from France, Denmark and Sweden—which cover 100% of all public jobs present in each of these countries—and assign all employment spells in public jobs as *de facto* non-employment spells, similarly to what we did above when looking at self-employed jobs in Sweden.

Notice that this clearly represents an extreme or "worst-case" type of scenario as we are implicitly setting *all* public jobs from Denmark, France and Sweden as not-employed, even those type of public jobs that would still instead show up in administrative data from countries like Italy, Portugal or Spain.[19] However, even setting all public jobs as non-employment spells in Denmark, France and Sweden (while maintaining employment spells in the public sector observed in the other countries) does not change the qualitative conclusions. As shown in Figure A.6a, employment effects due to displacement remains about twice as large in Italy, France and Spain compared to what we observe in the remaining countries.

We also produced a more nuanced analysis where we tried to identify public jobs that, to the best of our knowledge, would not be recorded in Italy, Portugal and Spain but that instead would show up in the registers of Denmark, France or Sweden. Treating these jobs as non-employment spells returns virtually identical results as our baseline case displayed in Figure 1, see Figure A.6b.[20]

All in all, while lack of detailed occupational data from Southern European countries does not permit us to provide a formal cross-walk of public jobs consistently measured across European datasets, the evidence presented in Figures A.6a and A.6b suggests that discrepancies in the coverage of public jobs broadly defined do not appear to drive our employment effects. Dropping public jobs from Denmark, Sweden and France that to the best our knowledge are unlikely to be covered in Italy, Portugal and Spain barely change our point-estimates. Even in a worst case scenario where all public jobs in Denmark, Sweden and France are set as non-employed spells leaves unaltered our main conclusions that displaced workers in Spain, Portugal and Italy are systematically less likely to find a post-displacement job compared to workers from Sweden, France, Austria and Denmark.

These results are consistent with the fact that many public sector jobs in Europe require some form of occupational licensing thus making it difficult for displaced workers – who were all displaced from the private sector – to re-allocate to one of these

[19] Employment in companies that are entirely or in part controlled by the national government (e.g. jobs in the national post-office) tend to be present in Southern-European countries.

[20] For Sweden and Denmark we classify as non-employment the following occupations: teachers, public sector clerks, legislators, and government officials. For France, which adopts an occupation classification not immediately mapped to ISCO codes present in Denmark and Sweden, we set as non-employment the following occupations: administrative and technical executives of the public service; intermediate professions in the public service (administration, security); administrative employees of the public service (service agents and health auxiliaries).

public jobs (Checchi et al., 2021). As a result, the potential discrepancies in the coverage of public employment jobs do not appear to drive our baseline employment effects.

B.5 Lee Bounds for Effects on Wages

This appendix discusses computation of "Lee Bounds" for the wage effects reported in Figure 1. Let $i = 1,\ldots,n$ index the sample of displaced workers along with their matched counterfactual, control workers. Let $D_i = \mathbf{1}\{\text{worker } i \text{ is a displaced worker}\}$; $E_{ik} = \mathbf{1}\{\text{worker } i \text{ is employed } k \text{ years following displacement}\}$ and W_{ik} is wages k years following displacement. The selection model is assumed to be the following

$$W_{ik} = \alpha + \theta_k D_i + \epsilon_{ik}, \tag{A.4}$$

$$E^*_{ik} = \beta + \gamma_k D_i + v_{ik}, \qquad \gamma_k<0 \tag{A.5}$$

$$E_{ik} = \mathbf{1}\{E^*_{ik}>0\} \tag{A.6}$$

Among displaced workers, we observe only the "Always Takers" individuals, i.e. those that would have a job in period k regardless of whether they were displaced k years before. These individuals have $v_{ik} > -\beta-\gamma_k$. However, within the control group, we see both "Always Employed" individuals as well as "Compliers": workers that, if subject to displacement, would actually not be employed in period k. Compliers have $-\beta-\gamma_k > v_{ik} > -\beta$. Therefore, the fraction of compliers among employed control workers is given by

$$p_k = \Pr(v_{ik} < -\beta-\gamma_k | v_{ik} > -\beta) \tag{A.7}$$

Under a monotone selection model that assumes that these compliers all belong to the left tail of the wage distribution, we can therefore compute an estimate of the wage effects due to displacement "controlling" for selection following the insights from Lee (2009). First, note that we can identify p_k from

$$p_k = -\frac{E[E_{ik}|D_i=1] - E[E_{ik}|D_i=0]}{E[E_{ik}|D_i=0]} \tag{A.8}$$

Given an estimate of p_k, one can then assume that all compliers lie in the left part of the distribution of wages, i.e. their wage must be bounded above by w^{p_k}, where w^{p_k} is the p_k centile of the wage distribution among control workers. Therefore, one can construct an estimate of the wage losses due to displacement under a monotone selection model of the type describe above simply by computing:

$$\bar{\mu}_k \equiv E[W_{ik}|E_{ik}=1, D_i=1] - E[W_{ik}|E_{ik}=1, D_i=0, W_{ik}>w^{p_k}] \tag{A.9}$$

