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The **Quarterly Report on the Euro Area** is written by staff of the Directorate-General for Economic and Financial Affairs. It is intended to contribute to a better understanding of economic developments in the euro area and to improve the quality of the public debate surrounding the area's economic policy.

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Major downside risks continue to affect the euro area economies. Besides its very high human cost, Russia's war of aggression against Ukraine has disrupted economic activity, leading to sharp energy price hikes, straining further the already fragile global supply chains and heightening uncertainty. Moreover, two years after the unprecedented shock from COVID-19, the fall-out from the pandemic continues to affect materially the euro area economy.

Against this background, our projections have worsened with real GDP growth in the euro area expected at 2.6% in 2022 and moderating to 1.4% in 2023, down from 2.7% and 2.3%, in the Spring 2022 forecast. At the same time, inflation is projected to peak at historical highs in 2022 at 7.6% in the euro area, before easing in 2023 to 4.0%., compared with 6.1% and 2.7% in our previous forecast. Strong demand for labour further tightened labour markets, setting the stage for faster, albeit still moderate, wage growth, partly mitigating losses in real disposable income. Labour markets are expected to remain resilient, but employment growth is set to soften.

While the economic impact of the war in Ukraine has been extensively discussed in the latest Commission Economic Forecasts, this Quarterly Report on the Euro Area (QREA) provides further assessments of the economic impact of the COVID-19 pandemic. More particularly, the report investigates three themes related to COVID-19. First, it analyses to what extent the COVID-19 pandemic affected aggregate productivity by forcing unproductive firms to exit; second, it provides an updated assessment of the impact on labour markets of the European instrument for temporary Support to mitigate Unemployment Risks in an Emergency (SURE); and finally it sheds some light on labour market developments across the euro area in the wake of the pandemic. Taking a more long-term perspective, this QREA issue also provides an analysis of the potential public finances impact of climate change. As usual, a short summary of recent policy developments in the euro area concludes the QREA.

In response to the COVID-19 crisis, Member States rolled out comprehensive policy support for firms. Its broad-based nature raised concerns of hampering the cleansing mechanism in which unproductive firms are replaced with productive ones. However, the evidence presented in this edition suggests that it was the correct policy choice as a significant share of productive firms, which normally are little affected by crises, were affected by the COVID-19 pandemic and benefitted from the policy support. As these policies are phased out, the cleansing mechanism is expected to start operating again. The exit of low-productive firms would contribute to aggregate productivity growth, which is a prerequisite for overall growth.

As the euro area started to recover from the shock caused by the pandemic in 2021, labour markets were characterised by persisting elements of labour market slack as well as an emerging abundance of vacant jobs. Concerns were raised whether this reflected a structural increase in labour market mismatch associated among other things with large-scale sectoral reallocation needs. An econometric assessment based on the estimation of euro area Beveridge curves suggests that the uptick in labour market mismatch has been rather mild and largely temporary. Short-time work schemes significantly dampened the effect of the pandemic on the labour market. While these measures may have postponed labour reallocation, they do not appear to have led to large labour market mismatches. Most of these support measures are by now phased out, and remaining measures should be withdrawn in such a way as to prevent extensive layoffs in sectors hardest hit by the pandemic, while managing the risk of wage pressures contributing to persistent inflation.

SURE continued to provide COVID-19-related support to EU Member States throughout 2021 and, to a lesser extent, at the start of 2022. An updated assessment of the impact of SURE suggests that it helped to avoid a large rise in unemployment when firms were forced to cease their activities in the first lockdown. Moreover, it also contributed to a very rapid recovery in 2021, by helping to maintain existing employer/employee relationships from the onset of the pandemic. In addition, SURE has provided a saving of EUR 8.5 billion on interest payments for Member States through the issuance of EU SURE bonds at interest rate lower than what many of these

Member States would have otherwise faced on the market. This successful use of SURE was mainly made possible by its purpose-based character, i.e., supporting job retention, its light conditionality that allowed Member States to retain ownership of the measures that they implemented nationally, and its robust financial construction.

Climate change has increased the risk of physical hazards, entailing challenges to the sustainability of public finances. The analysis of stylised stress tests, covering Member States with the strongest exposure and vulnerability to extreme weather events, confirms the potential macroeconomic relevance of climate -related disasters and the corresponding risks to government finances. While such impacts would remain manageable under standard, medium-term, global warming scenarios, the findings point to the need to implement adequate mitigation and adaptation policies to build macro-fiscal resilience to climate change, thus reducing debt sustainability risks.

The severe shocks triggered by the COVID-19 pandemic and Russia's invasion of Ukraine underscore the urgency to speed up the green and digital transitions and to strengthen Member States' resilience. A continued coordinated policy response will be crucial to foster this.

I. Estimates of corporate cleansing during COVID-19 – using firm-level data to measure its productivity impact

By Liza Archanskaia, Plamen Nikolov and Wouter Simons

Abstract: *This section traces one of the channels through which the COVID-19 pandemic affects aggregate productivity – namely aggregate productivity changes linked to the exit of vulnerable firms ("cleansing" through firm exit). The impact of the exit margin on productivity is obtained by: (1) quantifying the impact of the pandemic on sales; (2) simulating the impact of this reduction in sales on firm-level accounts from the ORBIS database to identify financially vulnerable firms; (3) connecting financial vulnerability and pre-pandemic productivity. Our simulations suggest the pandemic would not induce additional cleansing effects as compared with a counterfactual no-COVID-19 scenario. The reason is that the COVID-19 shock adversely affected the financial health of not only low-productivity firms, but also high-productivity ones. These findings suggest that broad-based policy support implemented in connection with the pandemic did not imply foregone productivity growth through the exit margin. (1)*

I.1. Introduction

The COVID-19 pandemic and the associated restrictions on economic activity exposed firms to liquidity and solvency stress. Plummeting sales caused uncertainty as to whether firms could survive without liquidity. (2) This type of uncertainty was quickly resolved thanks to extensive public support and the feared surge in insolvencies did not happen. Yet, beyond the immediate crisis impact, another reason for uncertainty emerged. It related to whether firms in some sectors would be able to operate by changing their business model, to minimise risks to public health and mitigate the effects of social distancing measures taken by public authorities on activity. Operating in an environment where close human contact must be avoided raised questions about firms' ability to adopt teleworking, the digitalisation of the production process and the reliance on disrupted supply chains. These elements naturally affect productivity at the firm level and hence at the aggregate sectoral level, via changes in within-firm productivity and possibly within-sector reallocation effects. (3) Of particular importance is the case in which the reallocation mechanism takes the form of cleansing mechanism, which sees unproductive firms being replaced by new, more productive and viable firms in the aftermath of recessions. Part of the cleansing mechanism, namely - the exit of unproductive firms - is the focus of the present section.

Before presenting our empirical results it is worth mentioning that several methodologies have emerged to assess the impact of the crisis on the corporate sector. Some studies carry out simulations using pre-pandemic information on firm characteristics available from firm-level corporate accounts. (4) Other studies match pre-pandemic corporate accounts taken from comprehensive administrative data (business registries) with information on sales, costs, and support effectively received by firms in 2020. (5)

(1) The authors wish to thank Emiel Afman, Alessandro Turrini, Lukas Vogel and an anonymous referee for their useful comments and suggestions.

(2) See Meyer, B, E. Mihaylov, J. Barrero, S. Davis, D. Altig and N. Bloom, (2022), 'Pandemic-Era Uncertainty', *Hoover Institution Economics Working Papers*, April 11, 2022.

(3) Within-firm productivity growth is the main driver of sectoral productivity growth. The economic mechanisms of interest are the channels through which the COVID-19 shock gives firms incentives to invest, innovate, and improve productivity. Empirical evidence suggests that sectoral productivity growth may be boosted by the pandemic because both the initially productive and the lagging firms took the shock as an impetus to invest and innovate (see e.g. Harasztosi, P, L. Maurin, R. Pal, D. Revoltella and W. van der Wielen (2022), 'Firm-level policy support during the crisis: so far so good? ', *EIB Economics Working Papers* 2022/01). It remains to be seen to what extent these initially productive or catching-up firms succeeded in gaining market share. If they are shown to have gained market share, within-firm productivity growth would also be linked to within-sector reallocation effects, further increasing sectoral productivity.

(4) Examples include Connell Garcia W. and Ho V., (2020), 'What Types of Firms become Illiquid as a Result of COVID-19? A Firm-Level Perspective using French Data', *ECFIN Discussion Paper* 136, Demmou L. and Franco G., (2021), 'From hibernation to reallocation: loan guarantees and their implications for post-COVID-19 productivity', *OECD Economics Department Working Papers* 1687, Ebeke C., Jovanovic N., Valderrama L. and Zhou J., (2021), 'Corporate liquidity and solvency in Europe during COVID-19: the role of policies', *IMF Working Paper* 2021/056 (March), Gourinchas, P.-O., Kalemli-Özcan S., Penciakova, V., and Sander, N., (2020), 'COVID-19 and SME Failures'. *NBER Working Paper* #27877 and Archanskaia E. , E. Canton, A. Hobza, P. Nikolov and W. Simons (2022), 'The sectoral nature of the COVID-19 shock: a novel approach to quantifying its economic impact', *European Economy Discussion Paper* 162.

(5) See, for instance, Altomonte, C., M. Demertzis, L. Fontagné and S. Mueller, (2021), 'COVID-19 financial aid and productivity: Has support been well spent?' *Policy Contribution 21/2021, Bruegel*, Bighelli T., F. Di Mauro and T. Lalinsky, (2021), 'COVID-19 government support and its consequences for productivity: cross-country evidence', *CompNet Policy Brief* #14, Cœuré B. ed., (2021),

Yet other studies match pre-pandemic corporate accounts with firm replies to surveys, in some cases carried out *ad hoc*, to assess the impact of COVID-19 and related measures. ([6]) Finally, certain studies take advantage of high-frequency data collected by private companies on the universe of firms. ([7])

This section follows the first approach to simulate the impact of the COVID-19 shock and of the associated policy support measures on the financial health of the corporate sector over the course of the pandemic and in the recovery phase. Documenting which firms are more likely to exit allows us to quantify the effect of COVID-19 on aggregate productivity, but only through the exit margin. ([8]) This approach has the least stringent data requirements. To run scenarios and construct counterfactuals, it is sufficient to have pre-pandemic information on firm characteristics from corporate accounts together with the sectoral information on the COVID-19 shock and on the policy support packages.

For pre-pandemic information on firm characteristics, we rely on the ORBIS database, combined with almost real-time simulations of the COVID-19 sales shock to arrive at firm-specific liquidity and solvency stress. The *ex ante* productivity characteristics of financially vulnerable firms allow us to pinpoint the effect of the crisis on aggregate sectoral productivity by identifying the types of firms that were most affected. By simulating the exit-related cleansing mechanism induced by the COVID-19 crisis, our analysis helps to interpret the so far inconclusive evidence on the productivity effects associated to within-sectoral reallocation in the context of the pandemic.

We find that pockets of financial stress exist in the most affected sectors. We run two simulations, with and without the COVID-19 shock on sales. We show that the connection between firm productivity and financial vulnerability is weaker in the presence of the COVID-19 shock than in normal times. ([9]) The reason is that both high and low-productivity firms suffer a negative profitability shock in connection with the pandemic and may become financially vulnerable. This finding implies that the pandemic does not bring significant additional cleansing effects. This result confirms the view that broad-based COVID-19 support did not imply foregone opportunities of productivity growth via cleansing effects. Other papers focusing on a set of EU Member States show that concerns voiced in connection with the potentially negative impact of COVID-19 support measures on aggregate productivity were mostly overstated. ([10])

The next subsection briefly presents the main channels through which the COVID-19 pandemic affected productivity, concentrating on three different aspects: within-firm productivity, reallocation across sectors and reallocation within sectors. Next, we present firm-level evidence on financial vulnerability and connect it with *ex ante* productivity characteristics. We then present some

'Rapport final du Comité de Suivi et d'évaluation des mesures de soutien financier aux entreprises confrontées à l'épidémie de Covid-19', Freeman D., Bettendorf L., and Y. Adema, (2021), 'Covid-19 support distorted the process of creative destruction in the Netherlands', *VoxEU*, 3 November and Lalinsky T. and R. Pál, (2021), 'Efficiency and effectiveness of the COVID-19 government support: Evidence from firm-level data', *EIB Working Paper* 2021/06.

([6]) Bloom N., Bunn P., Mizen P., Smietanka P. and G. Thwaite, (2020), 'The Impact of COVID-19 on Productivity', *NBER Working Paper* #28233 and Harasztosi et al., op. cit. (2022).

([7]) See Andrews D., Charlton A. and A. Moore, (2021), 'COVID-19, productivity, and reallocation. Timely evidence from three OECD countries', *OECD Economics Department Working Paper* #1676 and Chetty R., Friedman J., Hendren N. and M. Stepner, (2020), 'The Economic Impacts of COVID-19: Evidence from a New Public Database Built Using Private Sector Data', *NBER Working Paper* #27431.

([8]) We use firm-level data to document dispersion in productivity using COVID-19-related shocks to industry-specific sales, which are applied symmetrically to all firms in a given industry and which propagate to profits, liquidity and solvency. We do not model reallocation of market shares from exiting towards new or surviving firms. The data available are a cross-section and thus do not allow an assessment of dynamic effects.

