Should We Insure Workers or Jobs During Recessions?
Online Appendix

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A Short-Time Work Programs during the COVID Crisis

The majority of OECD countries had a short-time work program in place prior to the COVID crisis. At the onset of the crisis, several of those who did not have a scheme in place newly introduced it (e.g. Hungary and the United Kingdom), and most of those with existing short-time work schemes implemented measures to ensure rapid access to and wide take-up of the program. Such measures broadly consisted in (i) easing access, (ii) extending coverage, and (iii) increasing generosity. Combinations of such measures have been necessary for short-time work schemes to work swiftly and effectively [Giupponi and Landais, 2020a].

To facilitate access, several countries have streamlined the application and authorization phases. For example, countries such as Belgium, the Czech Republic, France, Italy, and Spain allowed firms to apply by simply invoking the health crisis as motive (rather than having to provide proof of economic need). Restrictions to minimum and maximum reductions in working time have also been eased. For example, before COVID, German firms could apply for short-time work only if at least 30% of their workforce would be subject to a reduction in hours. This threshold has been lowered to 10%. In the UK, the newly introduced Coronavirus Job Retention Scheme initially granted the subsidy for hours not worked only for employees with 100% hours reductions. From July 1, 2020 reduction of hours below 100% started to be subsidized.

Coverage has been extended both on the firm side and on the worker side. Italy, where short-time work eligibility was traditionally limited to firms with more than 15 employees and operating in certain sectors of the economy (mainly manufacturing and construction), extended the scheme to all sectors and firm sizes. On the worker side, eligibility has been extended to workers on temporary or non-standard work arrangements, and in some cases even the self-employed. Finally, many countries have increased the generosity of the program through higher replacement rates, lower costs to the firm and longer program durations.

Online Appendix Table A1 provides an overview of short-time work-related measures that have been adopted in selected European countries and the US in response to the pandemic shock. See Scarpetta et al. [2020] for a more detailed discussion.

Table A1: SHORT-TIME WORK MEASURES ADOPTED DURING COVID IN SELECTED OECD COUNTRIES

Country (Program)	Facilitating Access	Extending Coverage	Increasing Generosity
France (*Activité Partielle*)	Firms can invoke the health crisis as a "force majeure" to use short-time work.	All employees with a contract (whether permanent or temporary) are eligible.	The maximum duration of the scheme is extended from 6 to 12 months.
	Firms can apply retroactively.		The subsidy is 70% of gross wage, subject to a cap.
	Authorizations are deemed granted in the absence of response from the Ministry of Labor within two working days.		Most employers do not bear any cost for hours not worked.
Germany (*Kurzarbeit*)	Firms can apply if 10% of their workforce is subject to reduction of hours, compared to 30% before.	The subsidy, which normally covers permanent and temporary contracts, and apprentices, is extended to agency workers.	The reimbursement rate of social insurance contributions paid by the employer for hours not worked increases from 50% to 100%.
			The statutory replacement rate for lost earnings is raised to 70% from the fourth month and 80% from the seventh month onwards (respectively, 77% and 87% for those with children).
			Restrictions on taking another job while on short-time work are lifted.
Italy (*Cassa Integrazione Guadagni*)	Firms of any size and from all sectors can apply.		Employers do not bear any cost for hours not worked.
	Firms are no longer required to provide evidence of economic need and can simply declare that they have been negatively affected by the COVID crisis.		

Country (Program Name)	Facilitating Access	Extending Coverage	Increasing Generosity
Italy (*Cassa Integrazione Guadagni*) cont.	Applications can be filed retroactively up to four months after the reduction in hours.		
United Kingdom (Coronavirus Job Retention Scheme)	The scheme was announced on March 20, 2020, and was initially intended to run between March 1, 2020 and May 31, 2020. However, it was subsequently extended on various rounds. Initially, the subsidy was only granted for employees with 100% hours reductions. From July 1, 2020 hours reductions under 100% are also subsidized.	The scheme is open to all UK employers and employees.	Employees on short-time work are entitled to no less than 80% of their usual monthly wage for unworked hours, up to a cap of £2,500 a month. Employers can apply for a grant that covers short-time work employees' usual monthly wage costs for unworked hours, up to a cap of £2,500 per month up to 30 June 2021. From July 1, 2021 the level of the grant will be reduced. Employers are responsible for employer national insurance contributions and minimum automatic enrolment employer pension contributions.
United States (Short-Time Compensation)	Under the CARES Act, the federal government provides up to $100 million in grants to states to implement, improve and promote short-time work programs.		Under the CARES Act, states that have short-time work compensation programs can have short-time work benefits 100% federally financed for up to 26 weeks through the end of 2020. For states without existing programs, the federal government temporarily finances 50% of short-time work benefits and up to 100% of additional administrative expenses incurred through the implementation of the program.

Country (Program Name)	Facilitating Access	Extending Coverage	Increasing Generosity
US (Short-Time Compensation) cont.			Employees that are covered by a short-time work program receive, in addition to their short-time work benefit, the additional Federal Pandemic Unemployment Compensation (FPUC) $600 weekly payment.

Source: Scarpetta et al. [2020].

B Evidence on the Value of Insurance: Short-Time Work vs Unemployment Insurance

The relative value of short-time work vs unemployment insurance can be inferred from the relative magnitude of the marginal utility of consumption of individuals on short-time work and on unemployment insurance. Whilst we do not have direct measures of consumption for the two groups, we can gain insight on their relative marginal utility by looking at the characteristics of individuals who end up being on short-time work or unemployed.