We stress that this corresponds to a valid estimate of the treatment effect of displacement on wages under the extreme monotone selection model described above, where only highly-productive displaced workers can enter the labor market following the displacement event. In case the latter model does not hold, then $\bar{\mu}_k$ should be viewed as an upper bound on the wage losses due to displacement (with a lower bound that can be constructed simply by computing $E[W_{ik}|E_{ik}=1, D_i=1] - E[W_{ik}|E_{ik}=1, D_i=$

$0, W_{ik}<w^{p_k}$).

Computation: To compute p_k we simply scale our employment effects from equation (1) at $k = 5$ by the fraction of control workers employed at $k = 5$. We use this quantity to construct w^{p_k} and therefore $\bar{\mu}_k$ as displayed in equation (A.9). Results are displayed in Table A.9. The bound is particularly large in Italy, Portugal, and Spain, with a magnitude of almost 30 log points. Therefore, after accounting for re-employment selectivity the cross-country heterogeneity in wage losses are aligned with that found in our main results.

C Background: Institutional Settings and Data Sources

We harmonize the sample construction to make our cross-country variables of interests as comparable as possible. This section reports the details of data sources and key institutional features. In particular, we report the population of firms and workers, and how labor earnings, days worked, and employer size are measured.

Recall that the outcome variables are defined as follows (see Section 2.1). We define yearly labor earnings, deflated to 2010 EUR, as the sum of labor earnings (possibly from different employers) before taxation. Labor earnings include overtime, bonuses, and severance payments when available. We do not have information on hours worked for all countries. Wages are defined as daily earnings from the main employer, and are computed as labor earnings over days worked. The main employer is the establishment at which annual earnings is the largest. We connect all employment spells at the same establishment in case workers have multiple employment episodes during the year.

C.1 Austria

Data Sources We use the administrative records (AMDB) from the social security administration from 1984 through 2019. This data comprises daily information on all jobs and unemployment spells covered by social security (Zweimuller et al., 2009). It contains information on yearly earnings for each worker-establishment pair. The data does not contain information on hours worked. It further contains basic socio-demographic information at the worker level. Each establishment has a unique identifier that allows us to study changes in employer specific characteristics over time. Most public sector employees are subject to social security and are hence in the data. But there exist public sector employees which are not covered by social security, most prominently the police force, teachers, judges, are not covered by the dataset. The self-employed are not reported.

Definition of main variables

- *Employees:* Earnings are the sum of gross labor earnings across all yearly employers.
- *Employers:* The data only contain establishment identifiers, not firm identifiers, hence we cannot delete workers that are considered to be displaced but move to the same firm.

Institutional Settings on Layoffs Employers with more than 20 employees are obliged to notify the Austrian public employment service (AMS) if they intend to collectively dismiss more than a certain number of employees, where the exact threshold depend on firm size. Furthermore, firms and work councils must agree on a social plan, which can include voluntary severance payments, financial interim aid, reimbursement of costs for education, training or job interviews. Until 2002, long-tenured workers were eligible for severance pay. The Employees Income Provision Act in 2003 eliminated severance pay and replaced it with monthly employer contributions into pension accounts accessible during unemployment spells. See Kettemann et al. (2017).

Related studies Gulyas and Pytka (2020) is the closest paper. They use a recent machine learning method to uncover the sources behind job loss. They find that the main sources behind job losses are related to employer specific factors (AKM firm's wage premiums and the availability of well paying jobs in the local labor market).

C.2 Denmark

Data Sources Our main data source is the `IDA` dataset from 1980 to 2018, provided by Denmark Statistics. IDA contains the universe of Danish residents with establishment and firm identifiers. There is no information on job separations, nor on contract type (temporary or permanent). The data source changed in 2008, which impacts the computation of the days worked and labor earnings variables.