([9]) By 'normal times' we mean a hypothetical replication of normal business activity in the absence of a COVID-19 shock as predicted by a set of criteria and applied during the years that COVID-19 took place. A firm's normal business activity corresponds to its activity in 2018, the latest year observed in our dataset. Note that the COVID-19 simulation accounts only partially for the extensive support received by firms (we assume a temporary stop of interest expenses and tax payments and bigger sensitivity of labour costs to drops in sales, see Box I.1).

([10]) Evidence from administrative data matched with the universe of public support measures for France, Italy, and Germany shows that the bulk of support was allocated to firms in the middle of the productivity distribution (Altomonte et al., op. cit. (2021)). Support was broadly productivity neutral in France and Germany, while in Italy medium and large firms with higher productivity received proportionally larger guaranteed loans. Bighelli et al., op. cit. (2021) analyse administrative data for Croatia, Finland, Slovakia and Slovenia and find that firms in the middle of the productivity distribution received the most support. A recent study for Flanders (Belgium) finds that market share reallocation to more productive firms, whether subsidised or not, was sustained over the course of the pandemic. This study also finds that policy support helped firms preserve productivity growth and reduced the likelihood of exit (Konings J., Magerman G., and Van Esbroeck D., (2022), 'The Impact of Covid Rescue Policies on Productivity Growth and Reallocation', *mimeo*.)

results related to the cleansing mechanism. The final subsection contains our concluding remarks.

I.2. Channels through which COVID-19 affects productivity

The main channels through which the COVID-19 pandemic could affect productivity are ([11]):

Within-firm productivity

A reduction in output due to activity restrictions and health-related work absences, combined with measures to retain employees because of the hiring and retraining costs, led to a mechanical decrease in labour productivity (output per worker). Social distancing measures also entailed a cost that likely decreased productivity, i.e. time spent implementing safety measures rather than producing goods and services. Although these effects were estimated to be sizeable at the start of the pandemic, they became more moderate in the subsequent phases, due to less stringent restrictions and adaptation measures by firms. ([12]) In addition, the prolonged succession of lockdowns may have caused deterioration of skills and underinvestment in terms of both physical and human capital that can directly lower productivity. The downsizing of business operations resulting from the inability to operate at full capacity and any subsequent underinvestment may also have affected economies of scale and reduced the efficiency of production (i.e. multifactor productivity).

Reallocation across sectors

The effects of the COVID-19 pandemic on corporate sales were strongly sector-specific. Economic activities that rely on frequent and close contacts with customers or between employees, such as Hospitality, Transport, and on-site Retail trade industries were hit relatively hard. Demand was in part reallocated away from contact-intensive industries and toward 'safer' goods and services, leading to increased production in the latter industries. In practice, in the first months of the pandemic demand was redirected away from relatively less productive industries (e.g. Hospitality), towards more productive ones (e.g. Manufacturing of Electronics). This cross-sectoral reallocation of activity led to a short-lived increase in aggregate productivity. ([13]) ([14])

Reallocation within sectors

Within-sector productivity gains arise when certain firms in a given sector adapt better to the new business environment, gradually becoming more productive, gaining market share and pushing the less productive firms out of the market (cleansing mechanism). Firm-level evidence on cleansing effects in the context of the first waves of the pandemic is still rather scarce and thus far inconclusive. While some studies find that firms that exited after the outbreak of COVID-19 were on average less productive, ([15]) other studies estimate cleansing effects to be weak. ([16]) Moreover, some studies find that firms with relatively high productivity were also among the most affected by the COVID-19 shock in terms of the reduction in revenues or the increase in the risk of insolvency. ([17]) The interpretation of the results has to take into account that evidence in these studies, collected after the onset of COVID-19, relies largely on data for 2020, and that policy support measures have been strong and consistent

([11]) The empirical exercise presented in this section relies on total factor productivity (TFP), also called multifactor productivity, as a measure of firm productivity. The pandemic however had an impact on productivity in its various forms, including labour and capital productivity. In principle, therefore, the channels through which the pandemic affects productivity concern not only TFP, but also productivity in a wider sense including some positive implications of the pandemic on productivity, i.e. by accelerating digitalisation. For a more elaborate overview see Jolles, M. and E. Meyermans (2021), 'The structural economic impact of the COVID-19 pandemic on the euro area: a literature review', *Quarterly Report on the Euro Area (QREA)*, Vol. 20, No. 1 and Croitorov, O., Filippeschi J., M. Lichetta, P. Pfeiffer, A. Reut, W. Simons, A. Thum-Thysen, A. Vandeplas and L. Vogel (2021), 'The macroeconomic impact of the COVID-19 pandemic in the euro area' *Quarterly Report on the Euro Area (QREA)*, Vol. 20, No. 2.

([12]) Bloom, N., P. Mizen and S. Taneja, (2021), 'Returning to the office will be hard', *VoxEU*, 15 June.

([13]) Bloom et al., op. cit. (2020) document, on the basis of survey data on the UK, that the contraction of relatively less productive sectors was associated with an increase in both aggregate labour productivity and aggregate total factor productivity (TFP) at the start of the pandemic.

([14]) Note that some of these reallocations might be more persistent, such as the shift towards online retail. If such activities are characterised by higher productivity, the cross-sector reallocation might have an impact on aggregate productivity that persists after the pandemic subsides.

([15]) e.g. Altomonte et al., op. cit. (2021), Andrews et al., op. cit. (2021) and Lopez-Garcia P. and B. Szörfi, (2021), 'The impact of the COVID-19 pandemic on labour productivity growth', *ECB Bulletin 7 (chapter 4).*

([16]) e.g. Hadjibeyli B., Roulleau G. and A. Bauer, (2021), 'Live and (don't) let die: the impact of COVID-19 and of public support on French firms', *Direction Générale du Trésor Working Papers* #2021/2 (April).

([17]) e.g. Altomonte et al., op. cit. (2021), Harasztosi et al., op. cit. (2022).

during this period, potentially slowing down the reallocation process. (18)

Preliminary evidence indicates that more digitalised firms were better able to absorb the COVID-19 shock. (19) The incidence of telework is associated with a lower contraction in output following the COVID-19 lockdowns, both on a macro-level and on a sectoral level. Recent OECD analysis on data for Australia, New Zealand and the UK shows that firms with a more intense use of digital solutions and technologies (including teleworking) were able to contain labour shedding after the onset of COVID-19. (20) This confirms the presumption that the firms that were more productive before the pandemic hit may have been better able to adapt to the COVID-19 shock.

The rest of this QREA section evaluates the within-sector cleansing mechanism in the context of the pandemic by quantifying the contribution of the exit margin. By comparing the trajectory of firm sales, and the resulting levels of financial stress, in a pandemic and in a counterfactual scenario, we are able to identify firms at risk of exit in connection with the pandemic, and to draw some conclusions about the impact of the pandemic on sectoral productivity. (21)

I.3. The pandemic, financial vulnerability and firm productivity

This subsection assesses the impact of the COVID-19 pandemic on corporate financial health, and connects these findings with firms' pre-pandemic productivity.

The first step builds on a simulation of the pandemic's impact on the financial health of the European corporate sector by the end of 2021, using firm-level data from the ORBIS database. We quantify the increase in the fraction of financially vulnerable firms in each industry due to the combined effects of reduced equity, higher leverage, higher future expenses on debt and reduced profitability associated with the COVID-19 crisis (the methodology is explained in Box I.1, note that in the simulations firms are classified as either vulnerable or viable based on the methodology). (22)

The second step connects the results of simulations on the financial health of firms by the end of 2021 with their pre-pandemic characteristics. Specifically, we investigate the impact of firms' productivity before the onset of the pandemic on their likelihood to remain financially viable. We underpin a weakened connection between firm productivity and financial viability during the COVID-19 crisis relatively to the counterfactual no-COVID-19 scenario.

I.3.1. Magnified financial vulnerability in connection to the COVID-19 pandemic

Widespread losses incurred in connection with the pandemic affected corporate balance sheets and capital structures. A combination of reduced equity, higher leverage, higher future expenses on debt, and reduced profitability increased the fraction of firms that appear financially vulnerable. Our results on the magnification of financial vulnerability in each industry by the end of 2021 in connection with the COVID-19 pandemic are presented in Graph I.1. These results are obtained by identifying firms that become financially vulnerable after 2 years of activity under COVID-19 conditions while remaining financially viable otherwise.

Specifically, we take a firm and assess its financial health after 2 years of activity under COVID-19 conditions. In the COVID-19 scenario, we account for some policy support, namely the temporary suspension of interest expenses and corporate tax payments. As is common in the literature, we account for short time work schemes by increasing the sensitivity of labour costs to negative revenue shocks. We also simulate 2 years of activity for each firm in the absence of the pandemic, and characterise its financial health in this counterfactual no-COVID-19 scenario (see Box I.1 for details).

(18) Yet, other studies, such as Konings et al, op. cit. (2022), document that in some parts of Europe (Flanders) market share reallocation to more productive firms, whether subsidised or not, was sustained over the course of the pandemic.
(19) See Harasztosi et al., op. cit. (2021).
(20) Andrews et al., op. cit. (2021).
(21) An important caveat is that the analysis does not explicitly model resource reallocation due to the pandemic. Quantifying COVID-19-induced changes in productivity at the firm level, including purely positive impact on productivity, for example by speeding up the digital transition within firms, is also beyond the scope of this analysis.
(22) See Archanskaia et al., op. cit. (2022), for more information.

Box I.1: **Approach to quantifying financial vulnerability**

This box describes the methodology used to assess the implications of the COVID-19 shock for financial vulnerability in the European non-financial corporate sector. The analysis is based on granular firm-level information contained in the ORBIS database. Two scenarios are simulated for 2020-2021: the COVID-19 scenario and the counterfactual scenario in which the COVID-19 shock does not materialise. ([1]) In the COVID-19 scenario, information on monthly turnover in each industry is combined with the assumption that costs do not fully adjust to turnover fluctuations. The combination of turnover and costs' fluctuations determines the distribution of profitability shocks in each country and industry. ([2]) In the counterfactual no-COVID-19 scenario, it is assumed that each firm obtains the same profits in 2020 and 2021 as in its latest available pre-COVID-19 financial statement. In each of the two scenarios, the evolution of profits allows simulating the evolution of corporate liquidity positions, equity, and liabilities. ([3]) Comparing these two scenarios helps to assess underlying financial vulnerabilities that may have accumulated in specific industries, which could translate into actual bankruptcies and unemployment in the aftermath of the COVID-19 pandemic, notably as emergency support measures are withdrawn. ([4])

We build on the most recent literature in choosing the criteria used to identify financially vulnerable firms. The first criterion identifies financial vulnerability through the risk of insolvency. Following McCormick et al. (2016), a firm is said to be insolvent if it fulfils at least one of the following criteria by the end of 2021: (i) the firm is predicted to have negative equity or (ii) the firm is unable to cover accumulated debt expenses with operating profits and finds itself by the end of 2021 in the top quartile of the pre-COVID distribution of leverage in the country-industry. ([5]) This definition of the risk of insolvency is a refinement in comparison to previous studies, which only look at equity depletion. ([6]) Accounting for the role of the debt burden allows assessing the impact of the pandemic on corporate financial health in a more comprehensive way. Indeed, increased borrowing used to address liquidity shortfalls in the course of the pandemic may affect the extent to which firms are able to cover debt servicing costs with operating profits in its aftermath.

The second criterion identifies financial vulnerability with help of a statistical criterion, the Altman Z-score model, which groups firms in three bins according to their risk of default. ([7]) As documented in Altman et al. (2017), this scoring model performs well in predicting bankruptcy in a sample of countries and industries. ([8]) In line with this literature, the risk of default is assessed based on the firm's simulated liquidity, profitability, capitalisation, and leverage by the end of 2021. Two variants of the Altman Z-score model are used, as one

([1]) The comparison of the COVID-19 scenario to a counterfactual 'no COVID-19' case was initially used by Gourinchas et al. (2020) to quantify the risk of insolvency associated with the pandemic, and the role of policy support measures in mitigating this risk.

([2]) The impact of the COVID-19 crisis on industry turnover and the implications in terms of corporate financial distress are described in Croitorov, O., J. Filippeschi, M. Lichetta, P. Pfeiffer, A. Reut, W. Simons, A. Thum-Thysen, A. Vandeplas and L. Vogel (2021), 'The macroeconomic impact of the COVID-19 pandemic in the euro area', *Quarterly Report on the Euro Area (QREA)*, Vol. 20, No. 2.

([3]) For methodological details and a comprehensive overview of the findings, we refer the reader to Archanskaia E. , E. Canton, A. Hobza, P. Nikolov and W. Simons (2022), 'The sectoral nature of the COVID-19 shock: a novel approach to quantifying its economic impact', *European Economy Discussion Paper* 162.

([4]) The simulations in the COVID-19 scenario take into account support provided by short-time work schemes. Following Schivardi F. and G. Romano (2020), 'A simple method to compute liquidity shortfalls during the Covid-19 crisis with an application to Italy', *Covid Economics: Vetted and Real-Time Papers* 35, July, this support is modelled as an increase in the sensitivity of labour costs to revenue fluctuations. The simulations also incorporate the effect of payment moratoria on the time profile of interest payments. Other subsidies (e.g. grants, solvency support) are not taken into account. Firms are assumed to address all financing needs through new debt with no equity issuance, thereby likely overestimating equity depletion in the non-financial corporate sector.

([5]) The use of this definition of insolvency is motivated by the fact that in the EU the obligation to file for insolvency may hinge on a liquidity test (inability to pay financial obligations as they become due) and/or on a solvency test (negative equity). See McCormick G., A. Keay, S. Brown, and J. Dahlgreen (2016), 'Study on a new approach to business failure and insolvency: Comparative legal analysis of the Member States' relevant provisions and practices'. DG JUST: European Commission Tender No. JUST/2014/JCOO/PR/CIVI/0075.