To this end, we exploit newly collected data from the High-Frequency Online Personal Panel Survey (HOPP), a longitudinal survey launched by the German Institute for Employment Research. The HOPP survey is based on a random sample of individuals drawn from the administrative data of the Federal Employment Agency in Germany.[1] The survey started in May 2020 with the goal of assessing the evolution of individual socio-economic conditions in Germany during the COVID pandemic. At the time of writing, seven waves of the survey have been conducted since May 2020, at monthly frequency between May and August 2020, and every two months between September 2020 and February 2021. See Haas et al. [2021] for more details on the survey design. Online Appendix Table B1 reports the sample average of a set of individual characteristics for workers that are employed (though not on short-time work) in column (1), on short-time work in column (2) and unemployed in column (3). Columns (4)-(6) report the p-value of the test of difference in means between employed and on short-time work in column (4), employed and unemployed in column (5), and on short-time work and unemployed in column (6).

By comparing the demographic characteristics of individuals in the three labor market statuses, we observe that individuals on short-time work and unemployment are significantly less likely to be female (approximately 43% are women as compared to 51 among those employed). The age composition of those employed and on short-time work is not too dissimilar, while the unemployed tend to be significantly over-represented among the youngest (aged 18-34) and oldest (aged 55+) age categories. Being in those age groups tends to be associated with fewer sources of insurance in the face of labor market shocks (e.g. formal insurance, savings or a partner for those aged 18 to 34, and labor market opportunities for those over 55 years-old), as compared to prime-age individuals.

Unemployed individuals are the least likely to have a partner, and – if they have one – the most likely to have their partner not working. Those on short-time work tend to

[1] The administrative records cover all labor market participants except civil servants and the self-employed.

be more similar to those employed along those two dimensions, but are nonetheless significantly less likely to have a partner. Similar patterns emerge if we consider total monthly household income in the three groups. This evidence suggests that – absent formal insurance – the unemployed, and to a lesser extent, those on short-time work would not have access to self-insurance through either an added worker effect (i.e. their partner's labor supply) or savings.

Differences in demographic characteristics indicate that there is sorting into short-time work and unemployment with respect to dimensions that are associated with the ability to cushion labor market shocks through one's own means. As such, the unemployed appear to be more likely to have higher marginal utilities, and hence higher values of insurance, than those on short-time work, who – in turn – have higher marginal utilities than those employed. This suggests that both short-time work and unemployment insurance have insurance value, though this is likely larger for unemployment insurance. This conjecture is further corroborated by evidence on the marginal propensity to consume of the three groups. When asked what fraction of a lump-sum equivalent to their household monthly income they would spend within a month of receiving it, those employed answer 32%, those on short-time work 33% and those unemployed 39%. Finally, there is substantial variation in life satisfaction (measured on a scale from 1 to 10) across the three groups.

The value of insurance is a direct function not only of the availability of self-insurance options, but also of the size of the consumption (or income) shock experienced upon transitioning to the bad state. The HOPP data offer some insight on the relative drop in household income and hours worked (a proxy of an individual's earnings capacity) between the employed and the short-time work/unemployed states. We evaluate the change in household income bracket and the change in hours worked among individuals who transition from employment to short-time work (E to S) and from employment to unemployment (E to U) over subsequent waves.[2] Transitioning from employment to unemployment is associated with a household income bracket change of 0.16, which is approximately equivalent to €150 per month. No change is associated with transitioning from employment to short-time work.[3] The drop in hours is approximately 31 hours per week for E-to-U transitions, substantially larger than the 7 hour drop associated with E-to-S transitions.[4]

[2]There is a total of 218 individuals transitioning from employment to short-time work, and 49 from employment to unemployment.

[3]The difference between the E-to-S and E-to-U change is statistically significant at 5%.

[4]The difference between the E-to-S and E-to-U change is statistically significant at 0.1%.

Table B1: CHARACTERISTICS OF WORKERS IN EMPLOYMENT, SHORT-TIME WORK AND UNEMPLOYMENT

	Employed	Short-Time Work	Unemployed	P-value of difference		
				E-S	E-U	S-U
	(1)	(2)	(3)	(4)	(5)	(6)
Female	0.512	0.426	0.428	0.000	0.000	0.923
Age 18-34	0.223	0.211	0.245	0.199	0.079	0.024
Age 35-54	0.511	0.520	0.355	0.438	0.000	0.000
Age 55+	0.266	0.269	0.400	0.743	0.000	0.000
University degree (incl. applied)	0.453	0.323	0.301	0.000	0.000	0.198
Has partner	0.711	0.684	0.490	0.006	0.000	0.000
Partner not working	0.168	0.168	0.343	0.997	0.000	0.000
Monthly household income	4,246	3,637	2,107	0.000	0.000	0.000
MPC	0.323	0.334	0.389	0.041	0.000	0.000
Life satisfaction (scale 1-10)	8.036	7.572	6.409	0.000	0.000	0.000
Obs.	21,475	2,291	1,080			

Notes: The table reports the sample average of a set of individual characteristics for workers that are employed and not on short-time work in column (1), on short-time work in column (2) and unemployed in column (3). Columns (4)-(6) report the p-value of the difference in means between employed and on short-time work in column (4), employed and unemployed in column (5), and on short-time work and unemployed in column (6). In the underlying survey data, monthly household income is recorded in bins. From the binned data, we estimate the mean and standard deviation for each group of individuals using a robust Pareto midpoint estimator [Von Hippel et al., 2017]. The table is based on waves 3-7 of the HOPP panel survey [Haas et al., 2021]. Questions on life satisfaction have not been included in wave 6 of the survey, hence the statistics for this variable are based on waves 3-5 and 7 (the number of observations being 16,802, 1,897 and 867, respectively).

C Data

C.1 Data on Short-Time Work

We collect administrative data on the number of workers on short-time work at the monthly level for the period from January 2005 to December 2019 for France, Germany, Italy and the US. Data are sourced from national administrative authorities and statistical agencies. Data for France come from the French Ministry of Labor,[5] for Germany from the German Federal Employment Agency,[6] for Italy from the Social Security Administration,[7] and for the US from the Department of Labor.[8] For the period from January to June 2021, monthly data on short-time work have been provided by the OECD Directorate for Employment, Labour and Social Affairs [OECD, Forthcoming]. The OECD data cover 32 of the 37 members of the OECD: Austria, Australia, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Latvia, Lithuania, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the UK and the US.