Definition of main variables

- *Employees:* Earnings comprise all salary-related income in a year.
- *Employers:* The number of employees in the establishment on November 28th is used as establishment size. Industry group follows the NACE classification. Public sector employers include the state and municipalities.

Institutional Setting Employers have to inform the local authorities and start negotiating with a worker representative in cases of mass layoffs. Notice periods and severance payments vary from one to six months, depending on workers´ tenure. In the event of large mass layoffs, special funding (*Varslingspulje*) is granted to local job centers. The OECD (2016a) and the European Restructuring Monitor website provide further explanations of the institutional setting.

Unemployment insurance is voluntary. Low-income members of the insurance system receive benefits worth 90% of their pre-unemployment salary, but the replacement rate is lower for middle and top income groups. For an average production worker, the replacement rate is less than 50% (see Andersen et al. (2020)). A string of reforms changed labor market policies in the mid-1990s (see Andersen and Svarer (2007)).

Related Studies Roulet (2021) finds a similar impact of job displacement using plant closure as the displacement event. In contrast, Bennett and Ouazad (2019) find larger impacts.

C.3 France

Data Source We use the dataset DADS that includes a sample of salaried workers from 1991 to 2018. The dataset is provided by the CASD. Until 2001, the sample corresponds to a 1/25 random sample. Starting in 2002 the sample was doubled. The dataset contains establishment and firm identifiers, and records public sector jobs. The panel does not follow workers outside salaried jobs (e.g., self-employed workers).[21]

Definition of main variables

- *Employees:* Earnings include all payments to workers; profit-sharing schemes, employee savings schemes, severance payments and perks.
- *Employers:* The number of employees in the establishment on December 31st is the establishment size. Industry classification is based on a 5 group economic activity category.

Institutional Setting A plan that aims to reduce the numbers of layoffs is mandatory in firms with more than 50 employees, in which at least 10 employees will be laid off within 30 days. Legal severance pay comes to approximately 25% of the monthly reference wage. Severance payments can explain the increase of daily wages in t=0 reported in Figure 1.

Unemployment benefits end after 24 months for workers below 50 years old, and the net (and constant over the unemployment spell) replacement rate is 71%. Special benefits are granted to displaced workers. The replacement rate can be up to 100% of the previous net salary for one year, with special counselling and training.

The French labor market has become segmented over the last three decades, with an increase of jobs under fixed-term contracts. Moreover, part-time unemployment (*Activité Réduite*) is increasingly used (Benghalem et al., 2021).

Related Studies Royer (2011), Frocrain (2018) and Brandily et al. (2020) evaluate the impact of establishment closures on workers. Brandily et al. (2020) identify job losses from two samples: *1.* workers that receive unemployment insurance as "laid-off for economic reasons" and *2.* workers employed in establishments that close. They document a long term reduction of 36% of earnings ($\approx$ 15 % in sample 2.) and 11% of hourly wages ($\approx$ 6 % in sample 2.). The firm (AKM) wage premium explains 84.5% (sample 1) and 95.5 % (sample 2) of the long-term hourly wage losses.

C.4 Italy

Data Sources The main data source is derived from social security records stored by the Social Security Institute (Istituto Nazionale Previdenza Sociale, INPS). This dataset, which we label INPS-LOSAI, contains roughly 6.5% of the universe of workers present in the universe of INPS records. The panel records all employment spells in private-sector salaried-jobs. However, jobs under employers that are controlled in part or entirely by the government (e.g. job in the national post-office) tend to also be

[21] We are grateful to Pauline Carry, Bérengère Patault, and Elio Nimier-David for their help on the French data.

included. Attrition can be due to unemployment, self-employment or employment in public administration (e.g. teacher). Information on whether a job is under temporary contract and the reasons behind a job termination is available since 1998 and 2005, respectively.

Definition of main variables

- *Employees*: Earnings includes base labor earnings, regular benefits (based on seniority) and irregular benefits (e.g., profit distributions, premiums at the firm level, holiday bonuses are also included). Earnings are top coded at roughly the 99.5 percentile (Hoffmann et al., 2021).

- *Employers*: Yearly information on employer size is collected within the LOSAI dataset in various bins (0-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-40, 41-50, 51-100, 101-200, 201-300, 301-400, 401-500, 500). We take the midpoint in each bin and define that as the employer size for a given year. An employer is defined based on the employer identifier provided by INPS. As in Spain (see below), we consider an employer to be involved in a mass layoff when one of these two situations occurs: (i) when the employer experiences a reduction in the number of workers employed of more than 30% relative to the previous year or (ii) the reason of job separation given to INPS by the employer is "firing for economic reasons" which represents scenarios in which the employer is laying off part or all of its workforce because of financial difficulties. Below we show that similar earnings losses are obtained using only (i).