([6]) See Ebeke et al., op. cit. (2021) and Demmou et al., op.cit. (2021) who follow Carletti E., T. Oliviero, M. Pagano, L. Pelizzon and M. Subrahmanyam (2020), 'The COVID-19 Shock and Equity Shortfall: Firm-level Evidence from Italy', *CEPR Discussion Paper* 14831.

([7]) In relation to the COVID-19 pandemic, the Altman Z-score model was used in European Commission (2021), 'Corporate Solvency of European Enterprises – state of play'. *Note to the Eurogroup Working Group* (February).

([8]) Altman E., M. Iwanicz-Drozdowska, E. Laitinen, and A. Suvas (2017), 'Financial distress prediction in an international context: A review and empirical analysis of the Altman Z-score model', *Journal of International Financial Management and Accounting*, 28:2.

(Continued on the next page)

Box (continued)

puts more weight on liquidity while the other puts relatively more weight on profitability. (9) The firm is said to be at high risk of default according to this statistical criterion if, and only if, it is identified as being at high risk of default by the two specifications of the Altman Z-score model.

The firm is identified in our analysis as *financially vulnerable* by the end of 2021 when it *simultaneously* verifies the risk of insolvency criterion and the risk of default (Altman Z-score) criterion. The increase in the share of financially vulnerable firms associated to the COVID-19 pandemic is identified with the fraction of firms that appear financially vulnerable in the COVID-19 scenario while not being financially vulnerable in the counterfactual no-COVID-19 scenario.

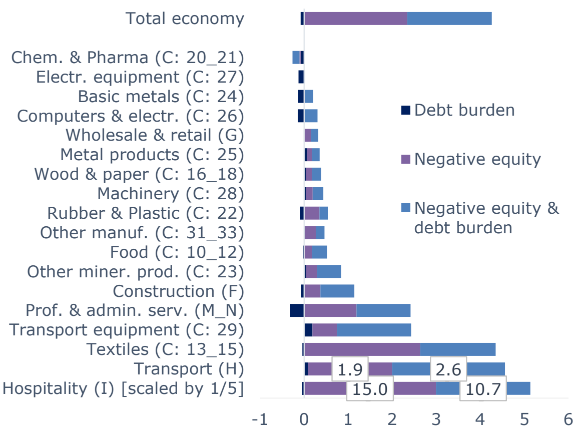
An important caveat of the simulated COVID scenario must be underlined, as it may affect the quantification of more widespread financial vulnerability. As explained above, the simulations take into account the role of short-time work schemes in increasing the sensitivity of labour costs to revenue fluctuations. They also incorporate the effect of payment moratoria on the time profile of interest payments. However, other subsidies (e.g. grants, solvency support) are not taken into account. Moreover, firms are assumed to address all financing needs through new debt with no equity issuance. It follows that the simulations likely overestimate equity depletion and debt overhang in the non-financial corporate sector.

(9) The first specification is Z_1=6.56 WK/TOAS+3.26 EQUITY/TOAS+6.72 EBIT/TOAS + 1.05 EQUITY/TOTLIAB, where WK stands for working capital, TOAS stands for total assets, and TOTLIAB stands for total liabilities. $Z_1 \leq 1.1$ qualifies the firm as at high risk of default. The second specification is Z_2=0.717 WK/TOAS+0.847 EQUITY/TOAS+3.107 EBIT/TOAS + 0.42 EQUITY/TOTLIAB+0.998 TURN/TOAS, where TURN stands for turnover. $Z_2 \leq 1.2$ qualifies the firm as at high risk of default.

Unsurprisingly, we find the highest prevalence of firms at risk of financial vulnerability by the end of 2021 in the industries that were hit hardest by the COVID-19 shock. Graph I.1 shows the largest increases in vulnerability, compared to the counterfactual no-COVID-19 scenario, in the Hospitality (I) industry. These vulnerabilities originate from the depletion of equity following protracted periods of losses, but also from an increased debt burden. For the European economy as a whole, the COVID-19 crisis raised the share of vulnerable firms by around 4 percentage points (i.e. an increase of about two thirds compared to the counterfactual no COVID-19 scenario).

Graph I.1: **Increase in the share of financially vulnerable firms in the EU**

in pp, by criterion of insolvency



(1) This graph plots the increase (in percentage points) in the share of financially vulnerable firms in the COVID-19 scenario relative to a counterfactual scenario, in which the COVID-19 pandemic did not occur and in which profits are extrapolated based on pre-COVID levels. This increase is computed for the full population of firms in each industry and for the European economy. Representativeness is achieved by reweighting the ORBIS sample within each country-industry- size class cell, with population weights taken from Eurostat SBS data. Firms are identified as financially vulnerable if they have either negative equity or a high debt burden (i.e. the firm is unable to cover debt servicing costs with operating profits and, on top of that, the firm is highly leveraged), or verify both criteria, by the end of 2021. The firms are also required to be identified as high risk of default according to the Altman Z-score model, the latter assessment being based on firms' expected leverage, capitalisation, liquidity, and profitability by the end of 2021. See Box I.1 for details

Source: Own elaborations on ORBIS data

I.3.2. Firm productivity and financial vulnerability

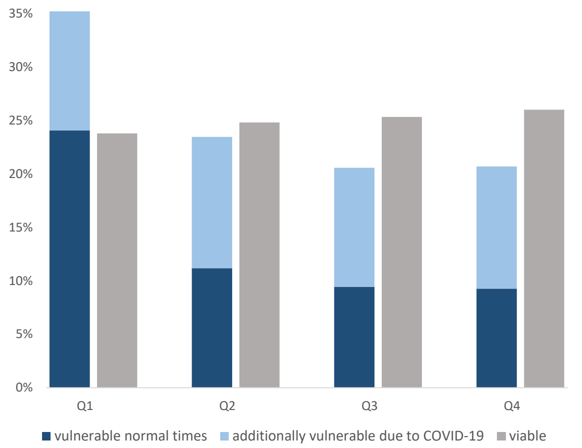
Having established the impact of the COVID-19 pandemic on corporate financial vulnerability in the previous subsection, we now connect these findings with firm characteristics. Specifically, we investigate the relationship between the financial health status of the firm and its pre-pandemic productivity. Our focus on firm productivity is motivated by its importance as a driving force of growth in the post-crisis recovery.

We document two salient facts. First, we find that less productive firms are more likely to become financially vulnerable. This result is to be expected as the financial health status of a firm is closely linked to the past trajectory of its profits. The latter hinges on a firm's fundamentals, such as its productivity. Second, we find that the link between financial vulnerability and pre-pandemic productivity is weakened in the context of the COVID-19 pandemic. In a given country and industry, more productive firms are as likely to become financially vulnerable in the COVID-19 scenario as are less productive firms (conditioning on firm viability in the no-COVID-19 scenario).

These findings are illustrated in Graph I.2. The graph plots the distribution of financially vulnerable firms (blue bars) side by side with the distribution of viable firms (grey bars) across the pre-pandemic multifactor productivity (or TFP – the choice of a productivity metric of this section) distribution. [23] While the firms that remain viable despite the COVID-19 crisis (grey bar) are distributed rather evenly across the productivity distribution, the blue bars suggest a concentration of financially vulnerable firms among the lowest productivity quartiles. The latter bars further distinguish those firms that would become financially vulnerable under 'normal conditions' (i.e. a no-COVID-19 counterfactual, obtained by extrapolating pre-pandemic revenue figures) (dark blue bars) from those that become vulnerable only in the context of the COVID-19 shock (light blue bars). The graph shows that the bulk of firms deemed financially vulnerable in the no-COVID-19 counterfactual are concentrated in the lowest quartile of the productivity distribution. Conversely, the link between pre-pandemic productivity and (additional) financial vulnerability in the aftermath of COVID-19 is not visible, as the distribution of additionally financially vulnerable firms (light blue bars) is close to uniform across the productivity quartiles.

Graph I.2: **Distribution of EU firms across TFP quartiles**

(%), across TFP quartiles - Dec 2021



(1) TFP is computed as the Solow residual, using sectoral factor shares reported in Eurostat. TFP quartiles are computed within each country and sector, based on firm-level information reported in 2018 financial statements. The firm data are weighted by firm size, sector and country to make results representative for the EU economy. The set of financially vulnerable firms is considered separately from the set of viable firms, i.e. the four blue bars sum to 1, and the four grey bars sum to 1.
Source: Own elaborations on ORBIS data

Graph I.2 suggests a weaker-than-usual connection between firm productivity and financial vulnerability in the context of the pandemic, as indicated by the equal size of the light blue bars across the TFP quartiles. In Box I.2, we empirically test this relationship by means of a probit model for the likelihood to remain viable (i.e. avoiding a state of financial vulnerability) in each of the two scenarios. The productivity of the firm has a significant positive impact on its likelihood to remain viable in the no-COVID-19 case, compared to an insignificant effect for COVID-19 viability.

In the next subsection, we quantify the impact of the weaker-than-usual connection between productivity and financial vulnerability during the COVID-19 crisis on the functioning of a particular aspect of the cleansing mechanism, namely the exit of vulnerable firms.

[23] Unless otherwise specified, the results still stand when using labour productivity (value added per worker) as a measure.

Box I.2: Productivity and likelihood of financial viability: a probit model

We assess the impact of firm productivity on the likelihood of financial viability (i.e. the absence of vulnerability as defined throughout the article) in the COVID-19 scenario and in the counterfactual no-COVID-19 scenario (also referred to as 'normal times') while conditioning on a set of firm characteristics. For each industry, the following probit model is specified:

$$Y = \beta_0 + \beta_1 Productivity + \beta_2 Age + \beta_3 Size + \beta_4 CashRatio + \beta_5 DebtRatio + \alpha + e$$

where Y is the dichotomous dependent variable, which equals 1 in case the firm remains financially viable and 0 otherwise. **Productivity** represents firm-level productivity, measured as total factor productivity (TFP). Age and size (number of employees) are firm-level control variables. CashRatio and DebtRatio are further control variables at the firm level that represent the firm's ratios of cash-to-assets and debt-to-assets relatively to its peers (measured as quartile of the pre-pandemic distribution within the country-industry). A dummy α is included to control for countries. We find the probability of remaining financially viable as:

$$\mathbb{P}(Y = 1|X, \alpha) = \mathbb{P}(Y \leq X'\beta + \alpha) = \Phi(X'\beta + \alpha)$$

with Φ(·) the standard normal cumulative distribution function (CDF). [1] The probit framework is better suited than a linear probability model, as the predicted probabilities in the latter model are not limited between 0 and 1.

Table 1 presents the results of the probit regression in the two scenarios for the ca. 150 000 firms in Manufacturing (C). Column (1) displays the results for the likelihood of remaining financially viable in the no-COVID-19 scenario ('normal times'). Column (2) displays the results for the likelihood of remaining viable in the COVID-19 scenario. In the latter case, 'normal times' vulnerable firms are dropped from the sample. Productivity has a significant positive impact on the firm's likelihood to remain viable in normal times, compared to an insignificant effect in the COVID-19 scenario. The firm's liquidity buffer and its reliance on debt further play a role in determining its likelihood of remaining viable (with the expected sign), in both scenarios. We focus on the productivity variable in this box, but detailed results for the control variables are available upon request.

Table 1: Probit regression results for probability of financial viability, Manufacturing (C)

Probability of financial viability	No COVID-19 (normal times) (1)	COVID-19 (excluding normal times vulnerable) (2)
Productivity (TFP)	0.522***	0.023
Age (base: 0-3 years)		
4-10 years	0.115***	-0.160***
10+ years	0.125***	-0.052**
Size (100 employees)	0.012	-0.007**
Cash-to-assets ratio (base: quartile 1)		
Quartile 2	0.178***	-0.040*
Quartile 3	0.447***	0.163***
Quartile 4	0.586***	0.668***
Debt-to-assets ratio (base: quartile 1)		
Quartile 2	-0.459***	-1.005**
Quartile 3	-1.048***	-1.930***
Quartile 4	-2.361***	-2.641***

*** p<0.01, ** p<0.05, * p<0.1

(1) Alternatively, if a logit model were specified, the CDF would be that of the logistic distribution. The choice between probit and logit depends on personal preference. Estimates from both models are typically similar (up to a scaling factor) and the interpretation of each estimator is straightforward when focusing on marginal effects, as we will do here.

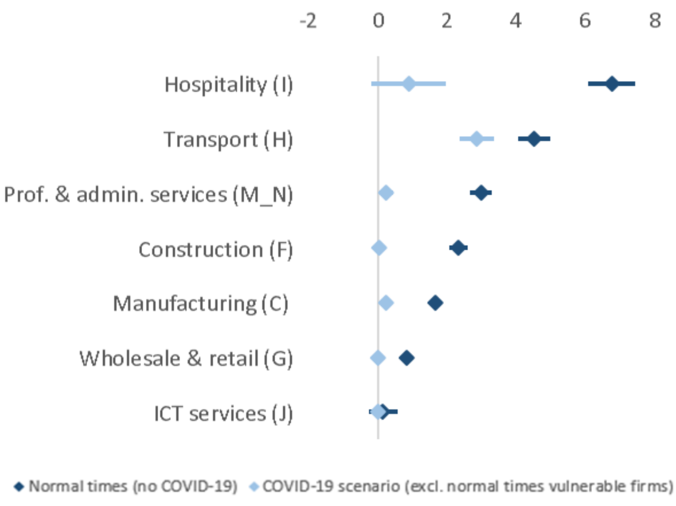
(Continued on the next page)

Box (continued)

While it is straightforward to evaluate the significance of the coefficients in a probit (or logit) model, interpreting their magnitude is not. Indeed, in contrast to a linear model, the marginal impact of one variable is not constant, but depends on the value of the variable as well as that of all other independent variables. Therefore, to assess the impact of productivity on financial viability we need to choose values for each of the regressors. This is done by evaluating marginal effects, which allow to back out the marginal impact of a 1-unit change in productivity on the probability of remaining viable, keeping all regressors fixed at a specific value.