For France, data on short-time work start from January 2008, when the program was introduced, and are not available between January 2017 and February 2020, due to a break in the series. Prior to 2020, Italian data on short-time work usage are recorded in terms of authorized hours of short-time work rather than employees on short-time work. In order to obtain an estimate of the number of individuals on short-time work, we assume – based on estimates in Giupponi and Landais [2020b] – that 90% of authorized hours are used and that, while on short-time work, work hours are 35% of usual hours (assumed to be 40 per week).

C.2 Data on Unemployment Insurance

We collect administrative data on the number of individuals on unemployment insurance at the monthly level for the period from January 2005 to December 2019 for Germany, France, Italy, the UK and the US. Data are sourced from national administrative authorities and statistical agencies. Data for France come from the French Ministry of Labor, for Germany from the German Federal Employment Agency, for Italy from the Social Security Administration, for the UK from the Office for National Statistics,[9] and

[5] https://dares.travail-emploi.gouv.fr
[6] https://statistik.arbeitsagentur.de
[7] https://www.inps.it
[8] https://oui.doleta.gov
[9] https://www.nomisweb.co.uk

for the US from the Department of Labor. For the period from January to June 2021, monthly data on unemployment insurance are sourced from the OECD Social Benefit Recipients Database.[10] The OECD data cover 14 countries: Belgium, Chile, Denmark, France, Germany, Ireland, Italy, Korea, Poland, Spain, Sweden, Switzerland, the UK and the US. For our measure of unemployment insurance take-up, we consider only contributory unemployment insurance schemes for job-seekers among those reported in the OECD data.

For Italy, data on unemployment insurance is missing before January 2011, when the main unemployment insurance programs where introduced, and between February and December 2015, due to a break in the series.

C.3 Data on Employment

Quarterly data on employment and the working age population are sourced from OECD Statistics.[11]

C.4 Measures of Short-Time Work and Unemployment Insurance Take-Up

In this subsection, we provide a detailed illustration of the series reported in Panels A and B of Figure 1. Panel A reports the evolution of short-time work (dashed lines) and unemployment insurance (solid lines) take-up in Europe (red lines) and the US (blue lines). Short-time work and unemployment insurance take-up are computed as the number of individuals in the program in a given month as a percentage of the quarterly working age population. The series for Europe are a weighted average of the series for Germany, France, Italy and the UK, weighted by the working age population. Data sources are described in detail in Online Appendix C.1 and Online Appendix C.2. For France, data on short-time work start from January 2008, when the program was introduced, and are not available between January 2017 and February 2020, due to a break in the series. For Italy, data on unemployment insurance is missing before January 2011, when the main unemployment insurance programs where introduced, and between February and December 2015, due to a break in the series. For the UK, data on short-time work start in March 2020, when the program started. We assume that take-up is zero for the months in which data is missing.

Panel B reports the evolution of the non-employment rate, i.e. one minus the employment rate (employed people as a percentage of the working age population). Quar-

[10] https://www.oecd.org/social/social-benefit-recipients-database.htm
[11] https://stats.oecd.org

terly data on the employment to population ratio are sourced from OECD (see Online Appendix C.3).

In both panels, the plotted series are moving averages of the raw series over the period up to June 2021. The moving average is based on twelve lagged terms, one forward term and uniform weights.

C.5 Vacancies

We use surveys at the establishment level to retrieve information on vacancy postings. For the US, we use the Job Openings and Labor Turnover Survey (JOLTS) from the US Bureau of Labor Statistics (BLS).[12] This survey is conducted on a monthly basis on a sample of 16,000 establishments. For European countries, we use data from the Job Vacancy Statistics (JVS) provided by Eurostat.[13] It covers all enterprises with one or more employees in each member state except in France where only units with 10 employees or more are surveyed. Both surveys rely on the same definition. A vacancy (Eurostat) or job opening (JOLTS) has to satisfy three requirements: (i) a paid post that is newly created, unoccupied, or about to become vacant, (ii) for which the employer is taking active steps to find a suitable candidate from outside the enterprise concerned, and (iii) which the employer intends to fill either immediately or within a specific period of time.[14]

C.6 Hires

For hires, we use an establishment survey for the US and a population survey for European countries. For the US, we use again JOLTS. Hires correspond to all additions to the payroll during the reference month.[15] For European countries, information on hires is not available from an establishment survey. Instead, to retrieve information on hires, we turn to a population survey – the Labor Force Survey (LFS). Each month, individuals have to declare whether they are in employment and, if so, since when. Eurostat uses this information to retrieve the number of recent job starters. These correspond to individuals who report having started their employment in the last three

[12] Data for the US are at monthly frequency and have been aggregated at quarterly frequency, by taking the sum of monthly values over the quarter.

[13] Surveys are conducted at the country level following guidelines defined at the European level. There are minor variations in terms of coverage across countries. However, as we plot time series or deviations with respect to a reference level, what matters most is consistency within countries over time.

[14] For more details on the definition in the JOLTS see https://www.bls.gov/news.release/jolts.tn.htm, and in the JVS https://ec.europa.eu/eurostat/cache/metadata/en/jvs_esms.htm.

[15] See https://www.bls.gov/news.release/jolts.tn.htm for more details on the definition.

months before the interview. Information on recent job starters is available for individuals aged 20 to 64 years old. The main downside of this proxy is that it allows at most one job transition per individual per quarter.

