

JRC TECHNICAL REPORTS

Fear and Employment During the COVID Pandemic: Evidence from Search Behaviour in the EU

*JRC Working Papers on
Taxation and Structural
Reforms No 08/2020*

van der Wielen, Wouter
Barrios, Salvador

2020

This publication is a Technical report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication. For information on the methodology and quality underlying the data used in this publication for which the source is neither Eurostat nor other Commission services, users should contact the referenced source. The designations employed and the presentation of material on the maps do not imply the expression of any opinion whatsoever on the part of the European Union concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Contact information

Name: Wouter van der Wielen

Email: Wouter.VAN-DER-WIELEN@ec.europa.eu

EU Science Hub

<https://ec.europa.eu/jrc>

JRC121718

Seville: European Commission, 2020

© European Union, 2020



The reuse policy of the European Commission is implemented by the Commission Decision 2011/833/EU of 12 December 2011 on the reuse of Commission documents (OJ L 330, 14.12.2011, p. 39). Except otherwise noted, the reuse of this document is authorised under the Creative Commons Attribution 4.0 International (CC BY 4.0) licence (<https://creativecommons.org/licenses/by/4.0/>). This means that reuse is allowed provided appropriate credit is given and any changes are indicated. For any use or reproduction of photos or other material that is not owned by the EU, permission must be sought directly from the copyright holders.

All content © European Union, 2020

How to cite this report: van der Wielen, W., and Barrios, S. (2020), *Fear and Employment During the COVID Pandemic: Evidence from Search Behaviour in the EU*, JRC Working Papers on Taxation and Structural Reforms No 08/2020, European Commission, Seville

Fear and Employment During the COVID Pandemic: Evidence from Search Behaviour in the EU*

Wouter van der Wielen, Salvador Barrios

Joint Research Centre, European Commission

Abstract

The COVID-19 pandemic has inflicted an economic hardship unprecedented for the modern age. In this paper, we show that the health crisis and ensuing Great Lockdown, came with an unseen level of economic uncertainty. First, using a European dataset on country-level and regional internet searches, we document a substantial increase in people's economic anxiety in the months following the coronavirus outbreak. Moreover, we observe a significant, coinciding slowdown in labour markets and (durable) consumption. Second, our analysis shows that the ensuing fear was significantly more outspoken in those EU countries hit hardest in economic terms. Finally, we show that economic anxiety during the Great Lockdown is similar or higher than during the Great Recession of 2007-2009. Unprecedented policy actions, such as the short-term working schemes implemented or reformed at the onset of the COVID crisis, however, do not seem to have mitigated overall economic anxiety.

Keywords: COVID-19, economic uncertainty, employment, expectations, Google Trends

JEL codes: D12, D83, D84, E32, J60

* Corresponding author: Wouter.VAN-DER-WIELEN@ec.europa.eu

The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission. Any errors should be attributed to the authors only.

1. Introduction

It is now beyond question that the COVID-19 pandemic is not only a global health emergency, but is also leading to a major global economic downturn as the death toll rises and economies are intentionally shutdown. Most EU countries, for instance, have responded to the Covid-19 shock by adopting a lock-down survival strategy, with leading figures coining the COVID-induced recession the Great Lockdown. Preliminary indicators on job destruction and unemployment benefit claims across EU countries suggest that the impact of the COVID-19 pandemic is likely to be exceptionally high. While the global job loss is more difficult to gauge, the decline in working hours thus far already exceeds 195 million full-time jobs (ILO 2020).

Traditional, backward looking measures of economic uncertainty derived from statistical models' fit to macroeconomic data are not well suited to quickly capture shifts associated with sudden, surprise developments like the COVID-19 crisis. Moreover, it is vital for real-time forecasting and for policy formulation to use measures that capture the uncertainties economic agents actually perceive.

One popular way of measuring the impact of the crisis is the severity of the disruption to movements and presence at the workplace.¹ For example, on April 11th the percentage changes vis-à-vis the median mobility on the same day of the week in the five weeks leading up to the crisis show a generalised (and exceptional) reduction in mobility, which was particularly pronounced for movements related to retail and recreation, which are specific to tourism and leisure activities, see Figure 1 below. Using these data, it becomes clear that countries that are generally considered to have been hit hardest by the health crisis (e.g. Italy and Spain), have also suffered the most drastic shifts in activity, especially in the tourism sector; capturing the extent of the confinement measures and ensuing economic standstill necessary to combat the virus.²

Another real-time source proven useful during this crisis is Google Trends data, as popularized by Choi and Varian (2012) and freely available. In addition to nowcasting and other non-economic applications, internet searches serve as a measure of economic sentiment among households and thus expectations.³ In response to the recent crisis, the European Commission, for example, actively monitored citizens' health, economic and social isolation concerns using Google search data.⁴ Using a large panel of search data, Fetzer et al. (2020) show that the Google search intensity for topics

¹ Mobility data have been shown to capture the impact of COVID-19 confinement measures, explain the spread of the pandemic and, hence, provide relevant information for policy design (Santamaria et al., 2020; Iacus et al., 2020a,b).

² Similar trends can be observed from Apple's mobility data.

³ Examples of forecasting using Google Trends data include Du and Kamakura (2012) and Fantazzini and Toktamysova (2015) for car sales, Askatas and Zimmermann (2009) and D'Amuri and Marcucci (2017) for unemployment, Guzmán (2011) for inflation expectations and Koop and Onorante (forthcoming) for an application to multiple macroeconomic variables.

⁴ See all weekly reports at https://ec.europa.eu/knowledge4policy/projects-activities/tracking-eu-citizens%2080%99-concerns-using-google-search-data_en

indicative of economic anxiety surged substantially after the virus has reached a country. Furthermore, Caperna et al. (forthcoming) document a surge of about 30% of unemployment-related, European searches in the wake of lock-downs.

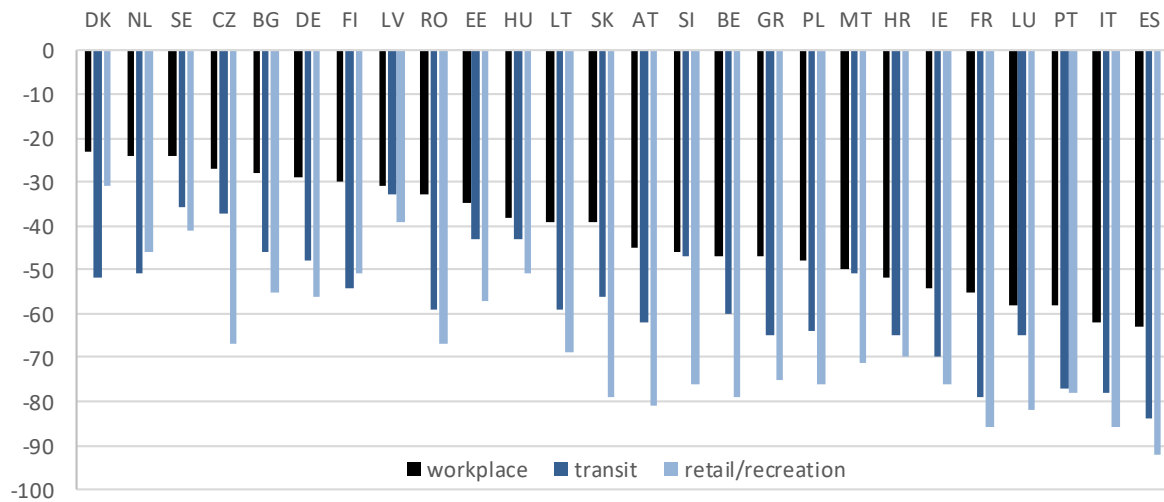


Figure 1: Google Mobility – Percentage changes w.r.t. median mobility on the same day of the week in the weeks leading up to the crisis

Importantly, economic anxiety and uncertainty are not only a transmission channel, but may affect the economy directly. For instance, Fontaine (2020) shows that uncertainty shocks lead to decreases in labour force participation. Many consumers moreover associate bad times with high inflation. Binder (2020), for example, show that greater concern about the coronavirus is associated with higher inflation expectations.⁵ Coleman and Nautz (2020) their results in turn indicate that the credibility of the ECB's inflation target has significantly decreased, particularly in the course of the coronavirus pandemic. At the micro level, people with more uncertain expectations, even accounting for their socioeconomic characteristics, exhibit more precaution in their consumption, credit, and investment behaviour (Ben-David et al., 2018). Recent estimates for the euro area suggest an unprecedented surge in saving rates, from 12.7% in the fourth quarter of 2019 up to 16.9% in the first quarter of 2020, due mainly to the exceptional fall in consumption expenditure (Source: Eurostat).⁶ High saving rates might prove insufficient for households to weather the crisis and therefore for consumption to resume, especially for low-income ones with a high spending propensity, see Gambacorta et al. (2020).

The purpose of this paper is to show that the outbreak of the COVID-19 pandemic and ensuing Great Lockdown, came with an unprecedented level of economic uncertainty in the EU. To this end, we employ a rich dataset of country-specific internet searches in the EU. The EU-panel is complemented

⁵ Interestingly, provision of information about the Fed announcement leads some consumers to become more optimistic about unemployment and revise inflation expectations downward.

⁶ See <https://ec.europa.eu/eurostat/documents/2995521/10300279/2-03072020-AP-EN.pdf/2edaf9a9-b5e5-db10-f6a9-5b05615e79f0>.

with a panel of regional internet searches for the four largest EU economies (Germany, Spain, France and Italy), to highlight important inter-regional differences of relevance for catering policy responses.

Our main conclusions are threefold. First, we document a substantial increase in people's economic anxiety in the months following the coronavirus outbreak.⁷ Moreover, we observe a significant, coinciding slowdown in labour markets and (durable) consumption. These results complement earlier findings for Great Britain and the US, both in scope and data used (e.g. consumer surveys, transaction data, financial management app data). For example, Chronopoulos et al. (2020) find that household spending in Great Britain declined as the imposed lockdown became imminent, and continued to decline throughout the lockdown period. They also find evidence for a strong increase in groceries spending consistent with panic buying and stockpiling behaviour in the two weeks following the World Health Organisation (WHO) announcement describing COVID-19 as a pandemic. Baker et al. (2020) use survey data to explore how American households adapted their consumption to epidemics. They also find that, after an initial hike in spending, greater levels of social distancing are associated with drops in spending, particularly in restaurants and retail.

The labour market trends observed for Europe are in line with those in the UK and US at the outset of the crisis. Binder (2020), for instance, observe more pessimistic unemployment expectations following the virus outbreak. Coibion et al. (2020), moreover, conclude that US citizens losing their jobs are not actively looking to find new ones. Furthermore, Costa Dias et al. (2020) observe that UK firms had stopped posting new vacancies almost entirely. While vacancies fell across the whole wage distribution, the fall was sharpest in low-paid occupations directly affected by social distancing measures, but new vacancies for higher-paid jobs in legal and managerial professions also experienced steep falls. By contrast, Campello et al. (2020) find that US firms have cut back on postings for high-skill jobs more than for low-skill jobs, with small firms nearly halting their new hiring altogether.

Second, our analysis shows that the ensuing fear was significantly more outspoken in those EU countries hit hardest in economic terms. As these countries labour market conditions were often already less favourable at the onset of the crisis, the risk of a widening gap between EU member states thus seems likely in absence of a commensurate (and coordinated) policy response. This result is very much in line with earlier findings suggesting that a higher share of jobs are at risk in southern Europe and France (Doerr and Gambacorta, 2020). Previous evidence on the impact of the financial crisis in these countries points to a risk of persistent high level of unemployment during the post-crisis phase,

⁷ Using an alternative set of near real-time indicators (stock market volatility, newspaper and Twitter-based uncertainty measures, forecaster disagreement and business expectation surveys), Altig et al. (2020) also document huge uncertainty jumps in reaction to the pandemic.

against the background of high debt levels, low population and productivity growth, see Boeri and Jimeno (2017) and Galí (2015).

Third, using monthly search data for the past decades, we show that economic anxiety during the Great Lockdown is similar or higher than during the Great Recession of 2007-2009. This is especially the case for unemployment-related fears, which have recently jumped far beyond those observed during the Great Recession. This difference is even more outspoken for wage compensation queries in countries that had short-term work (STW) schemes present during both crises, thus highlighting their relevance during the heat of the pandemic. The (intensified) use of STWs, however, does not seem to have mitigated overall economic anxiety relative to countries without such schemes; although there is suggestive evidence that during the Great Recession countries with STWs in place had less unemployment-related fears. While this does not have to affect the ability of STWs to save jobs, it supports the idea that the labour market impact of this crisis is more pervasive, at least in the people's minds, which might heighten the risk of unemployment hysteresis in countries most directly affected by the pandemic as suggested previously.

The rest of the paper is organised as follows. Section 2 describes in more detail the Google search data and the econometric identification. Next, Section 3 presents the estimation results for both the EU panel and regional panels of the big four countries in terms of economic sentiment, labour markets and consumption, respectively. Section 4 concludes.

2. Data and Methodology

For our analysis we rely on panels of internet search intensity data from Google Trends. Similar data have been used in the past for a variety of purposes, including the detection of influenza epidemics (Ginsberg et al., 2009) and nowcasting economic activity (Choi and Varian, 2012). Moreover, as illustrated by among others Choi and Varian (2012) and Vosen and Schmidt (2011), internet searches provide a good measure of the economic sentiment among households and, thus, may serve as a predictor of future economic demand and activity.