Graph 1 shows the marginal effect of firm productivity on the likelihood to remain financially viable, in 'normal times' and in the COVID-19 scenario. In each industry, we evaluate the marginal effect of total factor productivity (TFP) for a firm with an above-median debt-to-assets ratio and mean values for all other variables. (2) Productivity has a significant positive impact on the likelihood of avoiding financial vulnerability in normal times across all industries. A typical firm in the Transport industry (H), for instance, would face a 0.8 percentage point increase in the probability to remain viable in normal times for a one standard deviation increase in TFP. (3) The impact of productivity on avoiding financial vulnerability in the context of the COVID-19 pandemic, while controlling for 'normal times' vulnerability, is significantly lower across all industries, up to the point of insignificance in most.

Graph 1: Marginal effect of TFP on probability of financial viability (95% confidence interval) – evaluated at above-median debt-to-assets ratio and mean values for other variables



(2) The choice for these values is motivated by the strong impact productivity should have on likelihood of viability for a highly indebted firm.

(3) Starting from the mean value for TFP in this industry, a one std. dev. increase corresponds to a rise of 18%, which leads to a 0.18*Marginal Effect = 0.18*4.5 = 0.8 p.p. increase in probability.

I.4. Quantifying the impact of the cleansing mechanism on productivity

In this subsection, we quantify the potential cleansing effect of the COVID-19 shock, by computing the impact on sectoral productivity under the hypothesis that all firms identified as financially vulnerable (see above) exit in the course of 2022. We evaluate the potential of the cleansing mechanism following the COVID-19 crisis by comparing the impact on aggregate productivity of the exit of financially vulnerable firms, both in normal times and in the COVID-19 crisis scenario. We document significant cleansing effects associated with firm exits in the counterfactual no-COVID-19 scenario, resulting in a boost to aggregate TFP of ca. 2.5%. (24) Despite more exits under the COVID-19 scenario, the TFP gain linked to cleansing is slightly lower, with an

(24) This finding is in line with Bartelsman, E., J. Haltiwanger and S. Scarpetta (2009), 'Measuring and Analyzing Cross-country Differences in Firm Dynamics' in Producer Dynamics: New Evidence from Micro Data, University of Chicago Press, January 2009.

increase in TFP of 2.3%. We conclude that the crisis does not appear to bring additional cleansing effects, a finding that holds in most industries. As shown in the previous section, the main reason underlying this result is the weak connection between pandemic-related financial vulnerability and *ex ante* productivity. To the best of our knowledge, this is the first simulation of the impact of the COVID-19 crisis on sectoral and aggregate productivity.

For the quantification of cleansing effects, we build on the simulations of financial health for each firm in the ORBIS sample, obtained using the methodology described in Box I.1 and discussed above. We distinguish between three different subsamples: (i) all firms, (ii) all firms that remain financially viable after 2 years of normal activity, and (iii) all firms that remain financially viable in the COVID-19 scenario. We compute the potential change in productivity (i.e. the cleansing effect) that would arise under the hypothetical exit of all vulnerable firms in the no-COVID-19 and in the COVID-19 scenarios (i.e. the firms excluded from subsamples (ii) and (iii), respectively), by comparing aggregate productivity measures for each subsample. ([25])

Graph I.3 shows the change in aggregate productivity associated with the exit of financially vulnerable firms in each scenario (COVID-19 and no-COVID-19) at the industry-level for the EU as a whole. Graph I.4 presents these findings at the country-level (total economy). The dark blue bars in the two graphs indicate that there is a significant positive cleansing effect associated with exit in normal times, whereby less productive firms are more likely to shrink and exit, while more productive firms are more likely to survive. For the EU as a whole, this amounts to an approximately 2.5% increase in productivity if vulnerable firms exit the market in normal times (ca. 6% of the total number of firms).

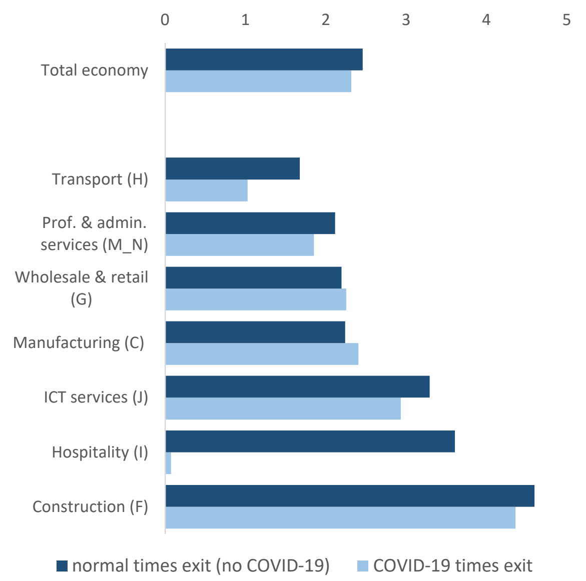
The light blue bars in Graphs I.3 and I.4 suggest that the COVID-19 shock does not bring about additional cleansing effects in most industries and countries. While the exit of the ca. 6% of firms that would have become vulnerable also in the absence of COVID-19 would lead to a 2.46% increase in aggregate TFP, the additional COVID-induced exit of another 4% of firms actually slightly reduces the aggregate productivity effect to 2.32%. ([26]) The small difference between the dark and light blue bars, across most EU industries and countries, suggests that a significant share of relatively productive firms are affected by the COVID-19 crisis. The fact that COVID-19 affected firms that were also productive pre-pandemic and thus in a relatively better position during other hypothetical crises suggests the presence of certain pandemic mechanisms, i.e. shocks to demand and supply that result in generalised vulnerability across the productivity distribution of firms. Investigation of these mechanisms remains a topic of future work.

The fact that the COVID-19 shock does not appear to bring significant additional cleansing effects implies that emergency support measures and the specific provisions, which suspended bankruptcy filings over 2020-2021, may not have had a major impact in terms of foregone productivity growth via the exit of low productivity firms. As these measures are phased out, cleansing mechanisms would start operating again.

([25]) The change in productivity is computed for each country-industry class. Using the size (number of employees) of each country-industry class obtained from Eurostat SBS as weight, we can compute weighted aggregate productivity changes at higher levels of aggregation, such as country-level, industry-level or total EU, ensuring representativeness.

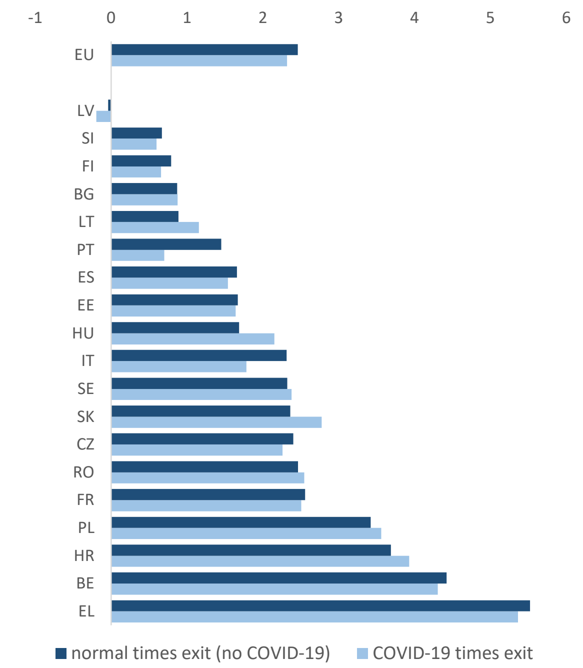
([26]) Using sectoral labour productivity rather than TFP as measure of productivity reaffirms the result that COVID-19 has overall not strengthened cleansing effects at the exit margin. The only important difference pertains to the hospitality sector, where labour productivity points to a strong additional cleansing effect. The discrepancy between both productivity measures in this industry is driven by a large difference in fixed assets between firms that exit due to the COVID-19 crisis and those that survive – the latter being twice as capital-intensive as the former. As the TFP measure accounts for fixed assets, while labour productivity does not, the exiting firms are of relatively high TFP and low labour productivity, ceteris paribus. Therefore, the exit of these primarily asset-poor firms reduces aggregate TFP in the Hospitality industry.

Graph I.3: **Change (%) in aggregate industry TFP due to exit of vulnerable firms,**
(%), EU aggregate



Source: Own elaborations on ORBIS data

Graph I.4: **Change (%) in aggregate country TFP due to exit of vulnerable firms,**
(%), total economy



Source: Own elaborations on ORBIS data

These results are obtained under the important assumption that the COVID-19 shock hits all firms within a given industry with the same intensity. In reality, firms that are more productive may have been better able to absorb the shock and to maintain their investment effort. There is some evidence pointing in this direction – see e.g., Andrews et al., op. cit. (2021) and Harasztosi et al., op. cit. (2022) – although more data is needed to reach a consensus. Further, it needs to be underlined that only exit is modelled, while no assumptions are made regarding entry or reallocation of market shares.

I.5. Conclusion

This section provides some empirical evidence on the functioning of one of the channels through which the COVID-19 pandemic may affect productivity in the EU. We use firm-level data and near real-time information on pandemic-related sector-specific shocks to simulate financial stress, which makes vulnerable firms more likely to exit, with implications for aggregate productivity through the exit margin. We find that this dimension of the cleansing mechanism was not magnified in the context of the COVID-19 pandemic, as compared to productivity-enhancing exit in the no-COVID-19 scenario.

This result can be rationalised as follows. The financial health status of the firm is largely determined by its cumulated past profits. The latter are determined by firm fundamentals, together with the ability of the firm to adapt to the specificities of demand. Consequently, we expect firm productivity to play an important role in determining corporate financial health in normal times. Yet, it is not clear that an exogenous shock, such as the COVID-19 pandemic, would favour more productive firms. Indeed, the ability to absorb a sudden reduction in profitability may be linked to the pre-shock strategy of the firm with respect to financing (debt vs equity), its investment effort, or other factors (e.g. its cost structure).

These findings have clear policy implications. Productivity growth is an essential contributing factor in the post-crisis recovery phase. It sustains growth in the aftermath of shocks so that output can return to its pre-crisis growth trajectory. During previous crises, public support was typically directed at keeping alive firms that were already under strain and thus tended to benefit the less productive firms. It was feared that COVID-19 support measures would similarly prop up weak firms, thereby pulling aggregate productivity down. The results presented in this article show that, unlike previous economic crises, COVID-19 offered limited potential for cleansing through the exit margin, implying that the available access to broad-based policy measures was not associated with major foregone productivity gains via cleansing effects. As support measures are phased out, cleansing mechanisms would start operating again.

Looking forward, productivity-boosting policies could help firms achieve sustainable growth. Measures that step up investment in upskilling and reskilling are needed to ensure that skills are re-oriented in line with the green and digital transitions, which accelerated during the pandemic. Insolvency frameworks should be made easily accessible and transparent, as well as capable of swiftly distinguishing between those companies that can become viable after restructuring and those that should be liquidated. Finally, effectively implementing the recovery and resilience plans will bring about both an increase in public investment and structural reforms aimed at removing bottlenecks to investments.

II. Slack vs. tightness in euro area labour markets: growing mismatch after COVID-19?

By Aron Kiss, Alessandro Turrini and Anneleen Vandeplas

Abstract: *This section aims to shed some light on post COVID-19 labour market developments across the euro area, notably on the simultaneous presence of signs of labour market slack and labour market tightness in late 2021. Indicators of labour market slack and mismatch are reviewed and discussed. The Beveridge curve relationship is estimated econometrically across euro area countries to assess if upward shifts took place after the COVID-19 outbreak, indicating a possible reduction in the efficiency of matching between jobs and job-seekers. The results indicate a modest upward shift in the Beveridge curves of the euro area in 2020, partly reversed in 2021. Despite the fact that skill mismatch increased somewhat in the wake of the COVID-19 pandemic, this appears to have had a very minor impact on the efficiency of labour market matching. Overall, the available results suggest that the simultaneous presence of labour market slack and tightness (shortages) was a temporary phenomenon. Labour shortages appear to be driven mainly by the labour market recovery and not by hampered labour market reallocation ([27]).*

II.1. Introduction

As labour markets in the euro area started to recover after being hit by the COVID-19 outbreak, they conveyed mixed signals. While unemployment remained above pre-pandemic levels over much of 2021, labour shortages started to emerge in widening segments of the economy. This section surveys these labour market developments and asks the question whether the coincidence of signals of 'slack' (an excess potential supply of labour as compared to that demanded at prevailing wage conditions) and 'tightness' (the relative abundance of vacancies as compared to the number of job-seekers) are likely to be due to temporary or structural factors (e.g. increasing skills mismatches). A correct reading of these signals is key to modulating the withdrawal of support measures in such a way as to prevent extensive layoffs in sectors hit by temporary shocks, while managing the risk of wage pressures contributing to persistent inflation. ([28])

The interpretation of labour market data over the pandemic period is complicated by the interplay of containment measures, notably lockdowns and other health-related measures, and of support measures, notably short-time work schemes (STWs), which helped containing labour shedding during lockdowns. STWs blurred the interpretation of most labour market variables (employment, unemployment, wages) and reduced their cross-country comparability. ([29]) Containment measures affect not only the incentives for employers to keep workers, but also the incentives of workers to search for jobs or accept job offers. A further difficulty in data interpretation is that COVID-19 may have accelerated pre-existing trends linked, among other things, to a growing relative demand for teleworkable occupations, ([30]) so that it may not be easy to untangle effects linked only to the pandemic from longer-term trends.