Recalls in the US. The definition of hires in JOLTS incorporates both newly hired and rehired employees.[16] Recalls are situations in which individuals have been recalled to their previous job after a temporary interruption of their contract. Using empirical work from Hall and Kudlyak [2021], we produce a series of hires which excludes recalls. We document that most hires following the pandemic were in fact recalls. That is there has been little to no reallocation. To do so, we start from the series of Hall and Kudlyak [2021]. They work on micro-data from the Current Population Survey. For each individual, they have information on whether an unemployed worker considers herself as being on temporary layoff or not. Workers are considered on temporary layoff if they expect to return within six months to their previous employer or have been provided with a specific recall date. Otherwise, if they fulfil the job search criteria, they are considered unemployed. From this, they distinguish two types of unemployed workers: the recall unemployed – job losers on temporary layoff – and the jobless unemployed – all other unemployed workers. They derive the work-finding-rate of recall and jobless unemployed, that is the rate at which the unemployed transition into employment from one month to the next. Using this information, we estimate the number of recalls using the number of recall unemployed ($recall$) times their job-finding rate (f_{recall}). Then, starting from total hires, we subtract inferred recalls to retrieve our series of hires without recalls. That is: $hires_{without\ recalls} = hires - recall \times f_{recall}$.

C.7 Measure of Tightness

Labor market tightness is an indicator of the state of the labor market. It is defined as the ratio of search effort by firms to that of the unemployed. It captures how the demand and the supply side of the labor market compare. The number of job openings is used as a proxy for search effort on the firm side. The supply side is usually decomposed into the number of unemployed workers times the effort they exert in looking for a job. Labor market tightness (θ) is thus defined as $\theta = v/e \cdot u$, with v the number of vacancies, u the number of unemployed workers and e their search effort. The standard intuition is that in recessions there are more unemployed workers and less job openings so labor market tightness decreases, while in booms there are less unemployed workers and more job openings so labor market tightness is higher, making it more difficult for firms to hire workers.

[16] For more details, see the JOLTS documentation: https://www.bls.gov/news.release/jolts.tn.htm.

In this paper, we provide a measure directly related to tightness. We define $q(\theta)$ as the ratio of hires to vacancies.[17] It corresponds to the probability to fill a vacancy per unit of time. This captures the outcome of search rather than the process. Variations in $q(\theta)$ should account for variations in θ. Indeed, if tightness increases – e.g. there is more search effort on the firm side *ceteris paribus* – then it should be the case that the vacancy-filling probability decreases. Thus, variations in $q(\theta)$ should be negatively correlated with tightness (θ). The following section looks specifically at the evolution of $q(\theta)$ over the very recent period – from 2019 onwards – in the US and a selected set of European countries.

C.8 Data on COVID Cases

Data on COVID cases are sourced from the Johns Hopkins Coronavirus Resource Center, a continuously updated source of COVID data. The data are available at the country level and daily frequency since February 22, 2020. We aggregate the data at the quarterly level summing up daily new cases.

[17] Data on hires and vacancies for the US are at monthly frequency. For $q(\theta)$, we aggregate the data at quarterly frequency by computing the average of monthly values over the quarter.

D Labor Market Tightness and the Effect of Public Policies

This section provides empirical evidence on the state of the labor market in the US and several European countries in the recent period. It puts labor market tightness into perspective with the recourse to short-time work and unemployment insurance.

D.1 Evolution of Labor Market Tightness during the COVID Crisis

As a first step, we document the evolution of the state of the labor market during the COVID crisis on both sides of the Atlantic. We look at variations in our proxy $q(\theta)$ over time within country and decompose them into variations in the number of hires and of vacancies. Formally, this relies on the following mathematical decomposition: $dq(\theta) = dh - dv$. Online Appendix Figures D1 and D2 plot the evolution of the number of hires (in blue), vacancy postings (in red) and the ratio of the two (in green) over time at the country level. Each variable is divided by its its 2019Q4 level – the last full pre-pandemic quarter. As such, the series can be interpreted as deviations with respect to pre-pandemic levels.

Findings for European Countries. Online Appendix Figure D1 displays the three series for a selected set of European countries.[18] For all them, pre-pandemic levels do not deviate significantly from one suggesting little variations, while the COVID crisis – marked by a red vertical line – causes adjustments of hires and vacancies. In Belgium, France, Ireland and Spain, the ratio of hires to vacancies $q(\theta)$ decreases sharply between the last quarter of 2019 and the second quarter of 2020, when the pandemic first hit. From the decomposition, it is clear that the drop is mainly driven by hires decreasing more than vacancies. However, by the third quarter of 2020 hires and vacancies are more or less back to pre-pandemic levels. Two notable exceptions are Sweden and the UK. In these countries, hires decrease less than vacancy postings, causing $q(\theta)$ to increase.

Findings for the US. Online Appendix Figure D2 displays the same three series – hires, vacancies, and the ratio of the two – for the raw series (left panel) and for the adjusted series without recalls (right panel). The left panel of Online Appendix Figure D2 suggests a large 50% increase in hires compared to pre-pandemic levels, which contrasts sharply with the 25% decrease in vacancy postings. The right panel of Online Appendix Figure D2 plots the series of hires without recalls. In 2020, the dynamics is drastically different. It resembles much more the one in European countries, where

[18] The selection is based on data availability. These countries correspond to those for which we have information on hires, vacancies, and short-time work and unemployment insurance take-up.