We construct three panels: (i) a country-level panel for the 27 EU member states and (ii) a regional-level panel for the four biggest European economies (Germany, Spain, France and Italy), both covering crisis, labour market and consumption related queries (including e.g., telework, recession, unemployment, social benefits) for the days in January through April 2020. The third panel (iii), by contrast, covers a subset of these variables on a monthly basis since 2004. Google Trends queries can be constructed based on individual search terms or search topics, which encompass groups of related individual search terms, i.e. capturing a broader set of search terms. We use individual search terms based on a large set of queries and their country-specific (translated) equivalents. One reason for doing this, is because the automatic stabilizers and policy measures acting in response to the crisis not

only differ in name but also in type across countries. Similarly, the most frequently used job boards for finding vacancies differ substantially across countries.

For each query, the Google Trends platform generates a measure of search intensity scaled from 0 to 100, with 100 representing the highest proportion among the queried terms within a selected country/region and time frame. Seven-day moving averages are used to rid the series of day of week effects.⁸ In addition to the raw search intensity series, we construct normalized series. Specifically, we normalize the search intensity at the country or region level by the mean search intensity prior to the surge of the coronavirus in each country or region. This normalization makes the coefficient estimates interpretable as percentage changes relative to pre-coronavirus levels.

The normalization of the series has an important benefit. By default the intensity series may capture queries not solely driven by anxiety or uncertainty. Nonetheless, such searches are captured by the baseline level used to normalize the series. For example, searches for a concept like “unemployment” or “recession” occur on a continuous basis. However, the “excess searches” in crisis times are unlikely to be driven by common interest, but much more by people confronted by the related health and economic risks, either directly or indirectly. Consequently, normalizing the series helps to guarantee that our series capture what we want them to capture.

As our baseline, we estimate the following econometric specification to capture the impact of the arrival of the coronavirus:

$$y_{c,t} = \alpha + \beta D_{c,t} + \epsilon_{c,t} \quad (1)$$

where $y_{c,t}$ measures the search intensity in country (or region) c on day t for a specific topic. Coefficient β is the coefficient of interest. The coefficient captures the difference in search intensity before and after the onset of the crisis.⁹ $D_{c,t}$ is a dummy variable set to one as soon as the pandemic reaches a country. To this end, we merge in data on the number of confirmed cases, active cases and COVID-19 related deaths from the primary source available, cf. John Hopkins. To determine the pre and post-COVID outbreak period, we exploit the precise timing of coronavirus arrival in a country by constructing different cut-off dummies. As the default, we set $D_{c,t}$ to one when the number of confirmed cases exceeds 3. However, this seems to push forward France and Germany (see Figure 2), hence we also tested and confirmed robustness of our results to a higher cut off (20 confirmed cases), which is more constant across countries. Alternatively, we set the cut off for $D_{c,t}$ based on the number

⁸ The results are robust to refraining from any averaging of the series.

⁹ In this set-up, the p-value of the cutoff coefficient boils down to a Wald-test for a structural break at the cutoff point. Alternatively, we performed Im-Pesaran-Shin tests for a unit root in the respective search series, confirming our conclusions.

of COVID-related deaths (i.e. exceeding 10), since this is likely to be more disconcerting to people. Finally, $\epsilon_{c,t}$ comprises panel fixed effects, day-of-the-week fixed effects and the error term.

Alternatively, we estimate the following difference-in-difference (DiD) regression:

$$y_{c,t} = \alpha + \sum_{\tau=-6}^6 \beta_{\tau} D_{c,\tau} + \delta D_{c,\tau}^+ + \epsilon_{c,t} \quad (2)$$

where $D_{c,\tau}$ are relative week dummies centred around the arrival of the pandemic in the country and $D_{c,\tau}^+$ represents a dummy for the weeks after the span covered by the β -vector, to distinguish it from the baseline impact. The latter specification has the benefit that, in addition to quantifying the difference between pre and post-COVID search queries, it captures the trend (e.g. presence or absence of persistence) in search behaviour in the weeks following the COVID outbreak.

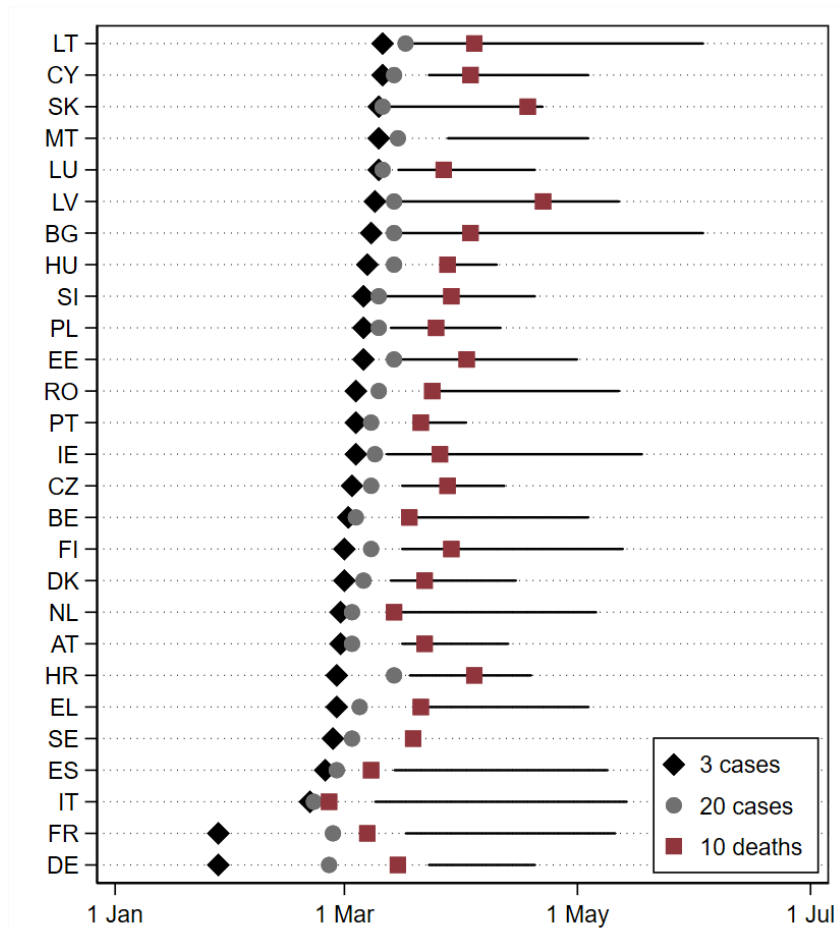


Figure 2: Overview of respective cut-off dates for COVID-19 arrival (emergency lockdowns indicated by vertical lines)

3. Main findings

3.1 Economic Sentiment

We first show that the arrival of the coronavirus led to a spike in economic anxieties. In particular, we look at searches capturing well the economic sentiment in Europe regarding the economy as a whole.

Table 1 reports the results of baseline specification (1) for four different country-specific search queries: telework, recession, unemployment and unemployment benefits.¹⁰ As the pandemic hits European countries, a significant increase in the searches for “telework” is observed, as households try to accommodate to the lockdown measures. This is also confirmed by the difference-in-difference estimates specified in (2) as shown in Figure 3, with peaks up to three weeks after the first COVID-cases. At the same time, concerns about an impending recession rose substantially over Europe, with earlier hikes in those countries hit earlier in the year (see e.g. Italy - in orange - in Figure A.1 in Appendix). This is a troublesome harbinger, since Fetzner et al. (2020) found that real GDP growth and real growth in consumption and imports are significantly lower, both in a statistical and economic sense, in quarters following increases in “recession” searches. The economic anxiety took on very concrete forms as shown by the last two panels of Table 1. People actively googled more for information on unemployment and unemployment benefits, with the latter only significant at a later cut-off date.¹¹ Figure 3, however, shows that both remained significantly larger up to six weeks after the arrival of the virus. This confirms the more pessimistic unemployment expectations following the virus outbreak observed in the US (Binder, 2020) and the surge of unemployment-related searches in Europe after the lockdown (Caperna et al., forthcoming).

Table 1: Economic sentiment – Baseline specification

| | Telework | | Recession | | Unemployment | | Unemp. Benefit | |
|-------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Intercept | 0.565 (0.799) | 0.552 (0.336) | 1.150** (0.466) | 0.753*** (0.211) | 1.031** (0.381) | 0.891*** (0.183) | 0.877 (1.892) | 0.922*** (0.0758) |
| Cut-off dummy I (# cases > 3) | 5.042*** (1.386) | | 3.914*** (0.906) | | 2.340*** (0.750) | | 4.420 (3.573) | |
| Cut-off dummy II (# deaths > 10) | | 2.578*** (0.755) | | 2.017** (0.779) | | 1.559*** (0.394) | | 0.926*** (0.149) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 4.471 | 8.192 | 5.200 | 13.025 | 8.271 | 15.770 | 2.112 | 10.034 |
| p-value | 0.005 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.081 | 0.000 |
| Goodness-of-fit | 0.132 | 0.205 | 0.115 | 0.071 | 0.082 | 0.162 | 0.018 | 0.168 |
| N° of observations | 1862 | 1862 | 2156 | 2352 | 2548 | 2548 | 2450 | 2450 |
| N° of countries | 19 | 19 | 22 | 24 | 26 | 26 | 25 | 25 |

Notes: The dependent variable is the seven-day moving average search intensity for country-specific terms (telework, recession, unemployment and unemployment benefit), normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

The impact moreover is found to be substantially larger in those countries hit hardest in economic terms. In Table 2 we replicate the earlier estimates splitting the sample based on the recorded revisions to GDP.¹² We distinguish between those countries with the relatively largest revisions (more

¹⁰ The number of countries covered by each specification depends on the quality of the series for the country-specific queries. Countries with insufficient non-zero observations are excluded from the analysis. For all countries included, the same timeframe (January-April 2020) and number of observations is considered.

¹¹ Similar results were obtained for “unemployed” searches instead of “unemployment”.

¹² Similar results are obtained by interacting the cut-off dummy with the large-revision dummy (instead of splitting the sample), see Table A.1 in Appendix.

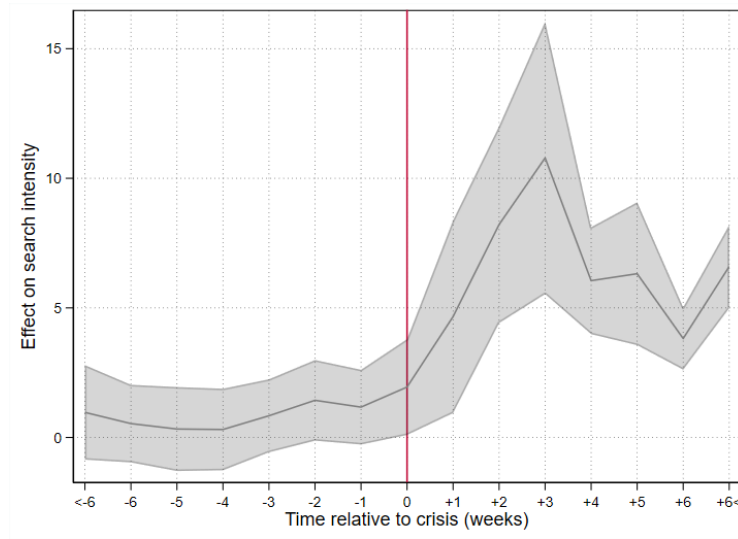
than 5.5 pp.) to their GDP growth. This subset includes (in order of the size of the revision): Italy, Spain, Greece, France, Croatia, Belgium, Lithuania, the Netherlands and Germany.¹³ Concerns about an impending recession were significantly larger in those countries expected to be hit hardest economically in the course of 2020. This corresponding output from model (2) is illustrated in Figure 4. Allowing for a time dimension in the estimation highlights a difference: several weeks after the arrival of the virus concerns in those countries hit hardest kept increasing, while they started fading in the other countries, although this is only evident with the model using “recession” searches. The overall divergence across European countries is also illustrated graphically in Figure 5, plotting the difference in the average search intensity before and after the crisis by country. The result plotted in this figure reveals an interesting pattern, in particular concerning the perceived risk of unemployment, which is especially high in countries with high pre-crisis level of unemployment (possibly with the exception of Belgium and Luxembourg). The population-weighted unemployment rates before the COVID-19 crisis (i.e. as of February 2020, source: Eurostat) shows a clear differential pattern between the four country groups considered: those countries with the highest search intensity for “unemployment” (displayed in red) had an average unemployment rate of 10.3%, while the other country groups had average unemployment rates of 7.5% (orange), 4.7% (dark yellow) and 3.4% (light yellow) respectively. This evidence suggests that the anxiety related to the employment consequences of the COVID-19 crisis reflect to some extent the pre-crisis performance of country-specific labour markets.