To address these questions, this section surveys labour market developments, including employment, unemployment, and activity rates, in the euro area over the pandemic period in the next subsection. Subsection II.3 focuses on indicators of labour market tightness and shortages, while Subsection II.4 assesses recent developments in the relationship between vacancies and unemployment (the Beveridge curve relationship). Subsection II.5 offers concluding remarks.

([27]) The authors would like to thank Géraldine Mahieu and an anonymous referee for useful comments and to Maria Chiara Morandini who contributed to an earlier version of this analysis.

([28]) For a discussion of these schemes, see: IMF (2022), 'Europe's Job Retention Schemes Contained Unemployment, But Challenges Remain' International Monetary Fund, European Department, as well as Ando, S. R. Balakrishnan, B. Gruss, J.-J. Hallaert, L.-B. Fah Jirasavetakul, K. Kirabaeva, N, Klein, A. Lariau, L. Qian Liu, D. Malacrino, H. Qu, A. Solovyeva (2022): 'European Labor Markets and the COVID-19 Pandemic: Fallout and the Path Ahead', IMF Departmental Paper No 2022/004.

([29]) See, e.g., Koester, G. N. Benatti and A. Vlad (2020). 'Assessing wage dynamics during the COVID-19 pandemic: can data on negotiated wages help?' *ECB Bulletin* 8/2020; and Koester, G. and E. Hahn (2020), 'Developments in compensation per hour and per employee since the start of the Covid-19 pandemic', Box 3 in Anderton et al.: "The impact of the COVID-19 pandemic on the euro area labour market", *ECB Economic Bulletin*, Issue 8/2020.

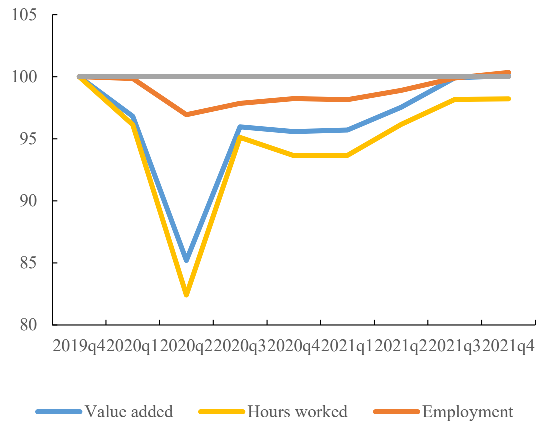
([30]) European Commission (2021), 'Labour market and wage developments in Europe: Annual Review 2021', Directorate-General for Employment, Social Affairs, and Inclusion.

II.2. Labour market developments in the euro area in the aftermath of the pandemic

Economic growth in the euro area regained traction in the second half of 2021, helped by progressively increasing vaccination rates and easing policy restrictions. After a contraction by 6.4% in the euro area in 2020, GDP rebounded at a rate of 5.4% in 2021.

While working hours contracted to a similar extent as value added over the pandemic, the drop in employment, though significant, was muted by comparison, largely as a result of the extensive policy support provided. By the end of 2021, value added and employment reached their pre-pandemic levels in the euro area, while hours worked lagged somewhat behind. Since hours worked per person have been on a long-term negative trend before the pandemic, it is possible that some of the decrease in hours reflects a permanent shift towards a higher incidence of part-time work or shorter working weeks.

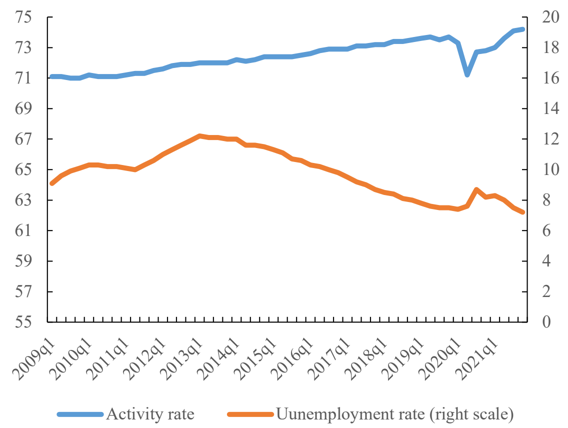
Graph II.1: **Output and employment dynamics in the euro area (Q4-2019 = 100)**



(1) Value added is calculated based on gross value added in chain linked volumes (index 2015=100). Employment, both in hours worked and in persons, is based on domestic concepts. Data are seasonally and calendar adjusted.
Source: Eurostat, quarterly national accounts data.

Even at the peak of the pandemic in Q2-2020, the increase in unemployment remained significantly below what would have been expected based on the historical relationship between GDP and unemployment (Okun's law). ([31]) Contributing reasons were not just the short-time work schemes, but also considerable (temporary) outflows to inactivity, as job search was complicated by health concerns, policy restrictions, and care responsibilities. Unemployment in the euro area peaked at 8.7 % in Q3-2020. After a slight uptick at the beginning of 2021, it has fallen below pre-pandemic levels by the end of 2021 (at 7.2% in Q4-2021 as compared to 7.4% two years earlier, see Graph II.2). ([32]) While some people became unemployed, others became (at least temporarily) inactive: the activity rate fell by 2.4 percentage points to reach a low of 71.4% in Q2-2020, before recovering strongly. By Q4-2021, the activity rate in the euro area had surpassed pre-pandemic levels (at 74.4% in Q4-2021).

Graph II.2: **Unemployment and activity rates in the euro area**



(1) The activity rate is shown for the age group 15-64, while the unemployment rate refers to age group 15-74. Both are seasonally but not calendar adjusted quarterly data.
Source: Eurostat, Labour Force Survey.

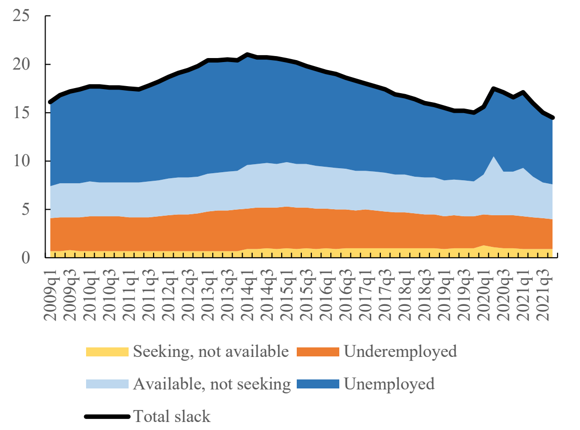
Compared with the unemployment rate, the most widely used slack indicator, the indicator of labour market slack developed by Eurostat allows us to look at a wider notion of labour market underutilisation (or 'unmet need for employment'). The concept of labour market slack includes, in addition to unemployed people, part-time workers who want to work more hours ('underemployed'), people who are available to work but are currently not looking for work, and people who are looking for work but are not immediately available.

([31]) See European Commission (2020), 'Labour market and wage developments in Europe: Annual Review 2020', Directorate-General for Employment, Social Affairs, and Inclusion.

([32]) Unemployment continued to inch down in monthly data, reaching 7% in December 2021 and 6.8% by April 2022 (seasonally adjusted data).

In Q1-2021, the euro area labour market slack peaked at around 17% of the extended labour force, compared with 21% at its previous peak after the financial crisis in Q1-2014 (Graph II.3). (33) Slack increased both on account of the number of unemployed and of those available to work but not seeking a job. After being very stable through the previous business cycle, the share of those available to work but not seeking increased from 3.4% of the extended labour force in Q4-2019 to 5.8% in Q2-2020. Containment measures and health concerns are likely to have played a role in this. By the end of 2021, this ratio has also returned to its pre-pandemic level in the euro area, after a brief uptick in the first quarter of 2021.

Graph II.3: **Labour market slack and its components in the euro area**



(1) Data are seasonally adjusted, refer to age group 15-74, and are expressed as % of the extended labour force.
Source: Eurostat, Labour Force Survey.

These labour market developments played out in a demographic context in which working-age population was declining in the euro area, by roughly one percent over two years (Graph II.4). This is also an element that sets apart post-pandemic labour market developments from previous business cycles, as working-age population increased between 2000 and 2008 and stagnated between 2008 and 2015, while a slow downward trend set in after that. This also means that despite increased activity rates, the labour force is slightly below its pre-pandemic level. (34)

Graph II.4: **Working-age population (age 20-64), labour force and employment in the euro area (2019q4=100)**

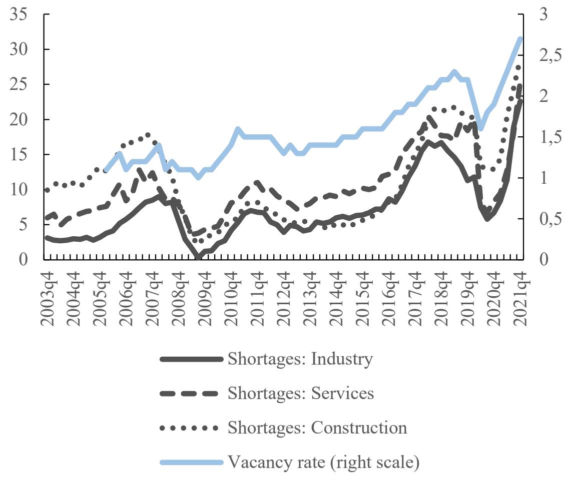
Source: Eurostat, Labour Force Survey.

II.3. Growing tightness amid signs of remaining slack

Both vacancies and reported labour shortages reached historical highs by the end of 2021 (Graph II.5). The pandemic brought a sharp fall in job vacancies in the euro area, followed by a recovery. By the end of 2021, the euro area vacancy rate (with 2,7% of all posts vacant) surpassed its pre-pandemic level, which was itself a historical high (2,3% in Q2-2019). Reported labour shortages show a very similar pattern: a sudden drop in Q2-2020, followed by a dynamic recovery, which led to historical highs by the end of 2021 (with about 25% of employers reporting that labour is a factor limiting production). The patterns are not uniform across sectors. In 2020, labour shortages fell most in services and less so in industry and construction. In contrast, 2021 revealed shortage increases in services at a higher rate than in industry. While the recovery drove up vacancies and shortages, other factors (such as demographic developments) may also have contributed to a longer-term upward tendency in shortage indicators.

(33) The extended labour force includes, in addition to those economically active those who are available to work but not seeking as well as those seeking to work but not available.
(34) Reduced mobility and migration flows may have contributed to these demographic trends during the pandemic period.

Graph II.5: **Labour shortages and vacancy rate, euro area**



(1) The labour shortage indicators reflect the share of firms reporting labour is a factor limiting their production. The vacancy rate is defined as the ratio of vacant posts to all posts (occupied and vacant), covering industry, construction and services (sectors B to S).
Source: EU Business Survey and Eurostat.

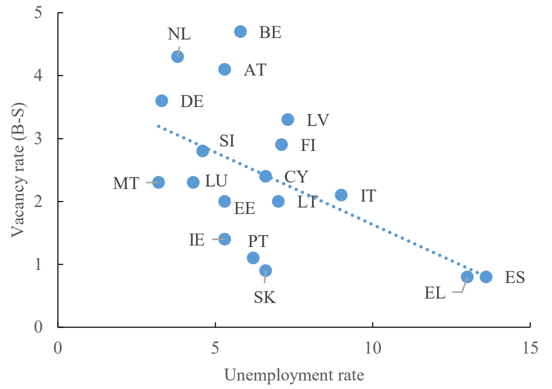
By the end of 2021, there was significant heterogeneity in the labour market situation across the euro area, with some countries showing signs of slack, others of tightness. In particular, a negative relationship could be observed between the unemployment rate and vacancies (Graph II.6).

- Some countries show comparatively low unemployment rates and high vacancy rates hinting at comparatively tight labour markets (e.g., in Austria, Belgium, Germany, the Netherlands).

- In other countries, the situation is the opposite: comparatively high unemployment rates and low vacancy rates, suggesting labour market slack (e.g., in Greece and Spain and, to a lesser extent, Italy).

- In other countries, the situation is intermediate. A group of Member States displays comparatively low levels of both unemployment and vacancy rates (Ireland, Portugal, Slovakia) while another group displays relatively high levels of both (e.g., Finland, Latvia).

Graph II.6: **Vacancies and unemployment across countries in the euro area, Q4-2021**



(1) Seasonally adjusted data. The vacancy rate covers industry, construction and services (sectors B-S). Data on vacancies is missing for France.
Source: Eurostat.

Regarding cross-country patterns of changes in unemployment and job vacancies across the euro area countries after the COVID-19 outbreak, some labour markets have become tighter, while others have observed a higher vacancy rate despite unemployment not yet having returned to pre-pandemic levels.