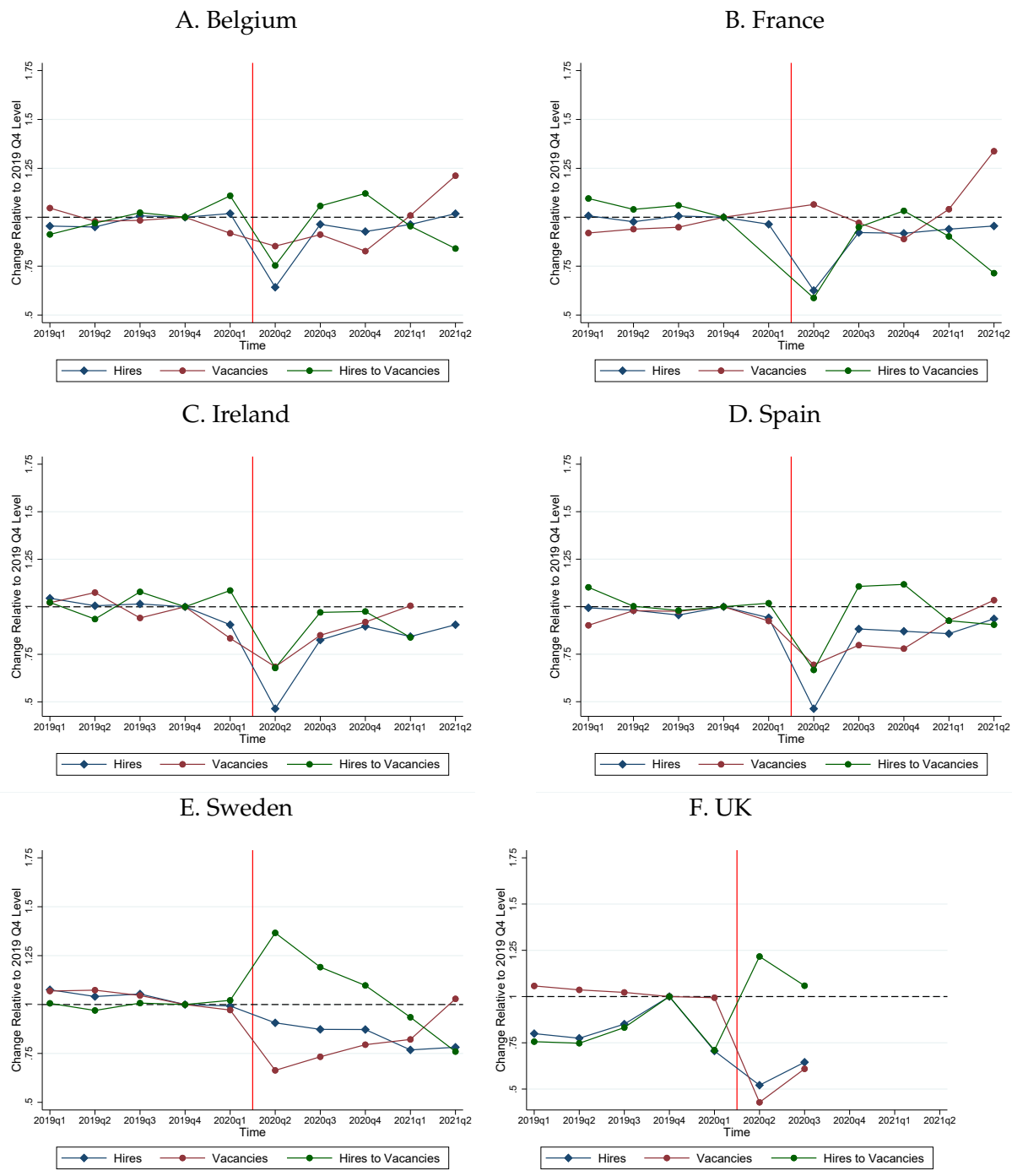
hires have decreased more than vacancy postings and $q(\theta)$ has decreased. At the beginning of 2021, the recall channel seems to be less strong. Those who have been recalled to their jobs were recalled in the six months following the pandemic (see Hall and Kudlyak [2021] for results on the dynamics of recalls in the US). Moreover, by the end of 2020, the number of vacancy postings was beyond its pre-pandemic level.

Online Appendix Figure D3 shows the evolution of $q(\theta)$ for the US from 2001 onwards. The blue line corresponds to the times series of $q(\theta)$ using raw JOLTS data.[19] The red line is obtained using our adjusted series of hires, i.e. hires without recalls.[20] Both series evolve hand in hand until 2020, with little discrepancy between the two. This holds true regardless of the business cycle. On the contrary, following the COVID pandemic, the ratio of hires to vacancies diverges drastically depending on whether we incorporate recalls or not. Indeed, it increases a lot for the unadjusted series (in blue), suggesting a surge in hires with respect to vacancy postings, and reaches level close to that in the aftermath of the 2008 crisis (1.65). To the contrary, for the series without recalls (in red), the ratio falls to an unprecedented 0.2. This divergence of the two series occurs mostly during the first few months of the pandemic, when mobility in the US labor market stalled, with very few new hires and massive recalls. In November 2020, the two series reach similar levels – although very low (0.8) – and seem to be back on the same trend. This suggests that recalls were a key adjustment mechanism at the onset of the pandemic, in line with the findings of Hall and Kudlyak [2021].

Cross-Country Comparison. Online Appendix Figure D4 stacks all the time series of $q(\theta)$ together. For the US, we plot the raw series (solid line) and the adjusted series (dashed line). The contrast in the evolution of the state of the labor market on both sides of the Atlantic is striking. In the US, the main adjustment mechanism seem to have been unemployment and recalls while in Europe there has been relatively fewer hires than vacancies compared to 2019Q4. These adjustment channels ought to be put into perspective with public policy decisions.

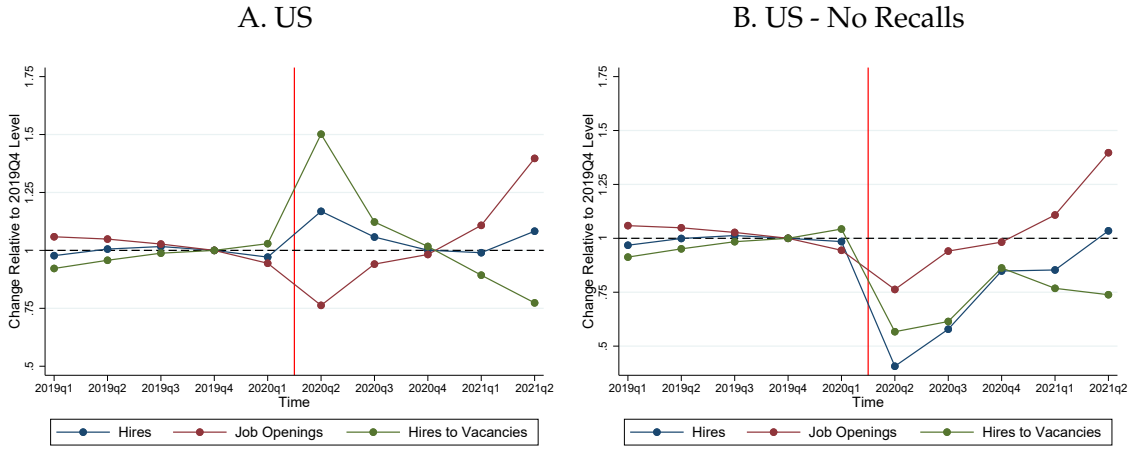
[19] The series corresponds to the ratio of seasonally adjusted data for hires and vacancies.
[20] See Online Appendix C.6 for more details.