Table 2: Economic sentiment – Split by size of the GDP revision

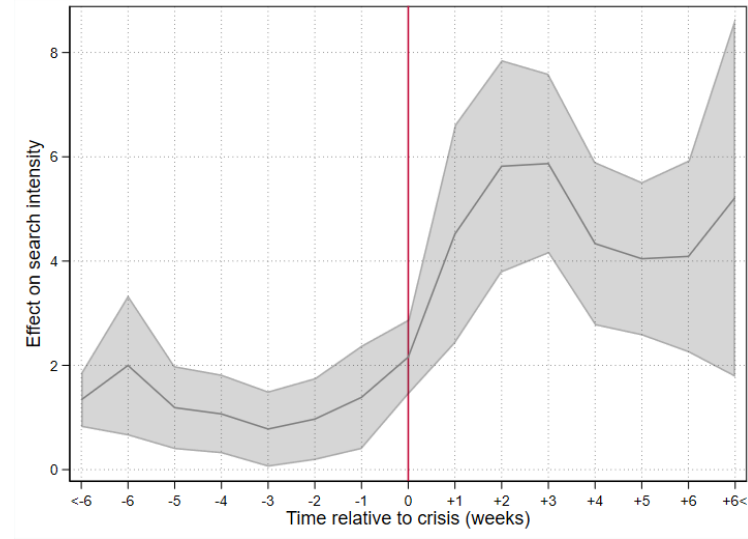
| | Telework | | Recession | | Unemployment | | Unemp. Benefit | |
|-------------------------------------|--------------------|--------------------|--------------------|----------------------|--------------------|---------------------|---------------------|----------------------|
| | (Hard) | (Rest) | (Hard) | (Rest) | (Hard) | (Rest) | (Hard) | (Rest) |
| Intercept | 0.492 (0.669) | 0.641** (0.208) | 0.908* (0.455) | 0.702*** (0.0705) | 0.812 (0.471) | 0.944*** (0.114) | 0.950*** (0.120) | 0.901*** (0.0959) |
| Cut-off dummy II (# deaths > 10) | 4.088** (1.400) | 1.287** (0.498) | 4.124** (1.726) | 0.574*** (0.188) | 2.180** (0.904) | 1.165*** (0.293) | 0.690** (0.218) | 1.087*** (0.196) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 8.549 | 12.276 | 5.378 | 15.037 | 16.885 | 18.559 | 4333.595 | 7.705 |
| p-value | 0.006 | 0.000 | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Goodness-of-fit | 0.300 | 0.103 | 0.116 | 0.041 | 0.194 | 0.133 | 0.207 | 0.174 |
| N° of observations | 784 | 1078 | 882 | 1470 | 882 | 1666 | 882 | 1568 |
| N° of countries | 8 | 11 | 9 | 15 | 9 | 17 | 9 | 16 |

Notes: The dependent variable is the seven-day moving average search intensity for country-specific terms (telework, recession, unemployment and unemployment benefit), normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

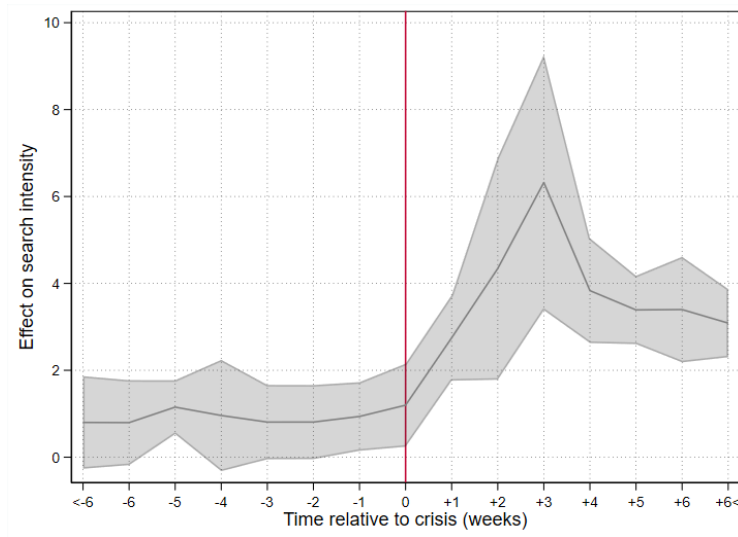
¹³ The GDP growth revision is computed as the difference between the 2020 growth rate in the European Commission’s Spring Forecast minus the one originally foreseen (before the crisis) in the Autumn Forecast.



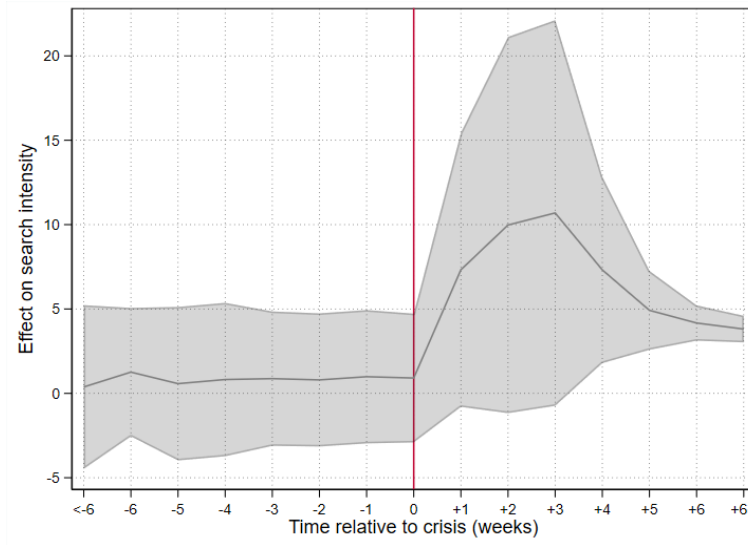
(a) Telework



(b) Recession



(c) Unemployment



(d) Unemployment benefit

Figure 3: Marginal impact on search intensity by week (relative to 3-cases cut-off) from DiD-model (2) and their 95% confidence intervals

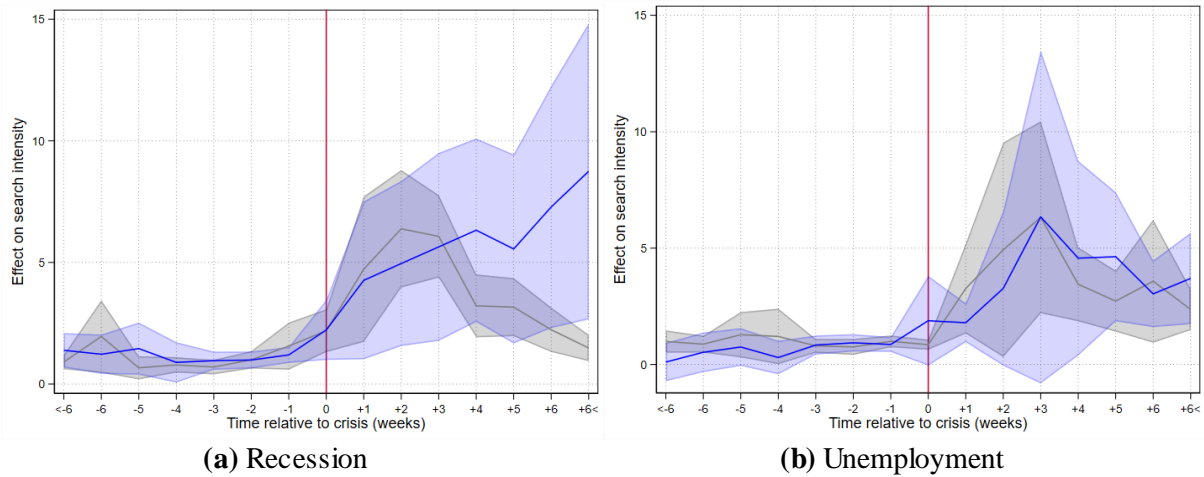


Figure 4: Marginal impact on search intensity by week (relative to 3-cases cut-off) from DiD-model (2) and their 95% confidence intervals - Split by size of the GDP revision (hard = blue, rest = grey)

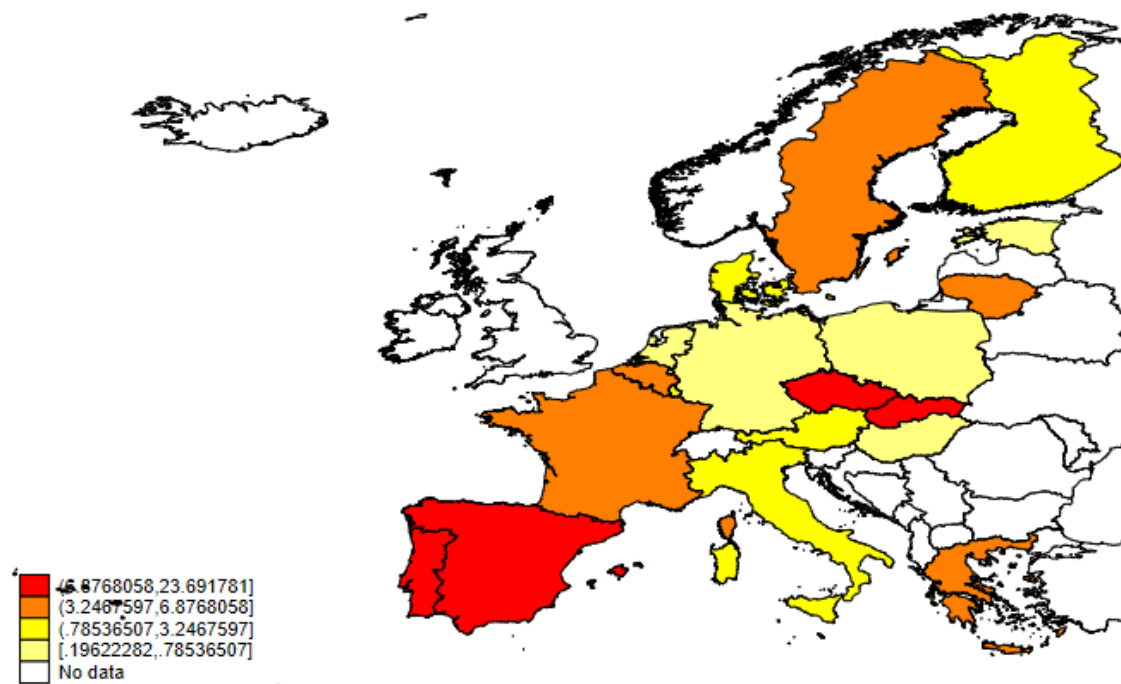
The contrast does not extend to searches for the respective unemployment benefit systems in each of the countries. Nonetheless, significant differences between the four largest economies in the EU are observed using the regional panel. While searches for both unemployment are significantly higher with the inception of the health crisis for all four, the anxiety as measured by the increase in search intensity (relative to the baseline) is substantially lower – in fact, almost half that of the second lowest – for Germany. In terms of unemployment benefit searches, we observe significant increases in three out of four countries.

Table 3: Economic sentiment – Unemployment (benefit) searches in the four largest economies¹⁵

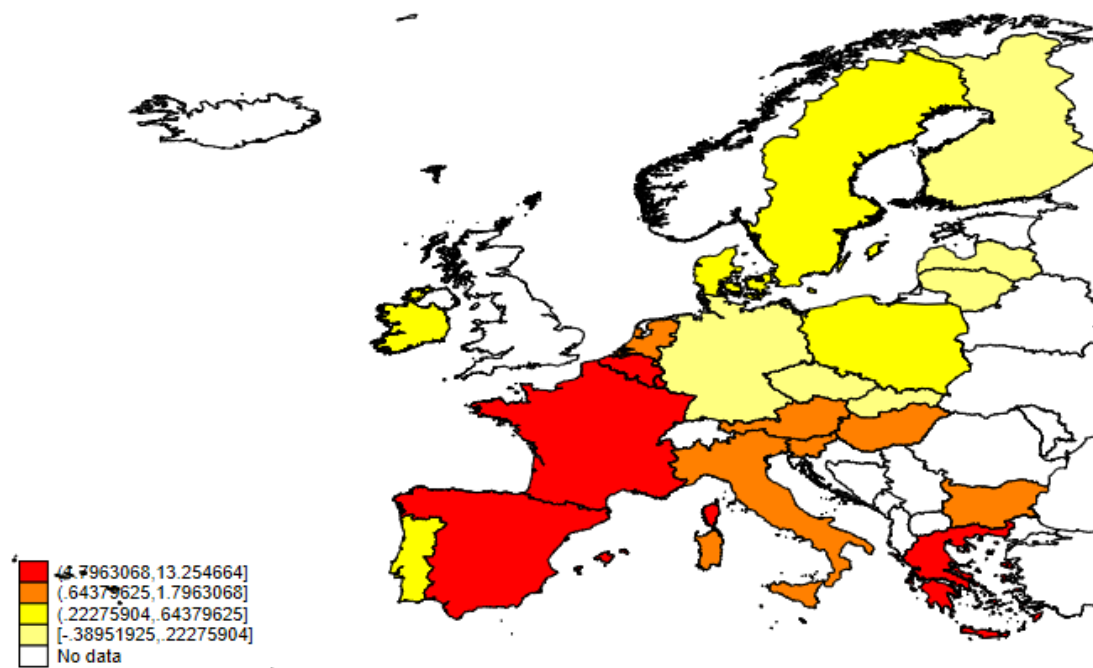
| | Unemployment | | | | Unemp. Benefit | | | |
|-------------------------------------|---------------------|----------------------|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|
| | (DE) | (ES) | (FR) | (IT) | (DE) | (ES) | (FR) | (IT) |
| Intercept | 1.272*** (0.163) | 1.031*** (0.0893) | 0.886*** (0.0738) | 1.015*** (0.216) | 1.020*** (0.0254) | 1.037*** (0.0376) | 0.947*** (0.0793) | 0.991*** (0.0301) |
| Cut-off dummy II (# deaths > 10) | 0.834* (0.416) | 1.645*** (0.214) | 4.067*** (0.149) | 1.781*** (0.404) | 0.477*** (0.0688) | 0.780*** (0.102) | 1.571*** (0.161) | -0.0134 (0.0558) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 4.602 | 15.823 | 285.865 | 5.125 | 22.320 | 10.014 | 19.508 | 2.489 |
| p-value | 0.006 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.054 |
| Goodness-of-fit | 0.036 | 0.342 | 0.438 | 0.112 | 0.200 | 0.173 | 0.277 | 0.000 |
| N° of observations | 1760 | 1980 | 2420 | 2180 | 1760 | 2090 | 2420 | 2180 |
| N° of regions | 16 | 18 | 22 | 20 | 16 | 19 | 22 | 20 |

Notes: The dependent variable is the seven-day moving average search intensity for country-specific terms (unemployment and unemployment benefit), normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

¹⁵ The respective country-specific search queries are Arbeitslosigkeit (DE), desempleo (ES), chômage (FR) and disoccupazione (IT) for unemployment and Arbeitslosengeld (DE), prestaciones (ES), indemnisation (FR) and NASpI (IT) for unemployment benefit.