Institutional settings Employment legislation surrounding layoffs typically applies to firms that have more than 15 employees (Kugler and Pica, 2008). Sectoral bargaining agreements might provide specific criteria on which workers should be subject to the layoff. Prior to the layoff, it is typical to observe some workers receiving zero hours contracts (Giupponi and Landais, 2020). Following the layoff, the worker receives the so-called "trattamento di fine rapporto (TFR)" which is calculated as a full year of salary divided by 13.5 plus approximately 1.5% for each year of tenure.

Related Studies The closest paper to our study using Italian data is Mossucca (2016). She estimated job displacement effects using INPS data. However, she does not have information on firm-size and, therefore, uses worker-level information on whether workers were assigned to zero-hours contracts to proxy for mass-layoff events.

Downward Trend in Pay Losses during the 2000s Earnings losses for Italian displaced workers appear to experience a downward trend during the 2000s.

It is worth investigating the causes of this particular downward trend. The decade 2000-2010 is a period of profound transformations of the Italian labor market. The landmark of this process of transformation is the dualization of employment contracts. Temporary employment contracts were liberalized during this period. This liberalization was achieved while maintaining rigid levels of employment protection for permanent contract workers (Boeri, 2011; Daruich et al., 2020).

This leads to the question: Are Italian workers who were displaced in the 2000s experiencing larger earnings losses because they are more likely to have a temporary

job following a job loss? Figure A.7 overlays the event study coefficients on earnings and wage losses experienced by workers displaced in different years with the event study of the probability that the first job obtained after a layoff is on a temporary employment contract. It appears that the effect on the share of displaced workers obtaining a temporary job following displacement predicts wage and earnings losses well, both in the short and long-run. The negative association between earnings losses and temp-share following displacement also suggests that these contracts did not help workers find jobs following displacement. Instead, a substitution effect appears to dominate: displaced workers are increasingly more likely to obtain a temporary job (as opposed to a permanent one) and this causes significant wage and earnings losses both in the short and in the longer run.

In conclusion: the downward trajectory in pay losses appears to be due in part to by changes to Italian institutions that facilitated the hiring of workers on a temporary basis. This finding echoes the ones in Woodcock (2020) who found that German workers displaced after the passage of the so called Hartz-reforms experienced (i) larger wage losses (ii) a substantial part of these wage losses is due to workers increasingly sorting into temporary jobs.

C.5 Portugal

Data Sources The main data source is the *Quadros de Pessoal* (hereafter QP) for the 1987-2018 period.[22] The data are gathered annually by the Portuguese Ministry of Employment through an questionnaire that every establishment is obliged by law to fill in. The dataset does not cover the public administration and non-market services, whereas it covers partially or fully state-owned firms. The dataset covers virtually the entire population of firms. The dataset contains a snapshot of firms' employment in October each year. It contains information on industry (NACE 2), hiring date, the kind of job contract (fixed-term or open-ended), the effective number of hours worked, and different types of compensation. This implies that jobs (hence earnings, days worked and daily wages) are not recorded for a worker who is not employed in October. Finally, due to the fact that the year 2001 is missing from the QP at worker level, we exclude the years 2000 and 2001 as possible treatment years. We also remove from the treatment years the year 1999, due to the disproportionate and implausible amount of displaced workers who disappear from the dataset compared to other years, which makes the year a clear outlier. See Acabbi et al. (2021) for additional details about the data source.

Definition of main variables

- *Employees:* Earnings include base earnings, regular benefits (based on seniority) and irregular benefits (profit distributions and premiums). Earnings do not contain severance payments.
- *Employers:* Number of employees in establishments are measured at the end of October. The definition of a mass layoff is based on the variation in employment from October to October each year.

[22] We are grateful to Pedro Raposo for his help to access to the data.

Related studies The closest paper to our study using Portuguese data is Raposo et al. (2021). They evaluate the sources of wage losses of workers displaced from 1988 to 2011, with different sample restrictions. They find that sorting into lower paying job titles represents the largest component of the monthly wage loss of displaced workers, accounting for 37% of the total average monthly wage loss compared to 31% for the firm and 32% for the match effects.