Figure D1: CHANGE IN HIRES, VACANCIES, AND $q(\theta)$ RELATIVE TO 2019Q4



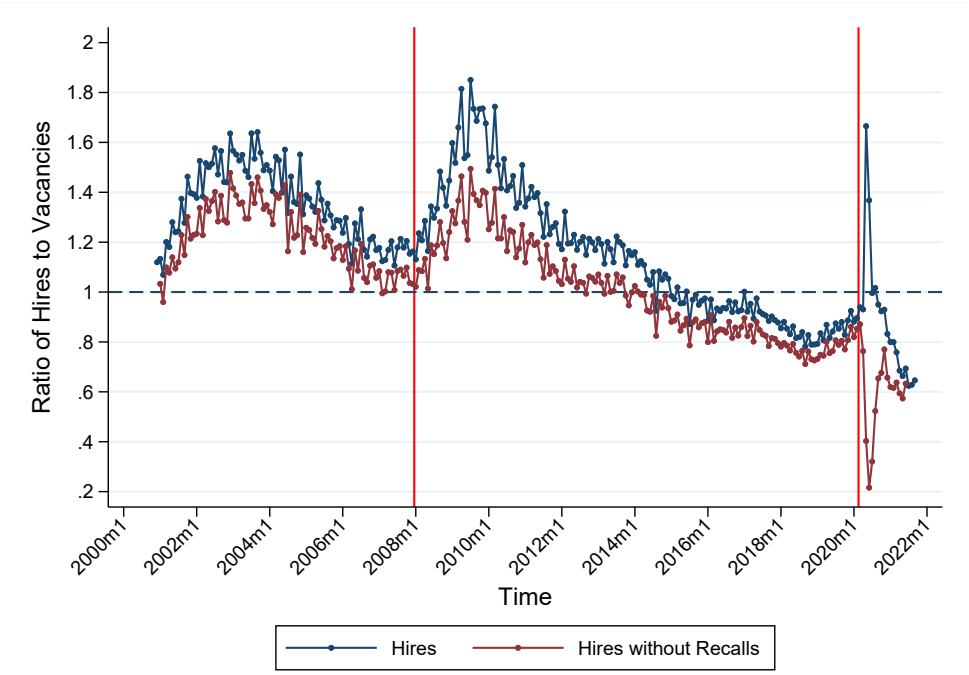
Notes: Data for European countries come from the Job Vacancy Statistics and Labor Force Survey, and for the US from the Job Openings and Labor Turnover Survey. $q(\theta)$ corresponds to the ratio of hires to vacancies. For European countries, hires are proxied by recent job starters – i.e. individuals who reported having started their employment in the three months before the interview. Job openings are restricted to the private sector. Data are seasonally adjusted. Each variable is divided by its its pre-pandemic level, i.e. the last quarter of 2019. That is, we apply the following transformation: $\tilde{x}_t = x_t / x_{2019Q4}$. The red line corresponds to the outbreak of the COVID crisis, that is the end of the first quarter of 2020.

Figure D2: CHANGE IN HIRES, VACANCIES, AND $q(\theta)$ RELATIVE TO 2019Q4



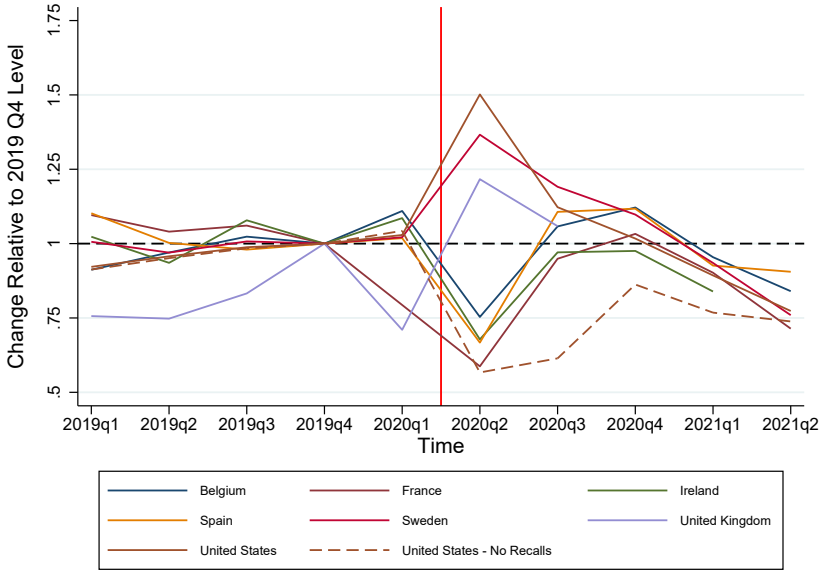
Notes: Data for European countries come from the Job Vacancy Statistics and Labor Force Survey, and for the US from the Job Openings and Labor Turnover Survey. $q(\theta)$ corresponds to the ratio of hires to vacancies. For European countries, hires are proxied by recent job starters – i.e. individuals who reported having started their employment in the three months before the interview. Job openings are restricted to the private sector. For the US, two series are available depending on whether recalls are included in hires (solid line) or not (dashed line). See Online Appendix C.6 for more details. Data are seasonally adjusted. Each variable is divided by its its pre-pandemic level, i.e. the last quarter of 2019. That is, we apply the following transformation: $\tilde{x}_t = x_t / x_{2019Q4}$. The red line corresponds to the outbreak of the COVID crisis, that is the end of the first quarter of 2020.