(a) Telework



(b) Unemployed

Figure 5: Difference between the average Google Searches before and after the Corona outbreak – normalized 7-day moving average; cutoff: # cases > 3

In addition to increases in comparatively generic searches, we also observe consistent spikes in queries for very specific wage compensation schemes, such as the Cassa Integrazione in Italy, Kurzarbietergeld in Germany, chômage partiel in France and the ERTE (expedientes de regulación temporal de empleo) in Spain. Figure 6, for example, plots the monthly search intensity for some of the most well known short-term work schemes in Europe.¹⁶ All eight cases show clear peaks during the Great Lockdown. None of them, however, supplemented the general searches for unemployment information (see Figure A.3 in Appendix).

The increases in searches are also substantially larger than those observed during the Great Recession of 2007-2009. For ease of comparison, each of the graphs is centred around the peak of both crisis. In each case, except Denmark, the search intensity for information regarding the short-term work systems was more than five times larger during the Great Lockdown. On the bright side, the persistence of the shock seems to be less outspoken this time around. In the case of Denmark, Spain and the Netherlands the level of searches four months after the peak has dropped below its corresponding level for the Great Recession.

Finally, the comparatively large increase in STW searches does not seem to have curtailed overall recession fears, relative to the Great Recession. Given the potential for STWs to save jobs (Boeri and Bruecker, 2011; Balleer et al., 2016; Efstathiou et al., 2018; Lydon et al., 2019; Gehrke and Hochmuth, forthcoming), one might expect their availability to (indirectly) diminish economic anxiety, especially in light of their recent extensions. Nonetheless, in countries with STWs (with the exception of Italy) recession and unemployment concerns appear to have been similar or even higher during the Great Lockdown (see Figures A.3 and A.4 in Appendix). Estimating the search intensity for “recession” or “unemployment” around the crises’ peak during both the Great Recession and Great Lockdown using specification (2), adjusted to monthly data, we observe no significant differences in responses between those countries that had STWs in place and those that had not (Figure 7).¹⁷ Statistically, the biggest difference between the two groups is observed in terms of unemployment concerns during the Great Recession (cf. panel (c) of Figure 7). Estimating a specification without the relative time dimension, but interacting dummies for each crisis period or peak with a group dummy shows even turns it significant, suggesting that countries with STWs portrayed lower unemployment concerns during the Great Recession (see Table A.2 in Appendix).

¹⁶ Unfortunately, the series plotted in Figure 6 do not allow for a comparison of the demand for each country’s short-term work system. The series are relative. The series are indexed at 100 on the moment the searches peak. For example, both the unadjusted ERTE and Kurzarbeit series would peak at the same level, even if these peaks may represent different volumes. What is possible is a comparison of the relative changes, i.e. using the difference in the mean search intensity before and after the crisis by country. For example, Figure A.2 in the Appendix illustrates this using the regional data for Italy. As expected, the country-level results comprise significant differences across the regions

¹⁷ The subset of countries with STWs in place includes Belgium, Germany, Denmark, Spain, Finland, France, Italy, Luxembourg and the Netherlands.

This result, however, does not extend to the Great Lockdown, despite the regained attention (and general deployment of) for STWs. Finally, while there is little to no difference between countries with and without STWs, the difference in unemployment concerns between the two crises is striking.

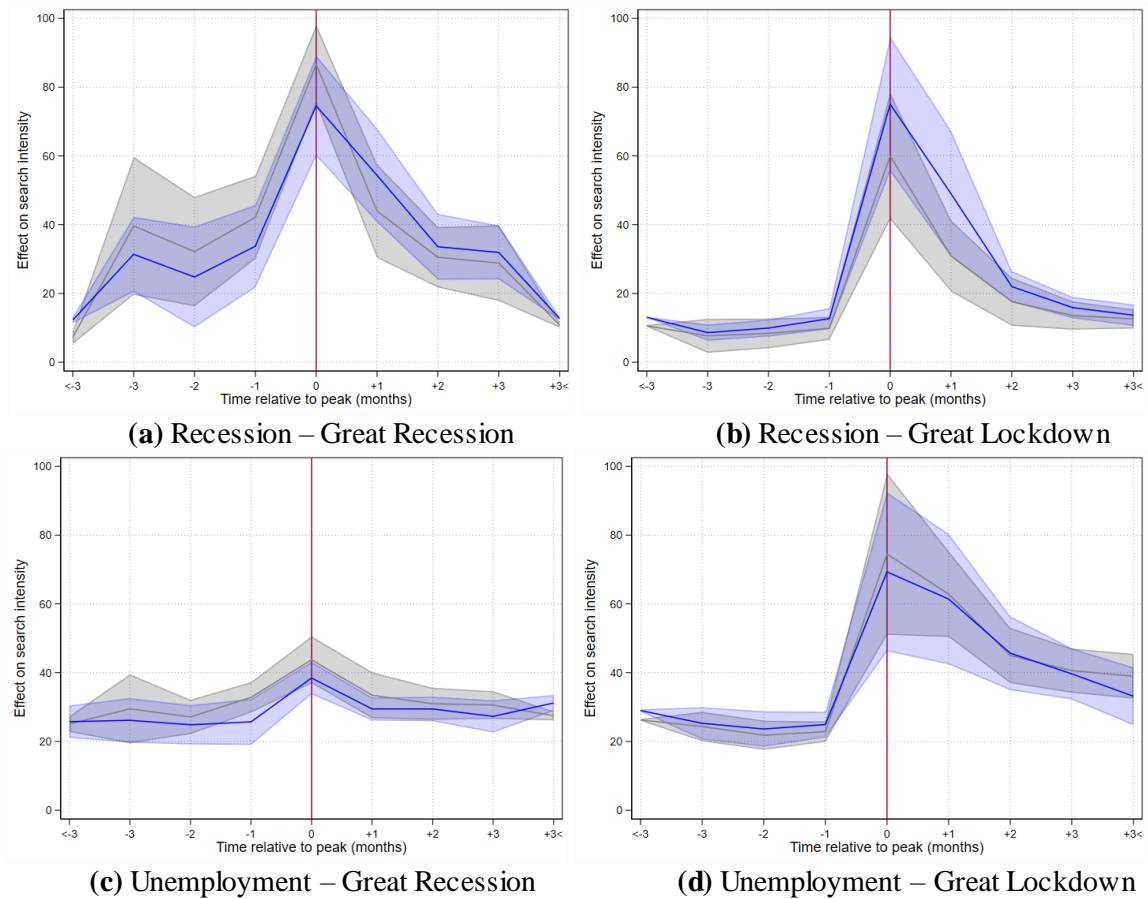


Figure 7: Marginal impact on search intensity by month (relative to crisis peak) from DiD-model (2) and their 95% confidence intervals - Split by presence of STW (yes = blue, no = grey)

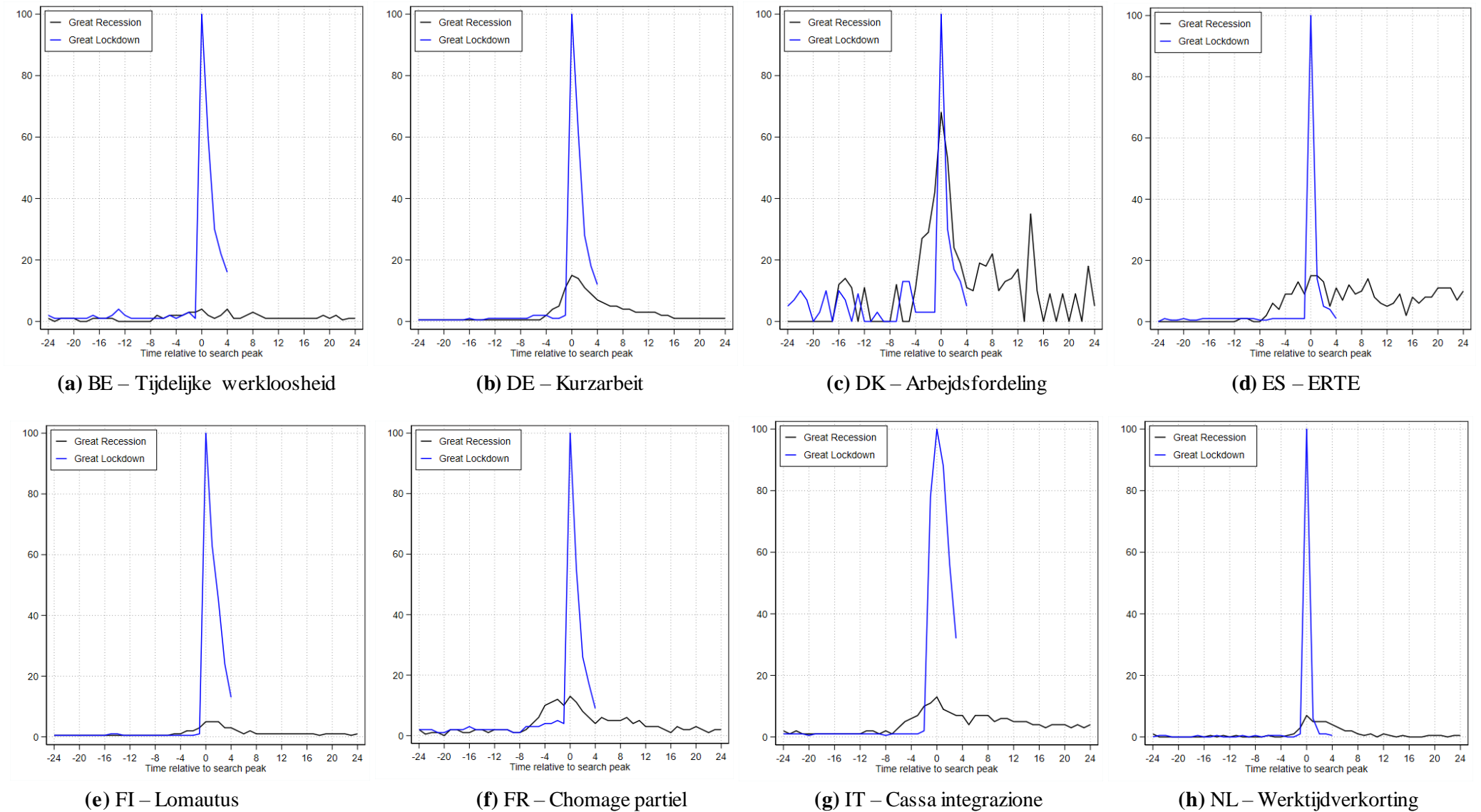


Figure 6: Google Searches for pre-existing short-term work schemes (STWs) during the Great Recession and Great Lockdown

3.2 Labour Markets

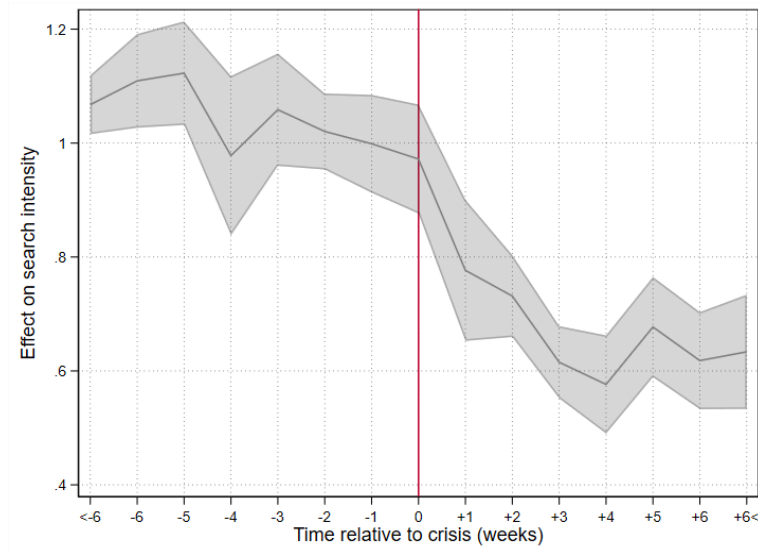
Having established the spike in economic anxiety, we now turn to the impact of the pandemic on more specific labour market trends, using a novel set of search queries. First, we analyse changes in households' searches for vacancies. Specifically, Table 4 and Figure 8 report the estimation results of specifications (1) and (2) for search queries regarding country-specific job boards, internationally active employment agencies, the online career platform LinkedIn and generic searches common for job applicants. The β -coefficient for the search queries on job boards and employment agencies are negative and significant, suggesting a 30% drop in interest relative to the pre-corona period. The data on the major employment agencies is slightly more noisy, as not all of them are (as) active (as others) in all EU member states. For example, the drop in "Manpower" searches in Italy is substantial, but less outspoken than the corresponding drop for "Adecco" (see Figure A.5 in Appendix, orange lines). Nonetheless, the result seems to be consistent across queries. In the same vein, a smaller, but significant drop in searches for the international platform LinkedIn is observed. The drop in searches for "resume" is smallest, yet significant. Consequently, our results extend to the EU the earlier survey-based findings for the US that currently unemployed are not (as) actively looking to find new jobs (Coibion et al., 2020).