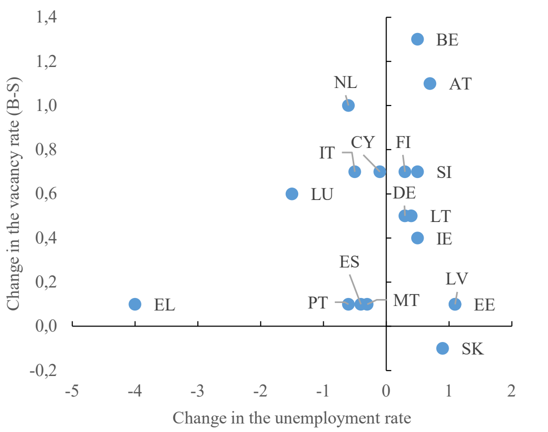
- By the end of 2021, labour markets appear to be tighter than pre-pandemic in eight countries where unemployment fell and vacancies rose (Cyprus, Greece, Italy, Luxembourg, Malta, the Netherlands, Portugal, and Spain in the upper left quadrant of Graph II.7). Some countries exhibit this pattern with a relatively small increase in vacancies (Greece, Malta, Portugal, Spain) or a small decrease in unemployment (Cyprus).

- In contrast, the labour market in Slovakia exhibited, at the end of 2021, somewhat higher unemployment and somewhat lower vacancies than pre-pandemic (lower right quadrant of Graph II.7).

- In turn, both unemployment and vacancy rates increased in nine countries (Austria, Belgium, Estonia, Finland, Germany, Ireland, Latvia, Lithuania, Slovenia in the upper left quadrant of Graph II.7). The rise in unemployment is relatively small in Germany, Finland and Lithuania but also in most other countries it is below one percentage point. In turn, in Estonia and Latvia, the increase in vacancies is relatively small.

- This means that, while unemployment, employment and activity rates in the euro area returned to pre-pandemic levels, some countries are characterised by remaining labour market slack and a concurrent increase in labour market tightness.

Graph II.7: **Vacancies and unemployment across the euro area, change over Q4-2019-Q4-2021, percentage points**



(1) Seasonally adjusted data. The vacancy rate covers industry, construction and services (sectors B-S). Data on vacancies is missing for France.
Source: Eurostat.

II.4. Has labour market matching deteriorated?

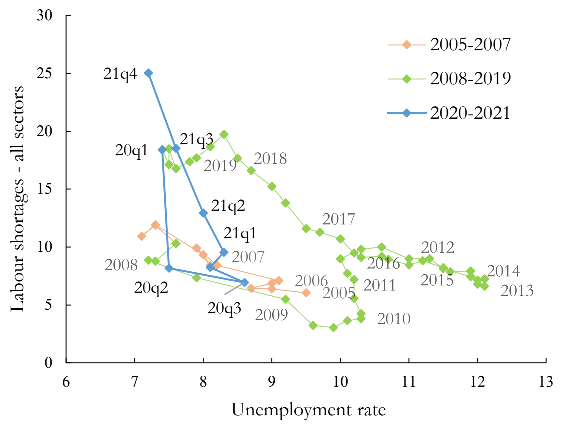
II.4.1. Evolution of unemployment and vacancies for the euro-area aggregate

The relationship between job vacancies and unemployment is often used to assess the efficiency of matching between labour supply and demand. Over the business cycle, vacancies and unemployment exhibit a negative relationship, known as 'Beveridge curve': in good times there are many job vacancies while unemployment is low, while the opposite happens during bad times. That said, vacancies and unemployment might also move in the same direction. This could occur for temporary reasons, as it may take time for vacancies to be filled in a recovery. However, if the shift is persistent, it could indicate a changed ability of the labour market to match job-seekers with posted jobs, i.e., it may signal changes in matching efficiency.

Graph II.8 shows the Beveridge curve for the euro area aggregate using labour market shortages as a proxy for vacancies. Shortages dropped significantly at the COVID-19 outbreak in Q2-2020, while unemployment increased in the third quarter. Since then, shortages have increased continuously, while unemployment has followed the developments of the pandemic: improving in Q4-2020, suffering a setback in Q1-2021 and improving since then. This pattern is in line with the experience of past business cycles: while vacancies are a leading indicator of the business cycle, unemployment moves with some lag. Negative shocks to labour demand are therefore followed by typical counter-clockwise movements in the vacancy-unemployment space. However, while after the 2008 financial crisis the variation in vacancies was relatively contained compared with unemployment, the opposite could be said in the aftermath of COVID-19. The change in unemployment was moderate and short-lived, while labour shortages showed large fluctuations.

While there was a clear upward shift in the euro area Beveridge curve after the 2008 financial crisis, a similar shift is not observed in the aftermath of COVID-19 from the simple inspection of the Beveridge curve in Graph II.8, i.e., the graphical inspection of the Beveridge curve is not sufficient to conclude whether a deterioration of labour market matching took place.

Graph II.8: **The Beveridge curve for the euro area 2005-2021**



(1) The indicator of labour shortages is defined as the share of firms reporting that labour is a factor limiting production. It is a weighted average (based on value-added weights) of sectoral indicators on manufacturing, services and construction.
Source: EU Business Survey and Eurostat.

II.4.2. Estimating the Beveridge curve on a panel of euro area countries

To be able to identify possible shifts in Beveridge curves based on evidence from a larger sample, the relationship was estimated across a panel of euro area countries using quarterly data. To obtain longer time series, vacancies are proxied by labour shortages (the Beveridge curve is qualitatively similar based on both indicators). The analysis of the behaviour of time trends and regression residuals from such estimation may be exploited to gauge Beveridge curve shifts. This approach is similar to that applied by Consolo and Dias da Silva (2019, p. 76), who estimate a Beveridge curve relationship for the euro area aggregate and use the residual as a proxy for matching efficiency. ([35])

Previous studies using panel methods have estimated the Beveridge curve across regions in specific countries. ([36]) In contrast to this strand of literature, this analysis explicitly takes account of residual autocorrelation, and estimates regressions parameters using the Prais-Winsten feasible GLS estimator (FGLS), besides OLS, to address the induced bias. Other recent approaches dealt with the econometric issue of autocorrelation by including the lagged dependent variable in the estimation or by using co-integration techniques. ([37])

Table II.1 summarises the regression results. Columns (1) to (3) report results from OLS regressions, while columns (4) to (6) report results from FGLS regressions. With the latter, the estimation procedure allows for country-specific first-order autocorrelation in the disturbances and standard errors take into account the heteroskedasticity of the data.

The dependent variable is the unemployment rate. All specifications include among the explanatory variables the labour shortages as a proxy for vacancies, the square of labour shortages to control for the non-linearity of the relationship, and country fixed effects. Specifications (3) and (6) also include time effects to pick up joint movements of Beveridge curves across the EU.

In specifications (2) and (5) two additional explanatory variables are added which may shift Beveridge curves. The first potential shifter is an indicator of macroeconomic skills mismatch, defined as relative dispersion of employment rates across the three main skill groups (low, medium and high qualifications). ([38]) The greater the discrepancies between the employment rates of various skills groups the higher the indicator. The hypothesis is that labour market matching could be less smooth (implying higher unemployment at a given level of vacancies or shortages) at times when there is a greater imbalance between the skills demanded and supplied. The second potential shifter controls for the effects of possible sectoral mismatch: it is calculated as the dispersion (coefficient of variation) of the three sectoral components of the labour shortage indicator (i.e., industry, services and construction). The greater the difference across labour shortages reported in the three sectors, the higher is the indicator. The hypothesis is that labour market matching could be less smooth at times when labour shortages are concentrated in some sectors only.

Both mismatch indicators are shown in Graph II.9. It is apparent that while the skills mismatch indicator increased somewhat over the pandemic, this increase was small as compared to historical developments, in particular the sharp rise after 2008. The sectoral dispersion of labour shortages increased significantly over the pandemic, to a degree comparable to the recession of 2009, before falling again to historically average levels over 2021. ([39])

([35]) See: Consolo, A. and A. Dias da Silva (2019), 'The euro area labour market through the lens of the Beveridge curve'. *ECB Economic Bulletin* 4/2019, 66-86.

([36]) Börsch-Supan, A.H. (1991), 'Panel data analysis of the Beveridge Curve: Is there a macroeconomic relation between the rate of unemployment and the vacancy rate?' *Economica* Vol. 58, 279-297; Wall, H.J. and G. Zoega (2002), 'The British Beveridge curve: A tale of ten regions,' *Oxford Bulletin of Economics and Statistics*, Vol. 64, 257-276; and Valletta, R.G. (2005). 'Why Has the U.S. Beveridge Curve Shifted Back? New Evidence Using Regional Data,' Federal Reserve Bank of San Francisco Working Paper 2005-25.

([37]) Bonthuis, B., V. Jarvis, and J. Vanhala (2013), 'Shifts in euro area Beveridge curves and their determinants'. *IZA Journal of Labor Policy* 5:20; Ebeke C. and G. Everaert (2014), 'Unemployment and Structural Unemployment in the Baltics'. IMF Working Paper 14/153; Bova, E., J. Tovar Jalles, C. Kolerus (2018), 'Shifting the Beveridge curve: What affects labour market matching?' *International Labour Review*, Vol. 157, No. 2.

([38]) For the definition of the indicator, see Kiss and Vandeplas (2015); the relationship of this indicator with matching efficiency has been analysed by European Commission (2013) and Arpaia et al. (2014).

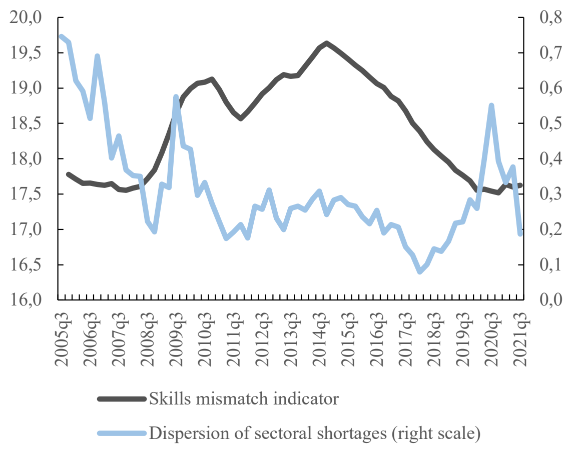
([39]) A similar conclusion has been reached by IMF analysts using a different methodology. "Sectoral job mismatch also played a role, but it rose less, and less durably, than it did after the 2008–09 global financial crisis". See: Duval, R., Y. Ji, L. Li, M. Oikonomou, C. Pizzinelli, I. Shibata, A. Sozzi, and M. M. Tavares, (2022) 'Labor market tightness in advanced economies', IMF Staff Discussion Notes 2022/1.

Table II.1: **Estimation of the Beveridge curve, euro area countries**

	(1) OLS country effects	(2) OLS, additional variables	(3) OLS, time effects added	(4) FGLS country effects	(5) FGLS, additional variables	(6) FGLS, time effects added
Dependent variable:	Unemployment rate					
Labour shortages, all sectors	-0.423***	-0.337***	-0.254**	-0.122***	-0.121***	-0.053***
	(0.108)	(0.108)	(0.119)	(0.016)	(0.015)	(0.014)
Labour shortages squared	0.007***	0.005**	0.005**	0.001***	0.002***	0.001***
	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
Skills mismatch indicator		0.453**	0.567**		0.077***	0.042*
		(0.189)	(0.231)		(0.024)	(0.021)
Sectoral dispersion of labour shortages		-0.028	-0.046		-0.004	-0.002
		(0.034)	(0.049)		(0.010)	(0.011)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Period effects	No	No	Yes	No	No	Yes
Observations	1,221	1,215	1,215	1,221	1,215	1,215
R-squared	0.687	0.729	0.795	.	.	.
Number of countries	19	19	19	19	19	19

(1) Robust standard errors in parentheses. Asterisks mark estimated coefficients that are statistically significant at the 10% (*), 5% (**) and 1% (***) level. (2) Labour shortages: the % of firms reporting that labour is a factor limiting production (industry, services and construction). The sectoral dispersion of shortages is the coefficient of variation of the three sectoral components. Finally, the skills mismatch indicator is the relative dispersion of employment rates by skills levels.
Source: Authors' calculations.

Graph II.9: **Skills mismatch indicator and dispersion of sectoral shortages, euro area**



(1) The skills mismatch indicator is defined as the relative dispersion of employment rates by qualification level. The dispersion of sectoral shortages is defined as the coefficient of variation of labour shortages in, respectively: industry, construction, and services.
Source: EU Business Survey and Eurostat.

The regression analysis confirms the expected negative and convex relationship between unemployment and vacancies. This finding is significant and robust with respect to alternative specifications and alternative estimation methods. The magnitude of the coefficients however seem to depend on the specification, as the Beveridge curve appears to become less steeply negative once time effects and mismatch indicators are included. Moreover, the estimations by means of feasible GLS indicate that OLS estimates are affected by bias, as the slope of the Beveridge curve drops considerably. This factor, which was neglected in previous literature, need to be taken into account. In our specific application, the bias could also affect the estimation of time trends and therefore the assessment of whether the Beveridge curve has shifted over time.

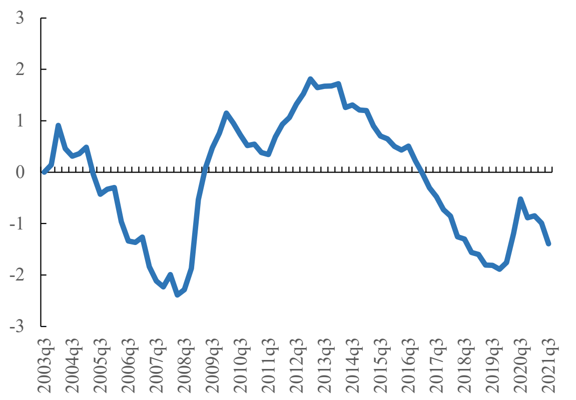
Turning to the other explanatory variables, Table II.1 suggests that skills mismatch is associated with higher unemployment at a given level of labour shortages or vacancies and therefore, potentially, with less efficient labour market matching. [40] By contrast, the dispersion of labour shortages across sectors does not appear to have an effect. This result is robust to the methods used and the specifications chosen.