Figure D3: EVOLUTION OF $q(\theta)$ OVER TIME IN THE US



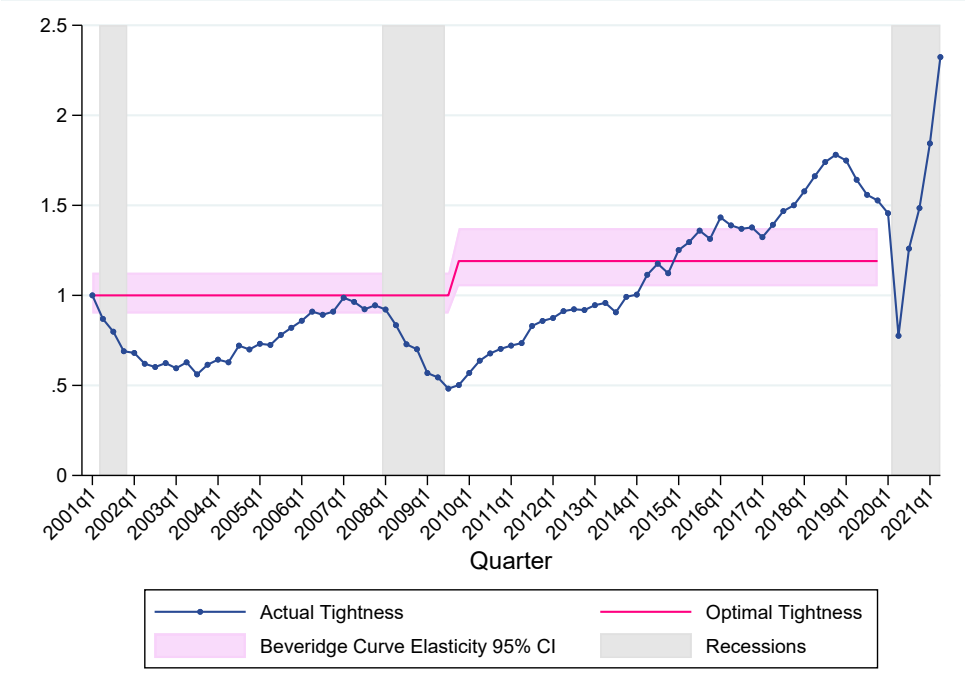
Notes: Data for hires and vacancies come from the Job Openings and Labor Turnover Survey. $q(\theta)$ corresponds to the ratio of hires to vacancies. Two series are available depending on whether recalls are included in hires (blue line) or not (red line). Recalls are situations in which individuals have been recalled to their previous jobs after a temporary interruption of their contract. Recalls are estimated using series from Hall and Kudlyak [2021]. See Online Appendix C.6 for more details. Data are seasonally adjusted. The red lines correspond to the onset of the Great Recession and to the outbreak of the COVID crisis, respectively December 2007 and March 2020.

Figure D4: CHANGE IN $q(\theta)$ RELATIVE TO 2019Q4 ACROSS COUNTRIES



Notes: Data for European countries come from the Job Vacancy Statistics and Labor Force Survey, and for the US from the Job Openings and Labor Turnover Survey. $q(\theta)$ corresponds to the ratio of hires to vacancies. For European countries, hires are proxied by recent job starters – i.e. individuals who reported having started their employment in the three months before the interview. Job openings are restricted to the private sector. For the US, two series are available depending on whether recalls are included in hires (solid line) or not (dashed line). See Online Appendix C.6 for more details. Data are seasonally adjusted. Each variable is divided by its its pre-pandemic level, i.e. the last quarter of 2019. That is, we apply the following transformation: $\tilde{x}_t = x_t / x_{2019Q4}$. The red line corresponds to the outbreak of the COVID crisis, that is the end of the first quarter of 2020.

Figure D5: EVOLUTION OF TIGHTNESS OVER TIME IN THE US & OPTIMAL TIGHTNESS ESTIMATES FROM MICHAILLAT AND SAEZ [2021].



Notes: Data for hires and vacancies come from the Job Openings and Labor Turnover Survey. $q(\theta)$ corresponds to the ratio of hires to vacancies and reproduces our baseline estimate with recalls from Figure D3. Estimates of optimal tightness come from Figure 6 in Michaillat and Saez [2021].

D.2 Labor Market Tightness and Public Policies

Public policies affect labor market tightness through their impact on vacancy postings, the number of unemployed and their search intensity. For example, there is a large strand of literature looking at the impact of more generous unemployment insurance on individuals' search effort. A recent paper by Landais et al. [2018] shows that this has in turn general equilibrium effects on how tight the labor market is. The literature on the impact of short-time work on search effort and tightness is scarcer. In this section, we correlate changes in the vacancy-filling probability with changes in the recourse to unemployment insurance and short-time work. This has the advantage of incorporating both policy instruments.

Online Appendix Figure D6 plots the correlation between changes in $q(\theta)$ and in short-time work take-up (Panel A) or unemployment insurance take-up (Panel B).[21] Outcomes are residualized to account for the effect of time, the intensity of the pandemic (proxied by the number of COVID cases) and the intensity in the recourse to the other policy instrument.