Table 4: Labour markets – Job search

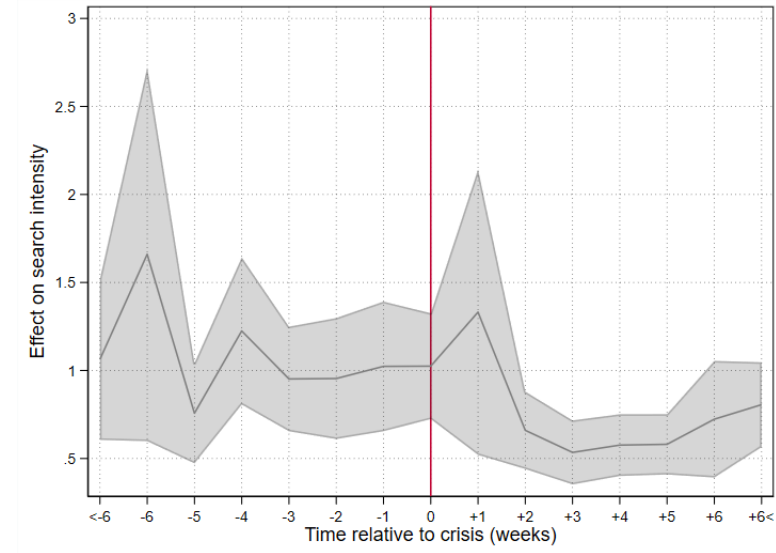
| | Job Board | Manpower | Randstad | Adecco | Indeed | LinkedIn | Curriculum | Resume |
|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Intercept | 0.996*** (0.0117) | 0.934*** (0.0385) | 0.986*** (0.0357) | 0.979*** (0.0364) | 1.003*** (0.0203) | 1.005*** (0.0104) | 0.996*** (0.0388) | 1.013*** (0.0212) |
| Cut-off dummy I (# cases > 3) | -0.364*** (0.0202) | -0.228*** (0.0600) | -0.311*** (0.0558) | -0.366*** (0.0473) | -0.314*** (0.0322) | -0.179*** (0.0168) | -0.156 (0.106) | -0.123*** (0.0339) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 70.354 | 10.924 | 17.981 | 39.167 | 35.955 | 22.518 | 11.405 | 4.279 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 |
| Goodness-of-fit | 0.395 | 0.020 | 0.030 | 0.049 | 0.104 | 0.235 | 0.010 | 0.016 |
| N° of observations | 2352 | 2646 | 2156 | 2548 | 2646 | 2646 | 2646 | 2646 |
| N° of countries | 24 | 27 | 22 | 26 | 27 | 27 | 27 | 27 |

Notes: The dependent variable is the seven-day moving average search intensity for country-specific job boards, internationally active agencies and general queries, normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

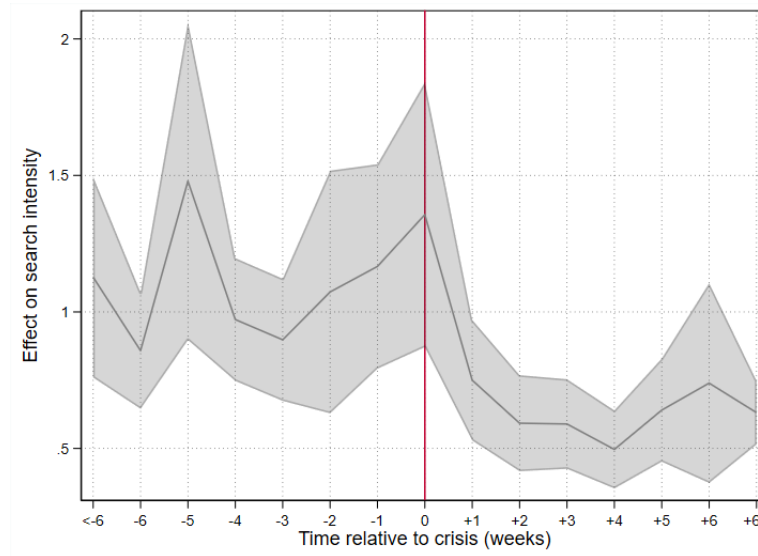
Interestingly, the job search trends do not seem to differ all that much between those countries hit harder in economic terms and the others (cf. Table 5). For example, the country-specific job board searches tend to drop by 36% to 38% in both subpanels. The use of LinkedIn, on the other hand, seems to be affected less in those countries hit hardest. The biggest difference is the significantly larger drop in searches for "curriculum" related information in the pool of hardest hit countries. This may, nonetheless, be the counterpart of the significantly larger decrease in searches for "resume" related info in the least hard-hit countries. Extending the estimation using (2), however, does not show any significant differences among the two panels for these queries, only a slower decline in LinkedIn searches.



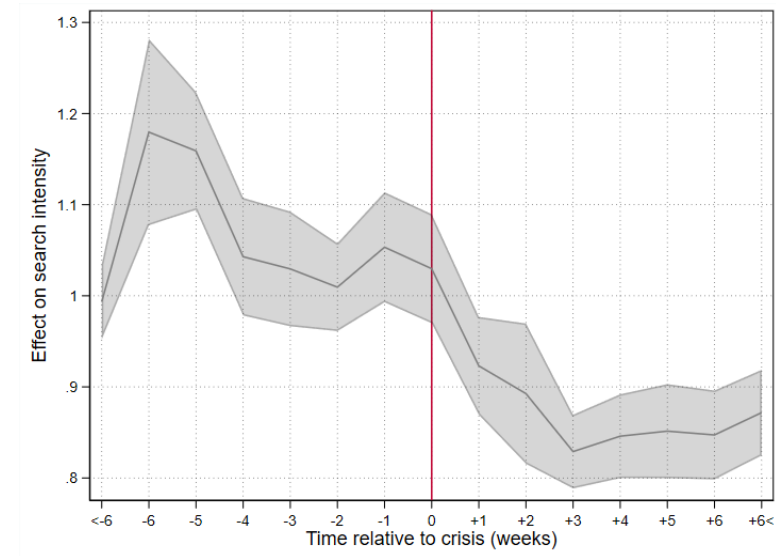
(a) Country-specific Job Boards



(b) Randstad



(c) Adecco



(d) LinkedIn

Figure 8: Marginal impact on search intensity by week (relative to 3-cases cut-off) from DiD-model (2) and their 95% confidence intervals

Table 5: Labour markets – Job search, split by size of the GDP revision

| | Job Board | | LinkedIn | | Curriculum | | Resume | |
|----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|----------------------|-----------------------|
| | (Hard) | (Rest) | (Hard) | (Rest) | (Hard) | (Rest) | (Hard) | (Rest) |
| Intercept | 1.002*** (0.0282) | 0.994*** (0.0122) | 1.009*** (0.00726) | 1.001*** (0.0142) | 1.004*** (0.0339) | 1.004*** (0.0499) | 1.007*** (0.0332) | 1.015*** (0.0276) |
| Cut-off dummy I (# cases > 3) | -0.380*** (0.0374) | -0.358*** (0.0245) | -0.153*** (0.0138) | -0.192*** (0.0235) | -0.340*** (0.0679) | -0.0731 (0.149) | -0.0907 (0.0719) | -0.138*** (0.0384) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 367.073 | 76.352 | 227.125 | 15.765 | 22.871 | 14.276 | 13.301 | 3.607 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.014 |
| Goodness-of-fit | 0.427 | 0.377 | 0.257 | 0.241 | 0.152 | 0.002 | 0.018 | 0.017 |
| N° of observations | 784 | 1568 | 882 | 1764 | 882 | 1764 | 882 | 1764 |
| N° of countries | 8 | 16 | 9 | 18 | 9 | 18 | 9 | 18 |

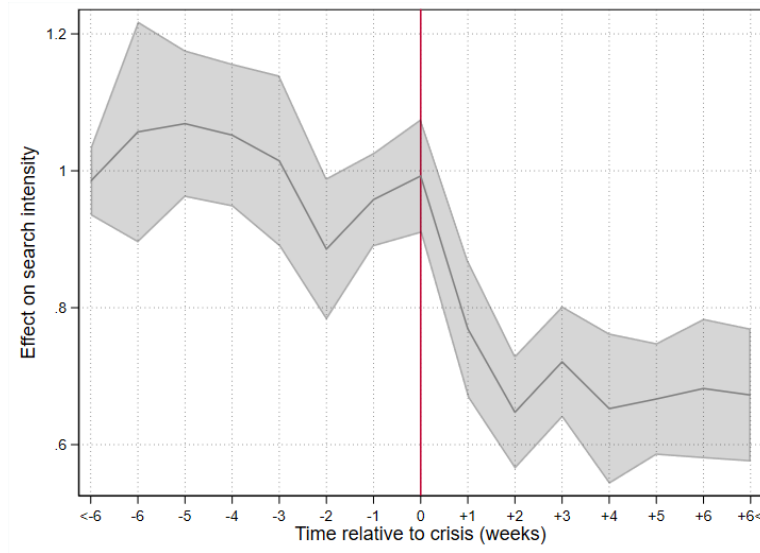
Notes: The dependent variable is the seven-day moving average search intensity for job boards and general queries, normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

3.3 Consumption

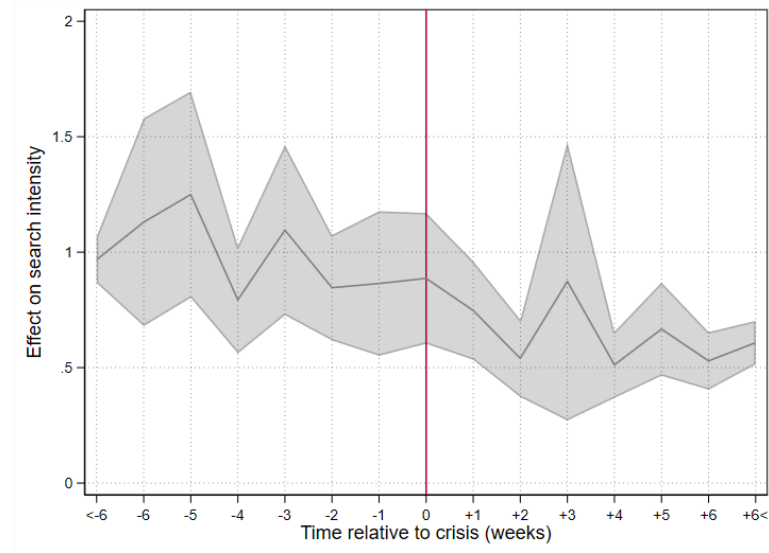
Finally, we show that the combination of the lockdowns and increased economic anxiety led to a likely drop in households' purchases. In particular, we investigate the impact on the purchase of durable goods as such consumption is often preceded by an information gathering process (e.g. for price comparison) and therefore search data are a good proxy for (near-term) purchases. Table 6 summarizes the results from baseline specification (1). Figure 9 plots the corresponding results from specification (2). We focus in particular on car purchases, which tend to be negatively correlated with income uncertainty and are usually considered a good proxy of consumer sentiment and the business cycle, see Dunn (1998) for evidence on the US and Casalis and Krustev (2020) for recent evidence for the euro area.

Following the spread of the pandemic, we observe a large and significant drop in searches for premium car brands such as Mercedes-Benz. Interest drops by approximately one third in the weeks following the outbreak. Similar patterns emerge when looking at second-hand car platforms. Both internationally active platforms (AutoScout and Auto1) and the country-specific alternatives (grouped in columns (7) and (8) and displayed in panel (c) of Figure 9).

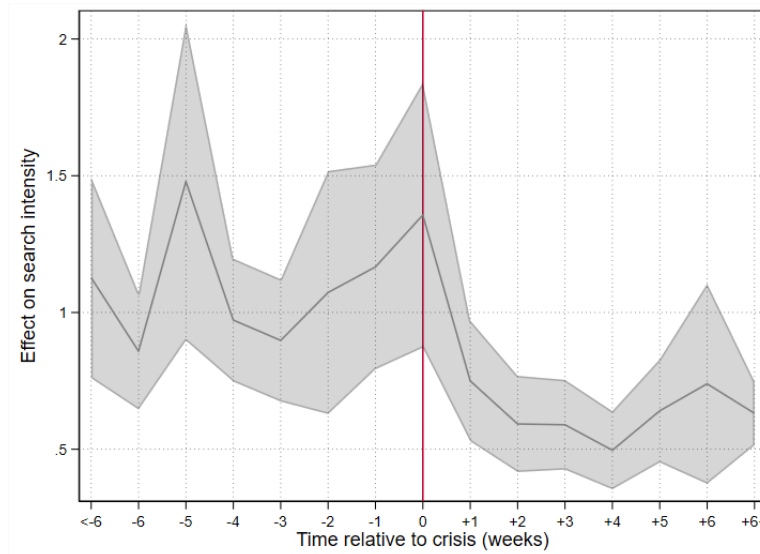
Finally, we find suggestive evidence that a similar, yet smaller pattern also affected less-durable consumption. Overall, the consumption of non-durable goods is harder to gauge using search data, since it is generally preceded by less of a search effort and comparison on part of the consumer. Nonetheless, interest in peer-to-peer second-hand goods platforms may provide a proxy for non-durable consumption or at least less-durable consumption. The last two columns of Table 6 offer some suggestive evidence that the drop observed for durables is also present for less-durable goods, although to a smaller extent. Interestingly, the data also show a significant increase in activity several weeks before the outbreak (Figure 8, panel (d)). While it would be tempting to relate this to possible hoarding behaviour, this is unlikely the case since we do not observe such early spikes in anxiety in other searches.