[40] An alternative explanation is that changes in skills mismatches may be temporary effects of cyclical developments, and may not always reflect on matching efficiency.

The time effects estimated in these regressions can be interpreted as unemployment developments not explained by labour shortages or the other explanatory variables. They are related to shifts of the Beveridge curve, as opposed to movements along the curve. Time effects can thus be interpreted as joint movements in the position of Beveridge curves across euro area Member States.

Graph II.10 shows the estimated time effects from specification (6) in Table II.1. Between the 2008 financial crisis and the COVID outbreak, the estimated time effects broadly follow the joint movements in unemployment rates across the euro area, with an upward swing in the aftermath of the financial crisis, and a continuous improvement between 2013 and 2019. Time effects in the aftermath of the COVID outbreak show a relatively moderate increase, followed by a downward trajectory in 2021. By Q3- 2021, the time effects are close to historical lows seen in 2008, suggesting that Beveridge curves in the euro area do not suggest a high degree of matching inefficiency by historical standards.

Graph II.10: **Joint movements of euro area Beveridge curves: estimated time effects**



(1) Based on a GLS specification (6) reported in Table II.1.

Source: Authors' calculations.

The evolution of the time effects may reflect shifts in matching efficiency, on top of those captured by the mismatch indicators, although shifts in Beveridge curves may occur for other reasons. In any case, the variation in matching efficiency associated with the mismatch indicators is quite limited, linked to their moderate variation and lack of significance in the case of sectoral mismatch. (41)

This is supported by evidence from estimating the contribution of the various explanatory variables to unemployment developments, based on the panel estimation. Graph II.11 shows cumulative changes in euro area unemployment compared with the pre-pandemic situation in Q4-2019 distinguishing the fraction of these changes associated with different drivers. The most relevant driver is labour shortages, while the contribution of skills mismatch is very limited. Despite some worsening of skill mismatch after the COVID-19 outbreak, its magnitude is insufficient to explain much of the variation in unemployment, while the immediate fall in vacancies after the pandemic appears to be a much more relevant driver of unemployment. Finally, the negative residual in Q2-2020 is consistent with the notion that job retention schemes significantly dampened the increase in unemployment as compared to what would have been expected based on the fall in vacancies.

Graph II.11: **Factors explaining unemployment developments based on the estimations: euro area, 2020Q1-2021Q3**

(1) Calculations based on GLS specification similar to column (5) reported in Table II.1 (sectoral mismatch excluded).

Source: Authors' calculations.

(41) Estimates of the time effects from a specification of the Beveridge curve without mismatch indicators follow a qualitatively similar path over the post-COVID-19 period.

II.5. Conclusion

Euro area labour markets were heavily hit by the COVID-19 pandemic. As soon as the recovery started, labour shortages quickly emerged, while indicators of labour market slack fell more gradually, resulting in signals of labour market tightness among remaining slack. By the end of 2021, employment, unemployment, and activity rates have returned to pre-pandemic levels in the euro area while job vacancies and labour market shortages stand at historical highs. However, in some Member States, shortages and signs of slack were still co-existing.

The analysis presented in this section suggests that the simultaneous presence of tightness and slack was not the result of a major deterioration in the matching efficiency of euro area labour markets. The econometric analysis indicates only a modest upward shift of Beveridge curves in 2020, partly reversed in 2021. This means that, historically, the position of Beveridge curves appears to be relatively low. Despite the fact that skill mismatch has somewhat increased in the wake of the pandemic, this appears to have had a very minor impact on labour market matching. The Beveridge curve estimation indicates that this variable explains little of the cumulated unemployment changes in the aftermath of COVID-19. Moreover, while the economic impacts of the pandemic had a marked sectoral character, these proved mostly transitory, as witnessed by the return of the dispersion of sectoral labour shortages to pre-pandemic levels.

Overall, the findings suggest that the simultaneous presence of labour market slack and shortages was temporary in the euro area. ([42]) A number of considerations can explain their temporary coexistence in 2021. The removal of containment measures led to a very sudden increase in labour demand in a context where the labour force was less reactive than usual. In particular, health risk concerns are likely to have held back some people from taking up jobs or even searching, while restrictions and containment measures may have hampered labour mobility, not only within countries but also across borders. Vacancy rates reacted rapidly both at the start of the lockdown and with the labour market recovery, while unemployment moved with lags. While containment and support measures (such as short-time work schemes) may have postponed some workers' decisions to seek a job in another firm or sector, this does not appear to have lead to labour market mismatches. Structural reasons may have contributed to increasing labour market shortages, in particular demographic developments as the working-age population is on a declining path in the euro area. These developments were likely exacerbated by a slowdown of mobility and migration flows during the pandemic.

While the bulk of the evidence suggests that the concurrent signs of slack and shortages post-COVID-19 were not mainly associated with worsening structural labour market mismatches, increasing mismatches cannot be ruled out going forward. The COVID-19 pandemic may have compounded structural trends affecting euro area labour markets which would imply challenges for labour market matching. In particular, shifts in the relative skills demand of the euro area economy have likely been accelerated by the COVID-19 shock, including the increased relative demand for teleworkable occupations and non-routine tasks, and for skills used intensively in low-emission activities. ([43]) The concerns that remaining short-time work schemes could slow down labour reallocation and worsen job matching are probably overstated, since as of January 2022 only an estimated 1.5% of jobs in the euro area are supported by such schemes, down from a peak of 20% in April 2020. ([44])

In a tight labour market characterised by labour shortages, policy can support the activation of groups that face barriers to work. Measures can aim to make work pay (e.g., for low wage and second earners), provide affordable and quality childcare and long-term care, and support the labour market integration of people with a migration background. In light of an ageing labour force, policy can also strengthen incentives for workers to continue working at an older age, and support employers in hiring older workers.

Policy should focus on supporting labour market reallocation in line with the Commission recommendation for effective active support to employment following the COVID-19 crisis

([42]) Such evidence is in line with recent analyses for advanced economies. See, e.g., Duval, et al., 2022, op. cit..

([43]) See European Commission, 2021, op. cit.

([44]) See ECB Economic Bulletins 2021/8 and 2020/8, respectively.

(EASE). This is notably the case should evidence of labour market mismatch grow stronger. [45] Targeted education and training would help the creation of skills in short supply, therefore easing labour shortages in fast-growing economic activities. Strengthening public employment services would help improve the labour market matching process.

[45] European Commission, Recommendation on effective active support to employment following the COVID-19 crisis (EASE), C(2021) 1372 final, 4 March 2021.

III. The SURE Instrument: an updated assessment

By Clíona McDonnell, Jocelyn Boussard, Isabelle Justo, Philipp Mohl, Gilles Mourre and Klara Stovicek

Abstract: *This section provides an updated state-of-play on the use of the financial assistance granted under the SURE instrument, as well as a thorough assessment of its impact. SURE's implementation has continued successfully in 2021 and 2022, with over EUR 94 billion in financial assistance now granted to 19 Member States, through 26 Council Implementing Decisions based on proposals by the Commission. Public expenditure under SURE has broadly mirrored the epidemiological situation and almost all of the total planned expenditure had been implemented by the end of 2021, with many measures now phased out in some Member States. SURE has produced two tangible effects on the labour market. Firstly, in 2020, when the EU economy was at risk of melting down following the COVID-19 outbreak and ensuing containment measures, SURE had a major positive effect on job retention. SURE is estimated to have helped prevent almost 1½ million people from becoming unemployed in 2020. Indeed the disparity of unemployment rates, both among SURE beneficiary Member States and between SURE beneficiary and non-beneficiaries, was substantially smaller than during previous crises, meaning that SURE was instrumental in containing labour market inequality in the EU due to COVID-19. Secondly, SURE supported the rapid rebound that occurred in the second half of 2021 by keeping workers connected to firms and boosting the confidence of businesses, households and financial markets. This appears to have outweighed any potential risk of impairing labour mobility, in particular as measures supported by SURE were scaled back quickly as the recovery took hold in mid-2021. The section concludes by highlighting the three crucial reasons for SURE's success, namely its social and economic purpose, its solidarity-based governance and its financial construction (46).*

III.1. Introduction

The European instrument for temporary Support to mitigate Unemployment Risks in an Emergency (SURE) – established on 19 May 2020 - has continued to support EU Member States' COVID-related expenditure throughout 2021 and, to a lesser extent, at the start of 2022 (47). This section provides an update on the use of SURE, based on and extending the analysis published in the third biannual report on SURE in March 2022. It follows on from an initial article on SURE published in the *Quarterly Report on the Euro Area* in July 2021.

SURE was created to help Member States protect workers' jobs and income during the COVID-19 pandemic. It provides loans with favourable conditions, with a budget of up to EUR 100 billion, to help finance Member States' short-time work schemes or similar measures aimed at protecting employees and the self-employed and, as an ancillary, health-related measures, in particular in the workplace.

This section is divided into three parts. The first part describes how the SURE instrument is used, both from a financial point of view and in terms of the expenditure that it funds. The focus is on developments since May 2021, the cut-off for the previous QREA article (48). The second part provides an updated preliminary assessment of SURE's impact, firstly, on the retention of employment in 2020 and, secondly, on its contribution to the rapid rebound in 2021. The third part outlines the key factors that have determined SURE's success.

III.2. The use of SURE financial assistance

III.2.1. Financial amounts to date

SURE's implementation has continued successfully in 2021 and 2022. Over EUR 94 billion in SURE financial assistance has been granted to 19 Member States, representing more than 94% of the total envelope. Of this, almost EUR 92 billion has been disbursed to date via back-to-back lending. The eighth bond issuance and disbursement took place in March 2022, when the Commission raised EUR 2.17 billion in social bonds on the back of further strong investor demand.

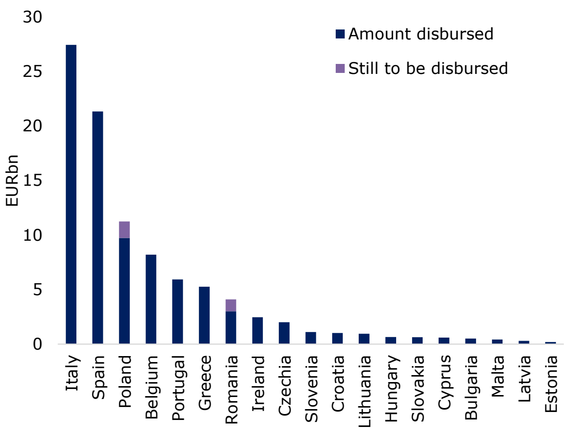
(46) The authors would like to thank Julian Winkler for his valuable contribution to the research in this article.

(47) Council Regulation (EU) 2020/672 of 19 May 2020 on the establishment of a European instrument for temporary support to mitigate unemployment risks in an emergency (SURE) following the COVID-19 outbreak, OJ L 59, 20.5.2020, p. 1

(48) Quarterly Report on the Euro Area, Section III, Vol. 20, No 2, https://ec.europa.eu/info/sites/default/files/economy-finance/ip155_en.pdf.

The instrument remains relevant and popular among Member States. So far in 2022, one Member State, Hungary, has been granted additional financial assistance of EUR 147 million. This was the 26th request for SURE financial assistance, considering both initial requests and subsequent requests for top-up support by the same Member States. Portugal, meanwhile, had the Council implementing decision granting it SURE financial assistance amended to include additional measures, allowing it to absorb the full amount of financial assistance granted in September 2020. As SURE financial assistance remains available until 31 December 2022 and there is still EUR 5.6 billion remaining, financial assistance under the instrument can continue to be granted to address severe economic disturbances caused by the COVID-19 pandemic. Some Member States have also expressed interest in additional financial assistance.

Graph III.1: **SURE amounts granted and disbursed**

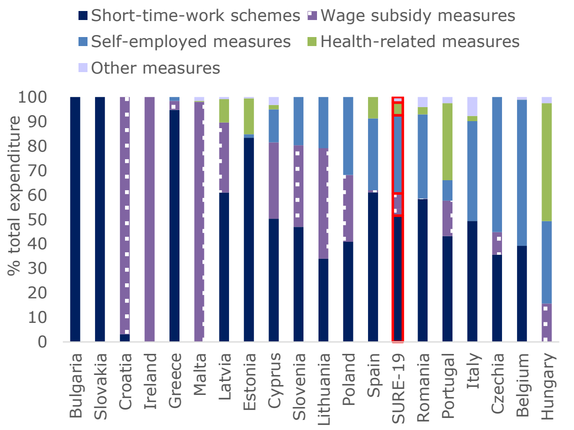


(1) Figures were updated here beyond the third biannual report's cut-off date to reflect the situation on 16 May 2022.
Source: Commission.

III.2.2. National measures and expenditure covered by SURE financial assistance

Over half of the total public expenditure on SURE-eligible measures has been allocated to short-time work schemes. In line with SURE's primary purpose to protect jobs and workers' incomes, 52% of total public expenditure on SURE-eligible measures has been allocated to *short-time work schemes*, with a further 32% to *measures similar to short-time work schemes* aimed at protecting workers and the self-employed (see Graph III.2) [49]. Only 5% of the financial assistance was spent on *health-related measures*, which are included as ancillary measures under the SURE Regulation.