More specifically, we first difference all variables at the quarter-on-quarter level, i.e. using the following transformation: $\tilde{x}_t = x_t - x_{t-1}$. Then, we residualize both outcomes – $q(\theta)$ and short-time work/unemployment insurance take-up – on year-quarter fixed effects, the quarter-on-quarter change in the number of COVID cases (quadratic), and in the take-up of the other policy instrument. For example, when correlating $q(\theta)$ with short-time work take-up, we run the following linear regressions:

$$\widetilde{y}_{t,i} = \gamma_1 \widetilde{UI}_{i,t} + \gamma_2 \widetilde{cases}_{i,t} + \gamma_3 \widetilde{cases}^2_{i,t} + \widetilde{\alpha}_t + \widetilde{\xi}_{i,t}$$

where y corresponds to $q(\theta)$ or short-time work take-up, i indicates the country, t the quarter and α_t a set of quarter fixed effects. Having run the above regression using $q(\theta)$ and short-time work take-up as outcomes in turn, we then retrieve the predicted residuals for both outcomes, as $\widetilde{\widetilde{\xi}}_{t,i} = \widetilde{y}_{t,i} - \widehat{\widetilde{y}}_{t,i}$. These residuals correspond to the dots in Online Appendix Figure D6. The red line corresponds to the linear fit of a regression of $q(\theta)$ on short-time work take-up and the set of controls. That is:

$$\widetilde{q(\theta)}_{t,i} = \beta_{STW} \widetilde{STW}_{i,t} + \beta_{UI} \widetilde{UI}_{t,i} + \beta_1 \widetilde{cases}_{i,t} + \beta_2 \widetilde{cases}^2_{i,t} + \widetilde{\delta}_t + \widetilde{\epsilon}_{i,t}$$

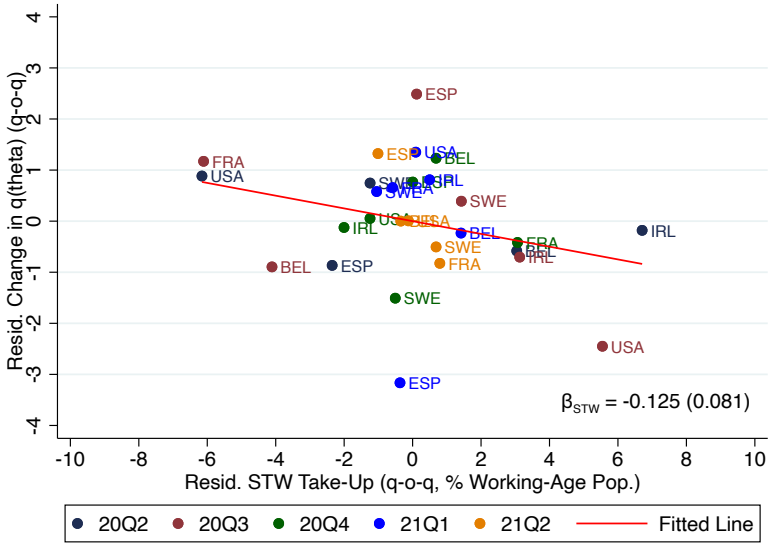
Both relationships between changes in $q(\theta)$ and short-time work/unemployment insurance take-up are negative, although not significant. Whilst these relationships do not have a causal interpretation, they provide evidence of a negative correlation be-

[21] For more information on the definition of short-time work and unemployment insurance take-up data see Online Appendix C.1 and C.2.

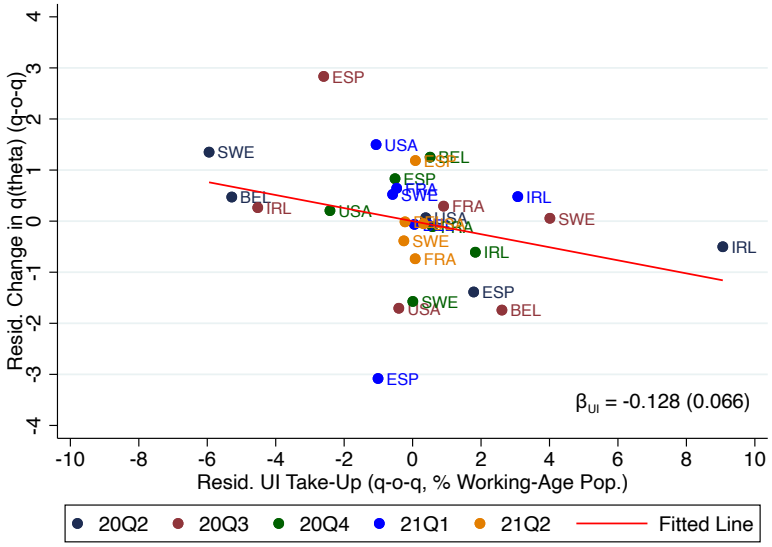
tween short-time work/unemployment insurance take-up and $q(\theta)$, and hence of a positive one between short-time work/unemployment insurance take-up and tightness (θ).

Figure D6: CROSS-COUNTRY SCATTER PLOTS OF $q(\theta)$ AND SHORT-TIME WORK/UNEMPLOYMENT INSURANCE TAKE-UP

A. $q(\theta)$ vs Short-Time Work Take-Up



B. $q(\theta)$ vs Unemployment Insurance Take-Up



Notes: The figure reports a scatter plot of the relationship between the quarter-on-quarter change in $q(\theta)$ and the rate of short-time work/unemployment insurance take-up at the country level. Data are not seasonally adjusted. To remove the seasonal component, we take the quarter-on-quarter change – i.e. for a given quarter t, we apply the following transformation to the data: $\tilde{x}_t = x_t - x_{t-1}$. Short-time work and unemployment insurance take-up are computed as the ratio of the number of individuals in the program over the working age population. Outcomes are residualized against year-quarter fixed effects, the quarter-on-quarter change in the number of COVID cases (quadratic), and in the take-up of the other policy instrument. The red line represents the linear fit. The figure reports the slope coefficient and associated standard error (in parenthesis), clustered at the country level. Data for European countries come from the Job Vacancy Statistics and Labor Force Survey, and for the US from the Job Openings and Labor Turnover Survey. For European countries, hires are proxied by recent job starters – i.e. individuals who reported having started their employment in the three months before the interview. Job openings are restricted to the private sector. Data on short-time work and unemployment insurance take-up come from the OECD and national statistics. Data on COVID cases come from the Johns Hopkins Coronavirus Resource Center. Short-time work and unemployment insurance take-up are computed as the ratio of the number of individuals in the program over the working age population.

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