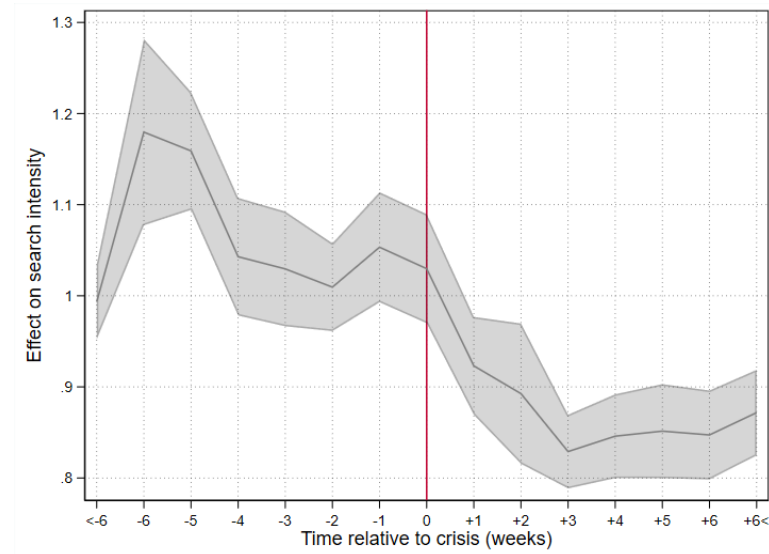
(a) Mercedes-Benz



(b) AutoScout



(c) Country-specific second-hand car platforms



(d) Country-specific second-hand platforms

Figure 9: Marginal impact on search intensity by week (relative to 3-cases cut-off) from DiD-model (2) and their 95% confidence intervals

Table 6: Consumption – Baseline specification

| | Mercedes-Benz | | AutoScout | | Auto1 | | Second-hand cars | | Second-hand goods | |
|-------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Intercept | 1.004*** (0.0154) | 1.043*** (0.0138) | 0.988*** (0.0332) | 1.039*** (0.0276) | 0.996*** (0.0372) | 1.059*** (0.0339) | 1.006*** (0.0222) | 1.027*** (0.0200) | 1.003*** (0.0122) | 1.024*** (0.0150) |
| Cut-off dummy I (# cases > 3) | -0.279*** (0.0240) | | -0.315*** (0.0527) | | -0.451*** (0.0550) | | -0.299*** (0.0449) | | -0.163*** (0.0338) | |
| Cut-off dummy II (# deaths > 10) | | -0.281*** (0.0326) | | -0.303*** (0.0567) | | -0.486*** (0.0680) | | -0.352*** (0.0520) | | -0.141** (0.0506) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 30.894 | 26.558 | 12.408 | 10.757 | 31.636 | 34.618 | 13.676 | 17.005 | 121.535 | 42.697 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Goodness-of-fit | 0.199 | 0.156 | 0.047 | 0.031 | 0.062 | 0.052 | 0.285 | 0.420 | 0.249 | 0.184 |
| N° of observations | 2646 | 2646 | 2646 | 2646 | 2058 | 2058 | 1176 | 1176 | 882 | 882 |
| N° of countries | 27 | 27 | 27 | 27 | 21 | 21 | 12 | 12 | 9 | 9 |

Notes: The dependent variable is the seven-day moving average search intensity for internationally active platforms/brands and country-specific platforms for second hand cars or second hand goods, normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

4. Conclusion

In this paper, we used a large panel of real-time search data for the EU to show that the recent health crisis and ensuing Great Lockdown, came with an extraordinary level of economic uncertainty. Consequently, innovative data sources, such as the Google Trends data, have proven indispensable during the sudden, surprise developments of the COVID-19 crisis, complementing the traditional, backward looking indicators used by policy makers. In this light, the current paper analyses more carefully some of the uncertainty's aspects most relevant to public policy makers, with a particular focus on labour market developments.

Our main conclusions are threefold. First, we documented a substantial increase in people's economic anxiety, e.g. in terms of recession and unemployment-related fears, in the months following the coronavirus outbreak. Such real-time trends are not to be taken lightly as economic anxiety and uncertainty are not only a transmission channel, but may affect the economy directly. Anxiety, for instance, may affect expectations and (future) consumption behaviour. In fact, we observe a significant, coinciding slowdown in labour markets and (durable) consumption. Overall, our results for the EU complement similar survey-based findings for Great Britain and the US.

Second, our analysis showed that the ensuing fear was significantly more outspoken in those EU countries hit hardest in economic terms. As these countries' labour market conditions were often already less favourable at the onset of the crisis, the risk of a widening gap between EU member states thus seems likely in absence of a (coordinated) policy response.

Finally, we compared the economic anxiety during the Great Lockdown to that during the Great Recession of 2007-2009. We found that especially the unemployment-related fears have peaked well-above their observed values at the peak of the Great Recession. This difference was even more

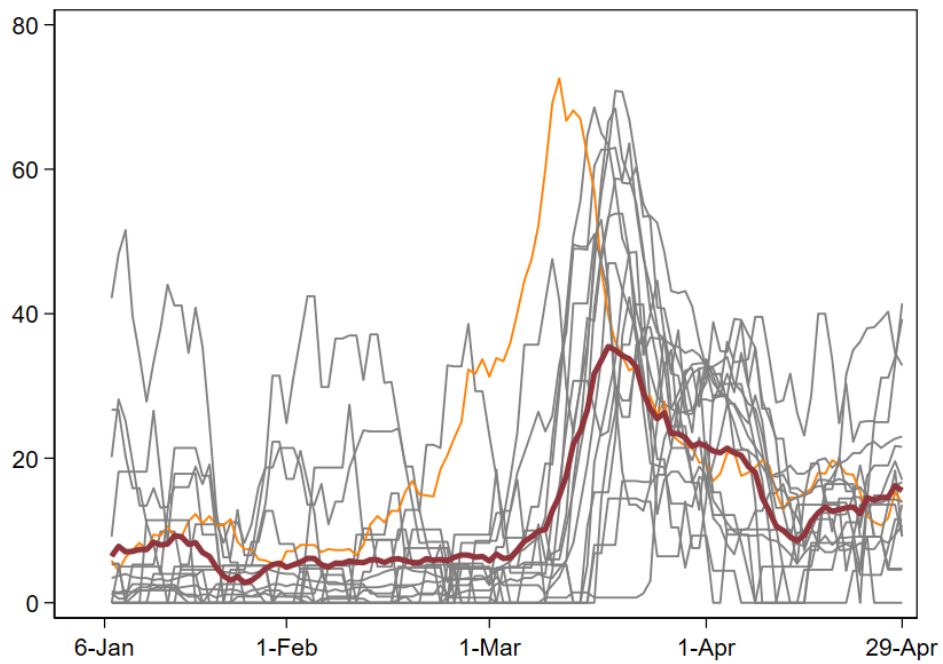
outspoken for searches regarding short-term work schemes, confirming their importance during the heat of the pandemic. Interestingly, the availability and extensions of such schemes, while highly sought after, however, did not seem to have mitigated the countries' overall economic anxiety relative to countries without such schemes. This is somewhat surprising, since we did find suggestive evidence that countries with STWs in place portrayed less unemployment-related anxiety during the Great Recession.

References

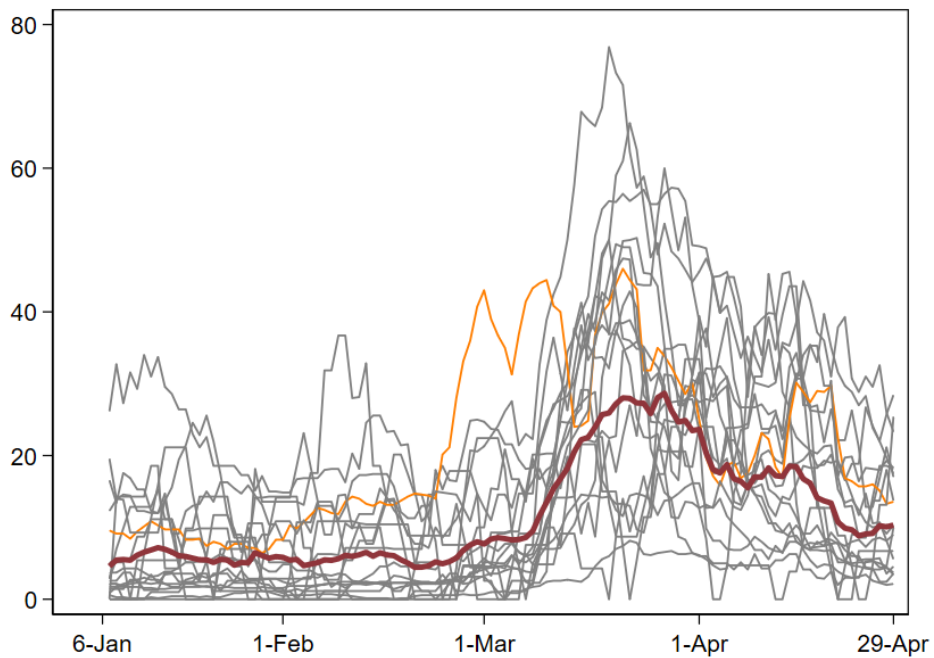
- Altig, D., Baker, S. R., Barrero, J. M., Bloom, N., Bunn, P., Chen, S., Davis, S. J., Leather, J., Meyer, B., Mihaylov, E., Mizen, P., Parker, N., Renault, T., Smietanka, P. and Thwaites, G. (2020). Economic Uncertainty before and during the Covid-19 pandemic, BoE Staff Working Paper 876, Bank of England, London, UK.
- Askitas, N. and Zimmermann, K. F. (2009). Google Econometrics and Unemployment Forecasting, *Applied Economics Quarterly*, 55(2): 107-120.
- Baker, S. R., Farrokhnia, R. A., Meyer, S., Pagel, M. and Yannelis, C. (2020). How Does Household Spending Respond to an Epidemic? Consumption During the 2020 COVID-19 Pandemic, Becker-Friedman Institute Working Paper 2020-30, University of Chicago, Chicago, USA.
- Balleer, A., Gehrke, B., Lechthaler, W. and Merkl, C. (2016). Does short-time work save jobs? A business cycle analysis, *European Economic Review*, 84(C): 99-122.
- Ben-David, I., Ferman, E., Kuhnen, C. M. and Li, G. (2018). Expectations Uncertainty and Household Economic Behavior, NBER Working Papers 25336, National Bureau of Economic Research, Cambridge (US).
- Binder, C. (2020). Coronavirus Fears and Macroeconomic Expectations. *Review of Economics and Statistics*, forthcoming.
- Boeri, T. and Bruecker, H. (2011). Short-time work benefits revisited: some lessons from the Great Recession, *Economic Policy*, 26(68): 697-765.
- Boeri, T. and Jimeno, J. F. (2016). Learning from the Great Divergence in unemployment in Europe during the crisis, *Labour Economics*, 41(4): 32-46.
- Campello, M., Kankanhalli, G. and Muthukrishnan, P. (2020). Corporate hiring under COVID-19: Labour market concentration, downskilling, and income inequality, NBER Working Paper 27208, National Bureau of Economic Research, Cambridge (US).
- Caperna, G., Colagrossi, M., Geraci, A. and Mazzarella, G. (forthcoming). Googling Unemployment During the Pandemic: Inference and Nowcast Using Search Data, JRC Working Papers in Economics and Finance, European Commission, Joint Research Centre, Ispra.
- Casalis, A. and Krustev, G. (2020). Consumption of durable goods in the euro area, ECB Economic Bulletin 5/2020, European Central Bank, Frankfurt am Main.
- Choi, H. and Varian, H. R. (2012). Predicting the present with Google Trends, *Economic Record*, 88(S1): 2-9.
- Chronopoulos, C. K., Lukas, M. and Wilson, J. O. S. (2020). Consumer Spending Responses to the COVID-19 Pandemic: An Assessment of Great Britain, Centre for Responsible Banking & Finance Working Paper 20-012, University of St. Andrews, St Andrews, UK.
- Coibion, O., Gorodnichenko, Y. and Weber, M. (2020). Labor markets during the COVID-19 crisis: A preliminary view, NBER Working Paper 27017, National Bureau of Economic Research, Cambridge (US).
- Coleman, W. and Nautz, D. (2020). The credibility of the ECB's inflation target in times of Corona: New evidence from an online survey, Diskussionsbeiträge, No. 2020/11, Freie Universität Berlin, Berlin.
- Costa Dias, M., Norris Keiller, A., Postel-Vinay, F., and Xu, X. (2020). Job vacancies during the Covid-19 pandemic, IFS Briefing Note 289, Institute for Fiscal Studies, London.
- D'Amuri, F. and Marcucci, J. (2017). The predictive power of Google searches in forecasting US unemployment, *International Journal of Forecasting*, 33(4): 801-816.
- Doerr, S. and Gambacorta, L. (2020). Covid-19 and regional employment in Europe, BIS Bulletin, Bank of International Settlements, Basel.
- Du, R. Y. and Kamakura, W. A. (2012). Quantitative Trendspotting, *Journal of Marketing Research*, 49(4): 514-536.
- Dunn, W. E. (1998). Unemployment risk, precautionary saving, and durable goods purchase decisions, Finance and Economics Discussion Series (FEDS) 98-49, Board of Governors of the Federal Reserve System, Washington D.C., USA.