C.6 Spain

Date Sources We use administrative data from the Continuous Sample of Working Histories (*Muestra Continua de Vidas Laborales*, MCVL) for the period 2005-2019, provided by the Spanish Social Security Administration. This sample is a 4% random draw from the universe of Social Security records, employed and unemployed workers and retired people in the reference year. This sample also offers retrospective information of the entire labor history of workers. Around one third of the public sector employees are not included in the sample (excluded from the General Regime of the Social Security).

The dataset contains monthly information on the number of days worked, the kind of job contract (open-ended or fixed-term) and the working time (whether full-time or part-time job, and the fraction of working time) for all employers. Hours worked are not available.

Definition of main variables

- *Employees*: Earnings refer to the monthly contribution to Social Security that can be top- and bottom-coded, including annual bonuses and excluding overtime hours and severance payments. The minimum and maximum limits vary by workers and over time, depending on the minimum wage and inflation. The data also provides information on total yearly earnings (i.e., not top and bottom coded) coming from tax records. As a robustness check, we have reestimated the consequences of job loss in earnings and wages to assess that the results are almost statistically identical when we use information on total taxable labor earnings for the period with both income sources available. They only differ significantly in the pre-displacement year ($t^* - 1$) and in the year of mass layoff (t^*) as earnings from tax records include severance payments.

- *Employers*: The number of employees in an establishment is available for the month of April one year later. Hence, we redefine our reference year in the analysis from May to April of next year. This makes the yearly information on the number of employees in the establishment coincide with the end of the reference year (for instance, year 2018 in our analysis covers from May of the calendar year 2017 to April of 2018).

  An employer is involved in a mass layoff when one of these two situations occur: (i) the reason for job separation given to Social Security by firms is a permanent collective dismissal (*Expediente de Regulación de Empleo*, ERE) or (ii) when the establishment experiences a reduction in the number of workers employed in more than 30% with respect to the previous year. Figure A.4 shows that estimates of earnings losses are similar with or without using the condition (i) (*ERE*).

Institutional Setting Firms must ask for authorization for a collective dismissal when the number of dismissed workers exceeds a certain threshold in a three-month period depending on the initial firm size (*Expediente de Regulación de Empleo*, ERE). In collective dismissals, the legal severance payments are the salaries of 20 days per year worked with a maximum level equal to 12 months earnings. In cases of unfair dismissals of permanent workers, severance payments are the earnings of 33 days per year worked with a maximum payment of 24 months. In cases of fixed-term contracts, it is 8 days per year worked and 12 days since 2015 (see Barceló and Villanueva (2016)). The maximum duration of unemployment benefits is 24 months. The replacement rate of unemployment benefits is 70% of the contribution base in the first 6 months and 50% afterwards. The amount of unemployment benefits varies between 527.24€ and 1,482.86€ in 2019. The use of fixed-term contracts is very high in Spain. Since 2015, the maximum length of a short-term contract is three years, which can be extended one year more in some cases.

Related studies Garda (2012) finds wage drops in the long run of roughly 10% for permanent contract and 5% for fixed term contract. Garcia-Cabo (2018) also finds wage losses of 15% on average, but the sample restriction is different.

C.7 Sweden

Data Sources We use the RAMS matched employer–employee database from Statistics Sweden (SCB). The database contains full population-level information on the gross labor earnings paid for each employment spell (public and private sector jobs). RAMS does not provide information on the reason for layoffs nor on the nature of the contract. We complement the employment information with socioeconomic characteristics from the LOUISE dataset (SCB). RAMS is also used to compute firm size and employer in November.

Definition of main variables

- *Employees:* Earnings is the sum of gross labor earnings across all employers.

  The employment spells are used to compute the number of days employed at the primary employer (by multiplying the corresponding number of months worked by 30) and the daily earnings at the primary employer.

Institutional setting The Swedish institutional setting is similar in many respects to that of Denmark and other Nordic countries when it comes to unemployment insurance and active labor market programs. The Swedish model integrates flexibility for employers and security for employees. Workers can *voluntarily* insure against job loss, which gives them eligibility to receive unemployment benefits. The unemployment insurance system is characterized by conditionality: unemployment benefits can be subject to suspension if jobseekers do not fulfill the job search requirements (see Lombardi 2019).

Job security councils help workers who lose their jobs during mass layoffs to transition towards a new job. The transition services provided include training and start-up support to employees.