- Efstathiou, K., Mathä, T. Y., Veiga, C. and Wintr, L. (2018). Short-time work in Luxembourg: evidence from a firm survey, *Journal for Labour Market Research*, 52(1): 1-20.
- Fantazzini, D. and Toktamysova, Z. (2015). Forecasting German car sales using Google data and multivariate models, *International Journal of Production Economics*, 170(PA): 97-135.
- Fetzer, T., Hensel, L., Hermle, J. and Roth, C. (2020). Coronavirus Perceptions and Economic Anxiety. *Review of Economics and Statistics*, forthcoming.
- Fontaine, I. (2020). Uncertainty and Labour Force Participation, *Oxford Bulletin of Economics and Statistics*, forthcoming.
- Galí, J. (2015). Hysteresis and the European unemployment problem revisited, NBER Working Paper 21430, National Bureau of Economic Research, Cambridge (US).
- Gambacorta, R., Rosolia, A. and Zanichelli, F. (2020), All in it together, but with differences: The finances of European households through the pandemic, VoxEU, 15th April 2020.
- Gehrke, B. and Hochmuth, B. (forthcoming). Counteracting Unemployment in Crises: Non-Linear Effects of Short-Time Work Policy, *The Scandinavian Journal of Economics*.
- Ginsberg, J., Mohebbi, M. H., Patel, R. S., Brammer, L., Smolinski, M. S. and Brilliant L. (2009). Detecting Influenza Epidemics Using Search Engine Query Data, *Nature*, 457(7232): 1012–1014.
- Guzman, G. C. (2011). The case for higher frequency inflation expectations, MPRA Paper 36656, University Library of Munich, Germany.
- Iacus, S.M., Santamaria, C., Sermi, F., Spyratos, S., Tarchi, D. and Vespe, M. (2020a). How human mobility explains the initial spread of COVID-19, JRC Technical Reports, European Commission, Joint Research Centre, Ispra.
- Iacus, S.M., Santamaria, C., Sermi, F., Spyratos, S., Tarchi, D. and Vespe, M. (2020b). Mapping Mobility Functional Areas (MFA) by using Mobile Positioning Data to Inform COVID-19 Policies, JRC Technical Reports, European Commission, Joint Research Centre, Ispra.
- ILO (2020). ILO Monitor 2nd edition: COVID-19 and the world of work.
- Koop, G. and Onorante, L. (forthcoming). Macroeconomic Nowcasting Using Google Probabilities, *Advances in Econometrics*.
- Lydon, R., Mathä, T. Y. and Millard, S. (2019). Short-time work in the Great Recession: firm-level evidence from 20 EU countries, *IZA Journal of Labor Policy*, 8(1): 1-29.
- Santamaria, C., Sermi, F., Spyratos, S., Iacus, S.M., Annunziato, A., Tarchi, D. and Vespe, M. (2020). Measuring the Impact of COVID-19 Confinement Measures on Human Mobility using Mobile Positioning Data, JRC Technical Reports, European Commission, Joint Research Centre, Ispra.
- Vosen, S. and Schmidt, T. (2011). Forecasting Private Consumption: Survey-Based Indicators vs. Google Trends, *Journal of Forecasting*, 30(6): 565–578.

Appendix:



(a) Telework



(b) Recession

Figure A.1: Google Searches before and after the Corona outbreak – 7-day moving average; average (bold red) across countries (grey); Italy (orange)

Table A.1: Economic sentiment – Interaction with the size of the GDP revision

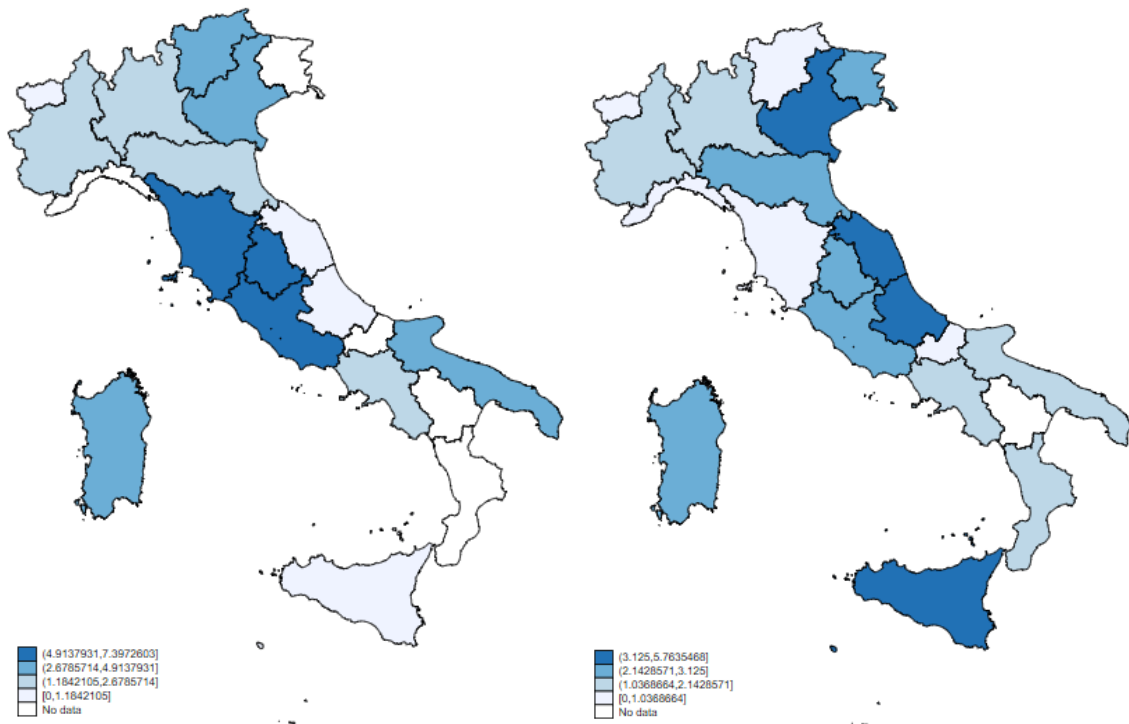
| | Telework | | Recession | | Unemployed | | Unemp. Benefit | |
|-------------------------------------|--------------------|--------------------|---------------------|---------------------|--------------------|---------------------|-------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Intercept | 0.581 (0.751) | 0.576* (0.296) | 1.017* (0.497) | 0.781*** (0.169) | 0.853** (0.404) | 0.859*** (0.195) | 1.065 (1.698) | 0.919*** (0.0737) |
| Cut-off dummy I (# cases > 3) | 5.206** (2.113) | | 2.648*** (0.534) | | 0.815** (0.316) | | 6.432 (5.334) | |
| Cut-off I * GDP revision dummy | -0.416 (2.527) | | 3.736 (2.311) | | 2.131 (1.633) | | -5.949 (5.342) | |
| Cut-off dummy II (# deaths > 10) | | 1.311** (0.482) | | 0.572*** (0.186) | | 0.685*** (0.219) | | 1.085*** (0.193) |
| Cut-off II * GDP revision dummy | | 2.762* (1.416) | | 3.546** (1.677) | | 1.758* (0.931) | | -0.395 (0.283) |
| Day Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 5.764 | 6.116 | 6.035 | 8.952 | 3.301 | 8.553 | 4.654 | 10.154 |
| p-value | 0.001 | 0.001 | 0.000 | 0.000 | 0.013 | 0.000 | 0.002 | 0.000 |
| Goodness-of-fit | 0.133 | 0.284 | 0.168 | 0.138 | 0.108 | 0.185 | 0.037 | 0.180 |
| N° of observations | 1862 | 1862 | 2156 | 2352 | 2156 | 2254 | 2450 | 2450 |
| N° of countries | 19 | 19 | 22 | 24 | 22 | 23 | 25 | 25 |

Notes: The dependent variable is the seven-day moving average search intensity for country-specific terms (telework, recession, unemployment and unemployment benefit), normalized by the mean search intensity before the COVID-19 outbreak. Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

Table A.2: Economic sentiment – Interaction with a dummy for the presence of STWs

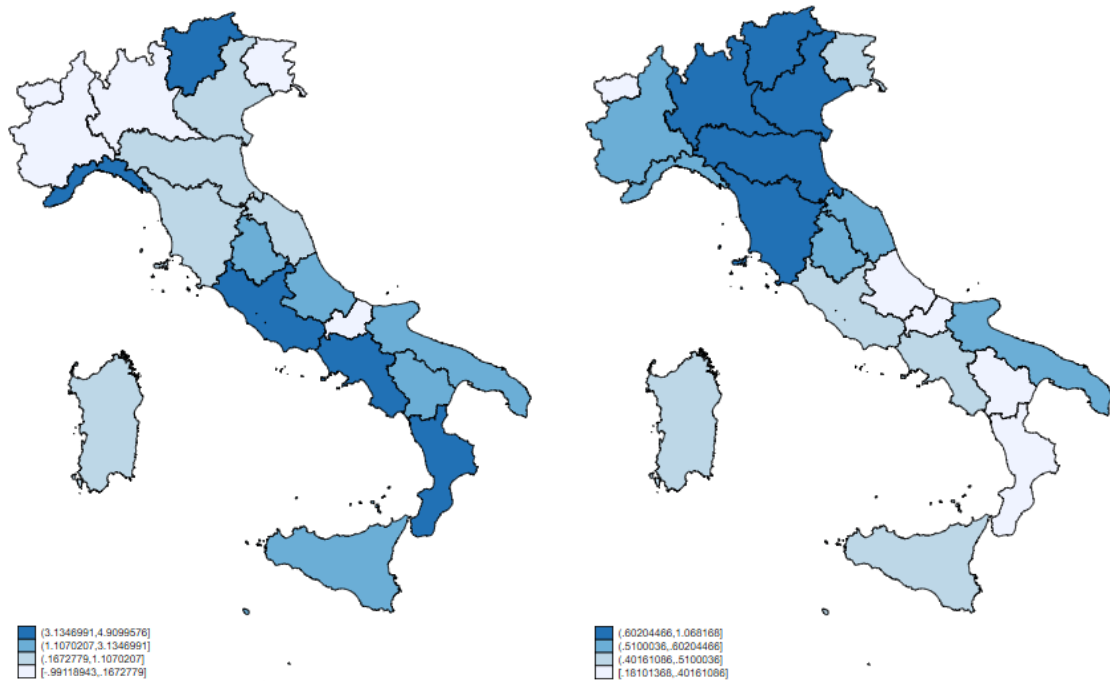
| | Recession | | Unemployment | | Unemployment topics | |
|-----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | (7 months) | (Peak) | (7 months) | (Peak) | (7 months) | (Peak) |
| Intercept | 11.16*** (0.714) | 12.66*** (0.509) | 23.25*** (0.849) | 23.34*** (0.779) | 28.09*** (0.735) | 28.29*** (0.691) |
| Great Recession dummy | 33.90*** (4.464) | 76.02*** (5.918) | 6.016** (2.137) | 17.29*** (3.489) | 5.617*** (1.652) | 22.07*** (3.062) |
| Great Lockdown dummy | 14.30*** (3.376) | 49.68*** (9.433) | 22.66*** (3.917) | 50.17*** (10.36) | 14.85*** (3.353) | 35.21*** (8.025) |
| GR dummy * STW dummy | -5.511 (6.171) | -13.96 (9.400) | -6.795** (2.978) | -8.586* (4.253) | -2.731 (2.326) | -9.884** (4.449) |
| GL dummy * STW dummy | 4.622 (4.269) | 12.44 (13.70) | -4.790 (6.284) | -4.588 (15.20) | 3.409 (6.154) | -2.661 (12.50) |
| Month Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Panel Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| F-statistic | 39.807 | 1348.84 | 821.960 | 372.952 | 76.870 | 104.188 |
| p-value | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Goodness-of-fit | 0.213 | 0.204 | 0.046 | 0.064 | 0.068 | 0.076 |
| N° of observations | 3781 | 3781 | 3184 | 3184 | 4975 | 4975 |
| N° of countries | 19 | 19 | 16 | 16 | 25 | 25 |

Notes: The dependent variable is the search intensity for country-specific terms (recession and unemployment). Cluster-robust standard errors are noted in parentheses: * p<0.10, ** p<0.05, *** p<0.01.



(b) Telelavoro

(b) Recessione



(c) Disoccupati

(d) INPS

Figure A.2: Difference between the median Google Searches before and after the Corona outbreak – normalized 7-day moving average; cutoff: # cases > 3

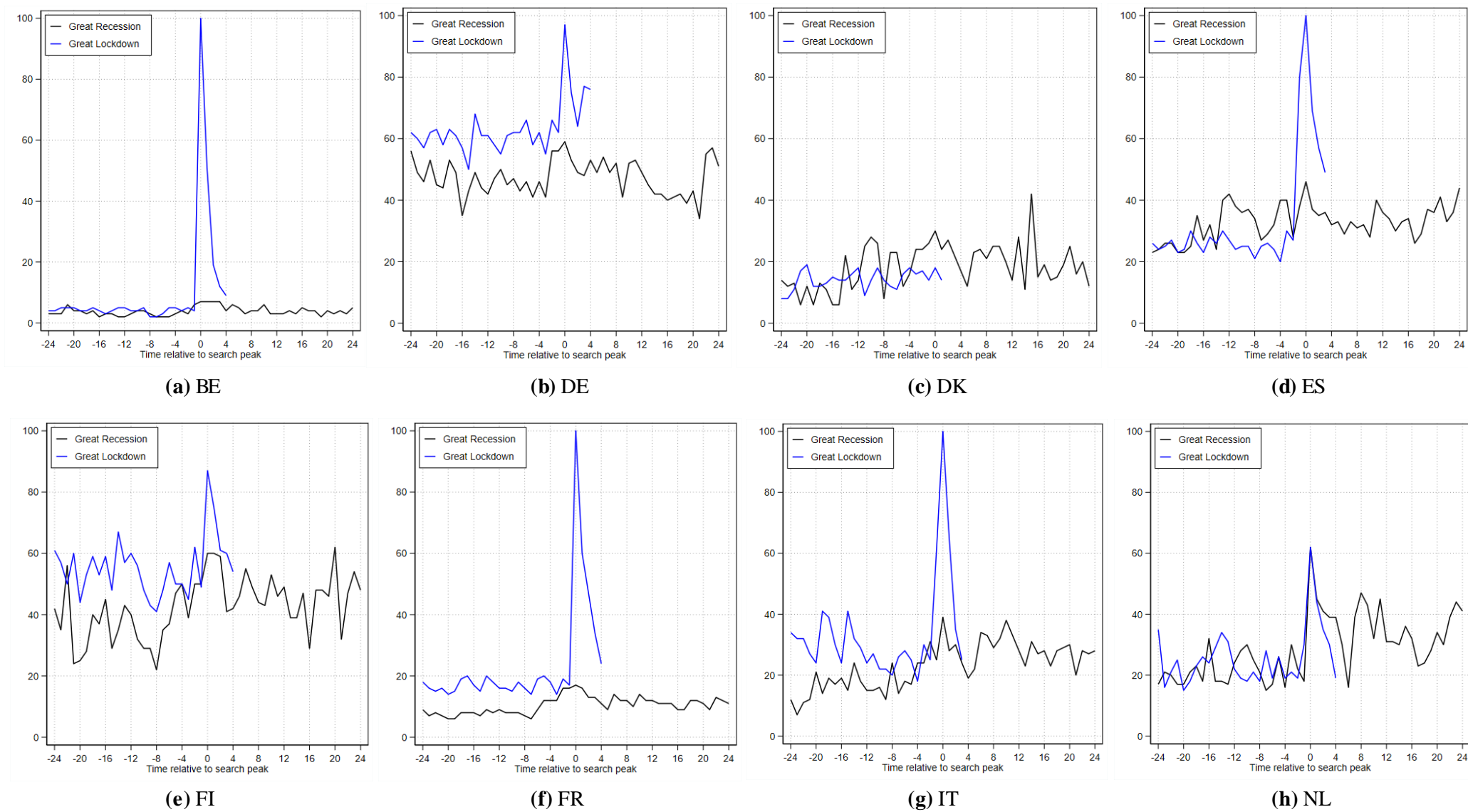


Figure A.3: Google Searches for unemployment during the Great Recession and Great Lockdown

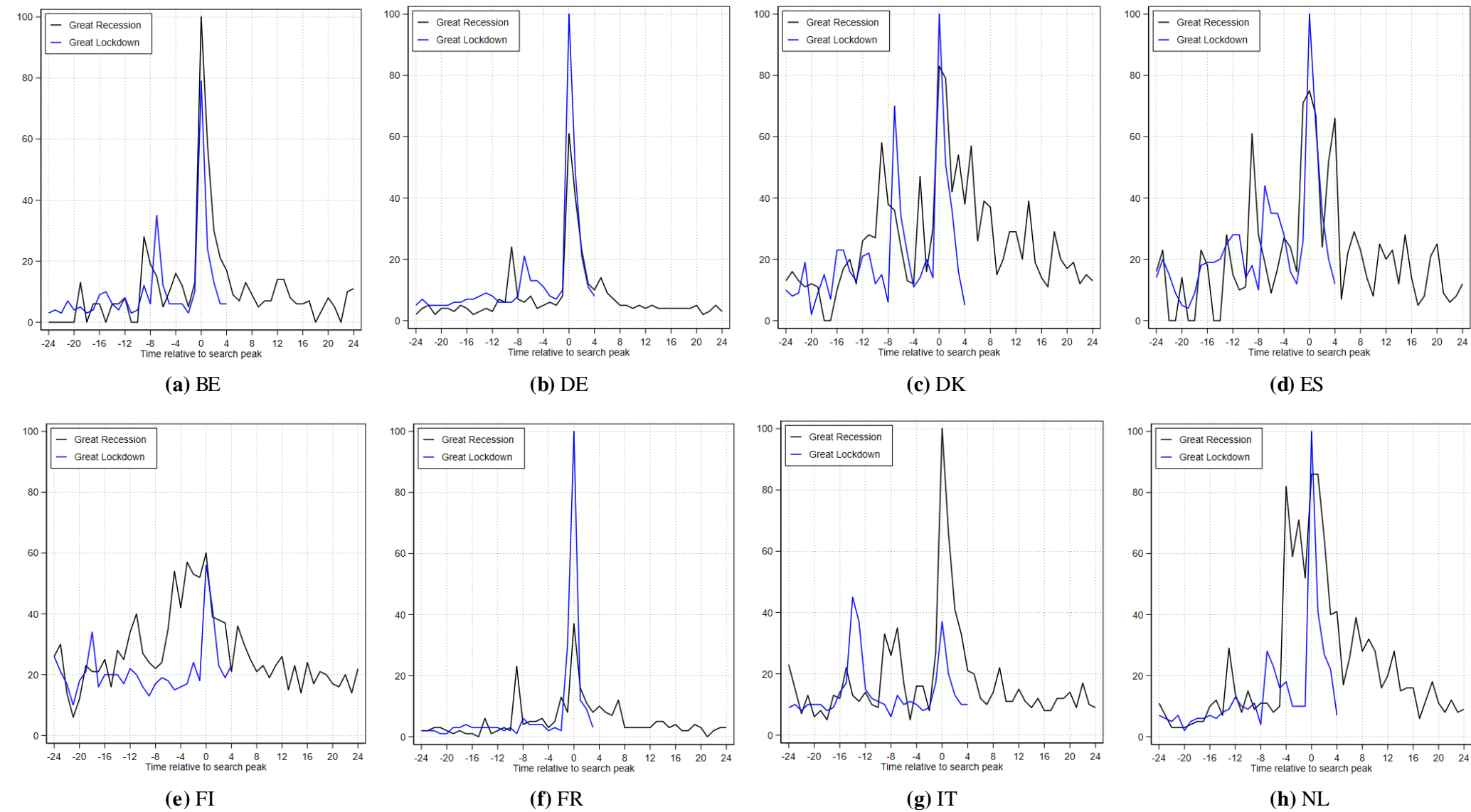
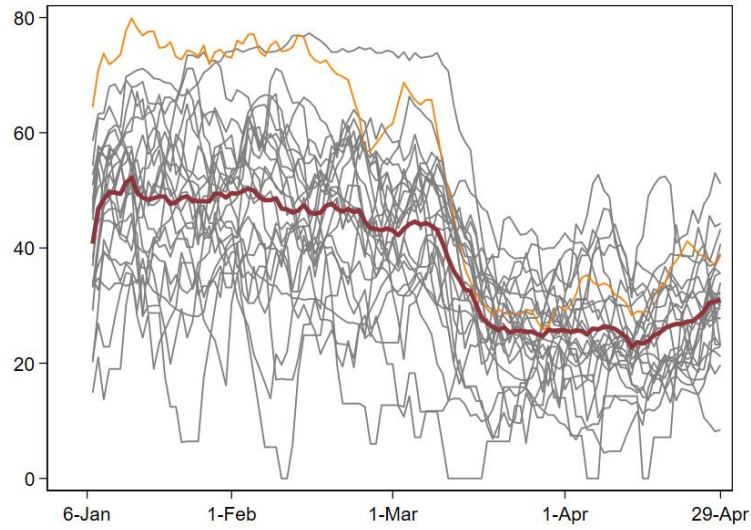
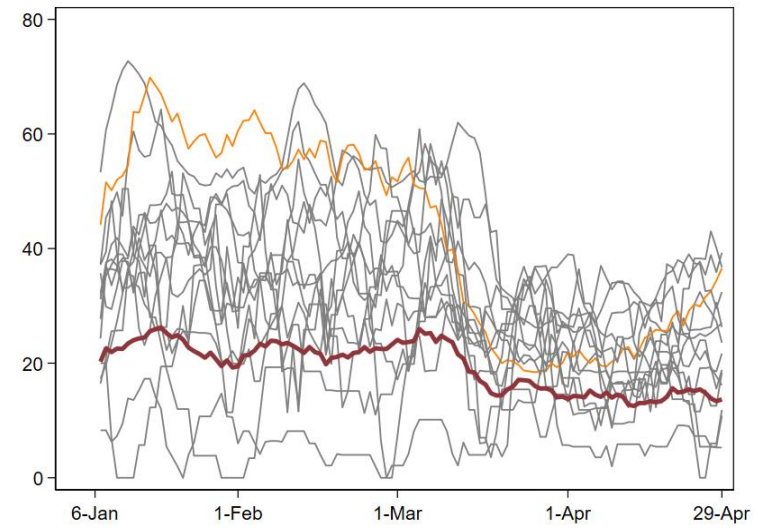


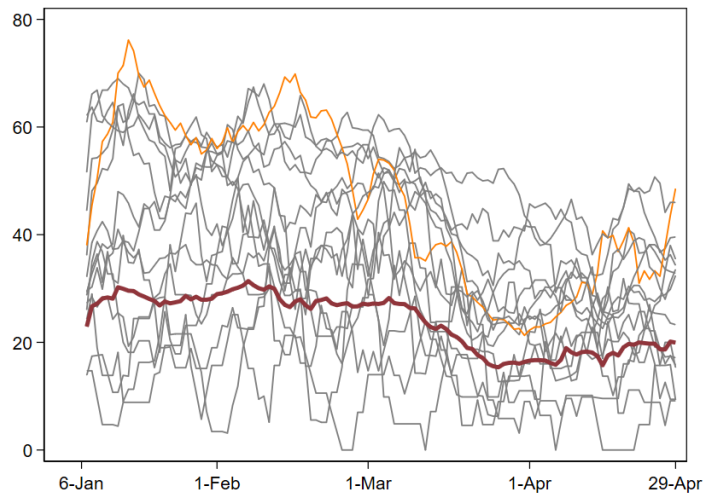
Figure A.4: Google Searches for recession during the Great Recession and Great Lockdown



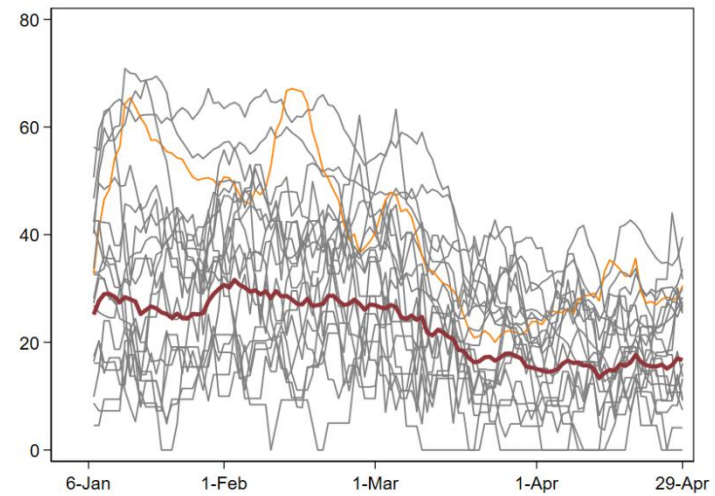
(a) EU: Country Job Boards



(b) EU: Manpower



(a) EU: Randstad



(b) EU: Adecco

Figure A.5: Google Searches before and after the Corona outbreak – 7-day moving average; average (bold red) across countries/regions (grey)

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct information centres. You can find the address of the centre nearest you at: https://europa.eu/european-union/contact_en

On the phone or by email

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696, or
- by electronic mail via: https://europa.eu/european-union/contact_en

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: https://europa.eu/european-union/index_en

EU publications

You can download or order free and priced EU publications from EU Bookshop at: <https://publications.europa.eu/en/publications>. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see https://europa.eu/european-union/contact_en).



The European Commission's science and knowledge service

Joint Research Centre

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



EU Science Hub

ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



EU Science, Research and Innovation



EU Science Hub