One specificity of the Swedish system in the case of mass layoffs is a set of rules that go under the name LIFO ("last-in-first-out"; see OECD, 2016b). This implies that workers with lower tenure leave the firm first, whereas longer-tenured workers are laid off at a lower priority. In practice, firm-level bargaining can imply deviations from LIFO rules. OECD (2016b) gives an overview of the institutional setting.

Permanent contracts are the main rule. Fixed-term employment contracts must be provided by law or collective agreement.

Related studies Eliason and Storrie (2006) study long-term effects of job displacements in 1987 up to 12 years later. The lack of post-displacement earnings recovery is attributed to the 1990s Swedish financial crisis. Seim (2019) studies displacement effects in Sweden for displacements in 2002–2004 by using information that allows resignations to be distinguished from actual displacements. Five years after displacement, our earnings loss effects are similar to those in Seim (2019), both in levels (around 4,000 Euros in 2010 currency) and as percentage change from the pre-displacement level (about 10% losses).

Cederlöf (2021) provides job loss estimates using a mass layoff design similar to the one we implement.

D Related Literature

This section reviews recent theoretical frameworks and empirical work. See Carrington and Fallick (2017) for a review.

D.1 Job Displacement

D.1.1 Theoretical framework

Key ideas. Some models are based on *loss of skills*. Loss of skills can be split into two categories. First, firm-specific skills are acquired over time during the employment spell and are mainly valuable in the current job (Becker, 1964; Lazear, 2009). Second, general skills can be lost over the unemployment period (Pissarides, 1992; Ljungqvist and Sargent, 1998). In the class of search models, *losses in firm rents or match components* explain earnings losses. Over the employment spell in search models, wages rise with tenure as wages are renegotiated (Cahuc et al., 2006), or simply through commitment (Burdett and Coles, 2003). In job matching models, such as in Jovanovic (1979), workers lose a fixed component of their wage which is specific to a match. Recent models combine some of those mechanisms. For instance, see Krolikowski (2017), Jarosch (2021), Huckfeldt (2022), Burdett et al. (2020), Acabbi et al. (2022).

D.1.2 Empirical Evidence

US evidence. Davis and Von Watcher (2011) report a range of earnings losses going from -18% to -25% depending on displacement years (see Hall (2011) for a discussion). Lachowska et al. (2020) study displacement events from 2008-2010 for Washington State. They find a reduction of 15% in earnings, 2.7% in hours worked and 4.9% in hourly wages up to five years after the event. Match effects, as in Woodcock (2015), explain 57% of the job loss, while AKM firm fixed effects explain 17%. In their sample,

the AKM firm fixed effect is not important as 70% of workers move to a better or same AKM quintile firm. Using Ohio data, Moore and Scott-Clayton (2019) report that between 16% to 24% of long-run earnings losses is explained by firm rents.

European evidence. Schmieder et al. (2020) study job displacement in 1980-2009 in Germany and find a 10% decrease in earnings up to 10 years after displacement. In contrast to evidence based on U.S data, they conclude that a large part of wage losses and a substantial degree of their cyclicality can be explained by the reduction of average wage levels of new employers. Schmieder et al. (2020) find that, going from peak to trough of the business cycle in Germany raises short-term earnings losses from -13% to -25%, similar in magnitude to Davis and Von Watcher (2011). Fackler et al. (2021) shows that wage losses for plant closures in Germany depend on pre-displacement plant size. Raposo et al. (2021) study job loss in 1988-2014 in Portugal. In their sample, 46% of the wage loss is due to sorting into lower paying jobs, 27% of the loss due to match effects, and the remaining 27% is accounted for the drop in employer fixed effects. OECD (2018) reports earnings losses using a mix of survey and administrative data over the period 2000 to 2005 for several OECD countries.

Comparing existing evidence. It is not possible to compare the above-mentioned results because they apply different econometric models and impose different sample restrictions. This point is illustrated in Table A.1. In terms of methods, Raposo et al. (2021) estimate an AKM model, but include job titles, that blend skill requirements of the worker and the bargaining power of the workers' organizations. Sample selection also greatly differs across the papers mentioned above. For instance, the set of comparison workers are different across studies. Schmieder et al. (2020) build their control as workers that do not leave the firm up to $t = 0$, while Lachowska et al. (2020) restrict to at least $t = 4$. Previous research shows that different comparison groups lead to different earnings losses (Krolikowski, 2018; Cederlöf, 2021).

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