Graph III.2: **Public expenditure under SURE by type of expenditure**



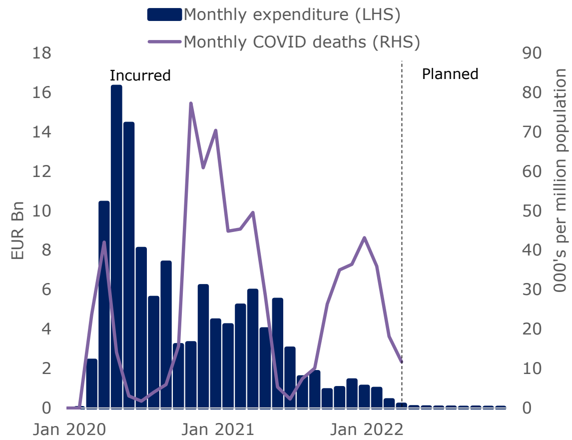
Source: Member States' reporting.

Public expenditure under SURE has broadly mirrored the epidemiological situation since 2020, while also decreasing steadily as economies have adapted to the pandemic. After increasing due to stringent EU-wide containment measures being put in place in the first half of 2021 as COVID-19 death tolls rose rapidly, expenditure on SURE-eligible measures fell to monthly lows by the end of summer 2021 as vaccination campaigns matured (see Graph III.3). Member States moved away from using blanket restrictions to manage the pandemic towards more targeted and sectoral restrictions and the widespread use of masks and social distancing. This caused the observed correlation between SURE expenditure and the virus trajectory to weaken progressively across pandemic waves. While public policy support measures were still required, they were far less broad-based than in 2020. There was a small increase in public expenditure at the end of 2021 as the impact of the Omicron variant led to the reintroduction of some containment measures. Almost all (98%) of the total planned public expenditure on SURE-eligible measures had been implemented by the end of

(49) See Quarterly Report on the Euro Area, Section III, Vol. 20, No 2 (2021) for an explanation of short-time work schemes and similar measures under SURE.

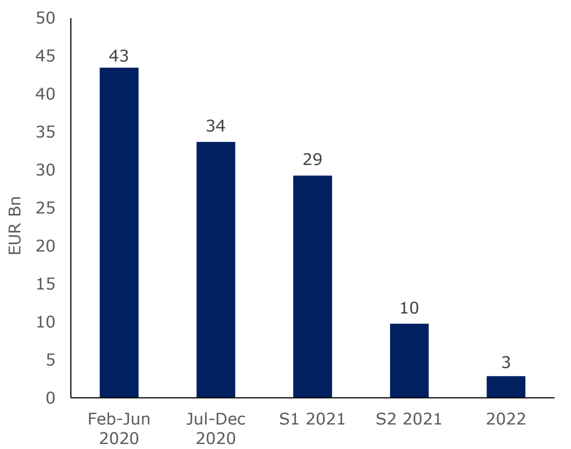
2021, with many measures now phased out in some Member States [50].

Graph III.3: **Monthly evolution of public expenditure under SURE and epidemiological situation**



Source: Member States' reporting (January 2022), ECDC.

Graph III.4: **Reported public expenditure under SURE**



Source: Member States' reporting (January 2022).

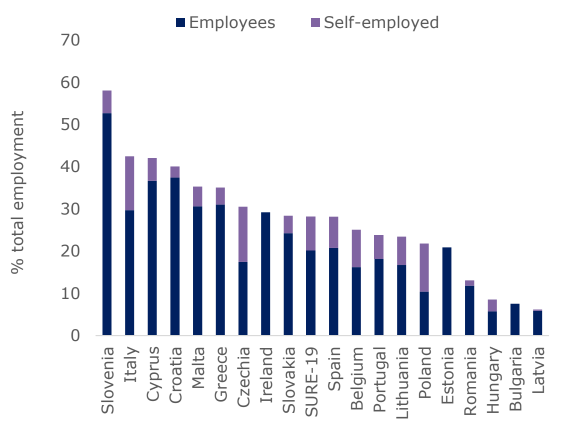
III.3. The impact of SURE

III.3.1. Did SURE help mitigate the effect of the COVID-19 crisis upon impact? The significant job retention effect

The first aspect of SURE's economic impact to be assessed is its contribution to employment retention at the onset of COVID-19 in 2020. SURE's aim is to safeguard employment and workers' incomes, primarily via short-time work schemes and equivalent measures that maintain a link between firms and employees in times of crisis.

By supporting an estimated 31 million people in 2020, SURE helped avoid a large rise in unemployment as firms were forced to cease their activities. Of those 31 million workers, approximately 22¼ million were employees and 8¾ million were self-employed. Together, they accounted for almost 30% of total employment (see Graph III.5). SURE is estimated to have supported 2½ million firms in 2020, which represents a quarter of all firms in beneficiary Member States (see Graph III.6). Small firms have been the primary beneficiaries of SURE support. There has been a shift from the use of short-time work schemes by predominantly large firms prior to the pandemic to mostly small firms, due to the fact that the schemes were mostly taken up by contact-intensive services (mainly hotels and restaurants) and retail sectors, rather than manufacturing.

Graph III.5: **Workers covered by SURE in 2020 (% of total employment)**



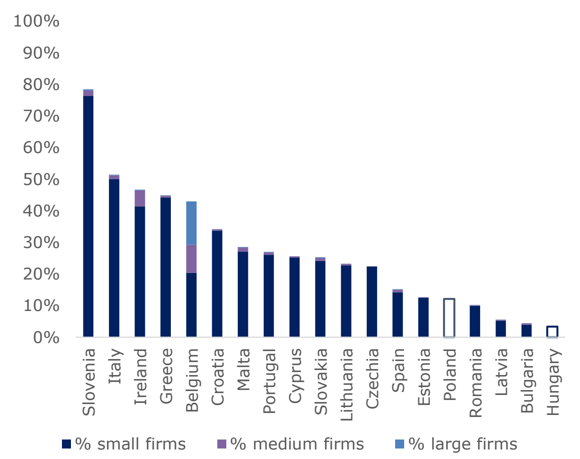
Source: Member States' reporting (January 2022), Ameco.

SURE is estimated to have contributed to helping prevent almost 1½ million people from becoming unemployed in 2020. The rise in unemployment in 2020 in beneficiary Member States was significantly less than expected as the unprecedented policy support measures, in particular national short-time work schemes, mitigated the impact of the fall in output on unemployment (see Graph III.7). At country level, the higher the amount received through SURE in

(50) SURE can be requested for both incurred and planned public expenditure.

2020, the more moderate was the rise in unemployment (see Graph III.8). This is supported by survey data, in which a majority of beneficiary Member States indicated that SURE played a role in their decision to adopt a new or modify an existing short-time work scheme ([51]). A majority of beneficiary Member States also considered that SURE support helped them to temporarily increase the coverage and generosity of short-time work schemes and the overall funding of COVID-19 mitigation policies, with positive confidence effects. Meanwhile, some non-beneficiary Member States were able to provide major short-time work schemes, thanks to their favourable financial position and funding conditions, which advised against competing for SURE funding.

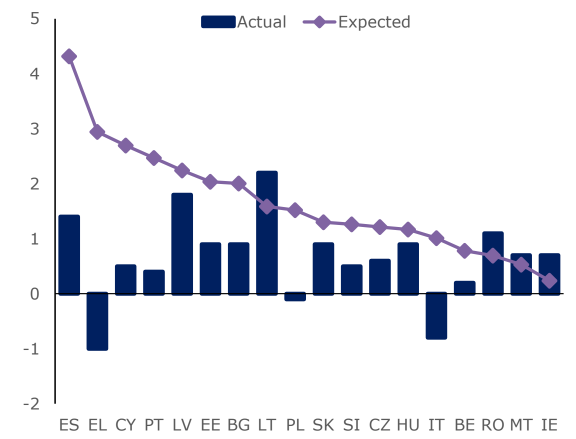
Graph III.6: **Firms covered by SURE in 2020 by size (% of total firms)**



Note: Total firms excludes zero-employee firms. Distribution of firms is assumed to apply to 2020 coverage. Poland and Hungary did not report on firm size. Small firms are those with less than 50 employees, medium with 50-250 employees and large with over 250 employees.
Source: Member States' reporting (January 2022).

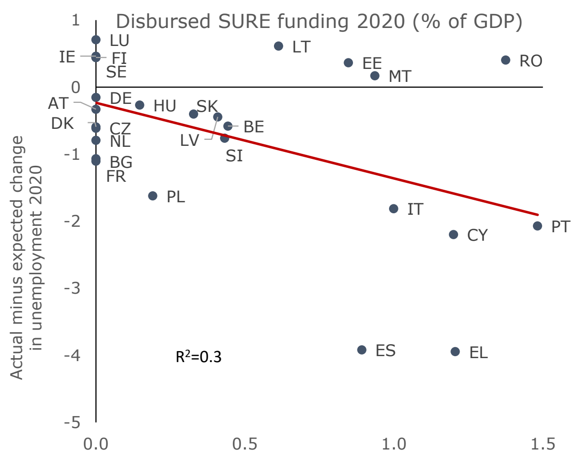
The methodology for this estimate uses a counterfactual based on an estimated Okun's law across countries. Box III.1 describes the methodology in detail. These labour market measures, in particular short-time work schemes and equivalents, along with other policy responses to the pandemic, are estimated to have reduced the unemployment rate in SURE beneficiary Member States by around one percentage point. This is compared with the expected rise in unemployment (as a standard reaction to the very large drop in growth). This corresponds to around 1½ million people who avoided unemployment during the COVID-19 outbreak in the SURE beneficiary Member States.

Graph III.7: **Actual vs expected changes in unemployment rates by SURE beneficiary Member State in 2020**



Source: Ameco and own calculations. The actual change in unemployment rate comes from the Commission's 2021 Autumn Forecast.

Graph III.8: **Relationship between the change in the unemployment rate and disbursed SURE funding in 2020**



Source: Ameco and own calculations.

([51]) The Commission's Directorate-General for Employment, Social Affairs and Inclusion directly solicited the views of Member State authorities through a questionnaire submitted to the Employment Committee. Further details are provided in the first biannual report on SURE: https://ec.europa.eu/info/sites/default/files/economy-finance/com2021_148_en_act_part1_v6.pdf

Box III.1: Impact of SURE on unemployment in 2020

The economic literature frequently uses an Okun's Law approach to capture the relationship between output and unemployment. The responsiveness of changes in economic growth on unemployment is often referred to in the economic literature as Okun's Law. More of an empirical 'rule of thumb' than a relationship grounded in theory, Okun's Law suggests that a decline in output growth of between 2% and 3% is associated with a one percentage point increase in the unemployment rate ([1]).

We estimate an Okun's Law for a sample of EU countries benefiting from SURE with a regression approach. The specification looks as follows ([2]):

$$\Delta\, unemp_{i,t} = \beta_1\, growth_{i,t-1} + \beta_2\, X_{i,t-1} + \theta_t + \vartheta_i + u_{i,t}$$

where the dependent variable corresponds to the change in unemployment rate and the key independent variable is the real GDP growth rate. We test the robustness of the relationship by using employment as an alternative dependent variable and adding further control variables (*X*), namely the change in the labour force participation rate and employment protection legislation indicators ([3]). We estimate the Okun's Law for both a panel of up to 19 SURE-beneficiary Member States and for each country in isolation (*i*). We also run the regression for all the EU countries. The sample covers up to 16 years (*t*), ranging from 2004 to 2019. The panel specification includes time-fixed effects (θ) and country-fixed effects (ϑ) to capture systematic differences across Member States and time, while *u* represents an error term.

The findings confirm that economic activity appears to be a key determinant of the change in the unemployment rate (Table III.1). The real GDP growth variable is strongly statistically significant irrespective of the specification (specifications 1-5). The labour force participation rate appears to have no strongly significant impact on the change in the unemployment rate (3-5). Tighter employment protection measures appear to increase the unemployment rate slightly, which is usually associated with the increase in the cost of hiring. Finally, we find that stronger economic growth appears to have a positive impact on the change in the employment rate (i.e. employment over working-age population). This specification is a way to correct for the change in labour force, affecting unemployment indicators (5).

The findings show that the increase in unemployment due to changes in output in 2020 was weaker than expected in beneficiary Member States (see Graph III.7). We use our panel and time series estimates of the real GDP growth coefficient to compare the actual and expected changes in unemployment rates in beneficiary Member States. The results suggest that the swift and sizeable policy measures taken in 2020 to address the crisis reduced the impact of the fall in output on unemployment. Therefore, the increase in the unemployment rate was, in most countries, less than expected.

While it is difficult to design a counterfactual scenario of labour market performance in the absence of SURE, the analysis presented here examines the relationship between output and unemployment since the pandemic unfolded. The results should be interpreted with caution, since the output-employment relationship is impacted by a wide range of factors, including SURE.

(1) Okun, A.M., 'Potential GNP: Its measurement and significance', Proceedings of the Business and Economic Statistics Section, American Statistical Association, 1962. For a more recent assessment see Furceri, D., Jalles, J.T. and Loungani, P., 2020, 'On the determinants of the Okun's Law: New evidence from time-varying estimates', Comparative Economic Studies 62, 661–700.
(2) A similar set-up is chosen as that used in European Commission (2020C).
(3) The latter corresponds to the OECD's employment protection legislation (EPL) indicators, namely EPL for individual as well as individual and collective dismissals.

(Continued on the next page)

Box (continued)

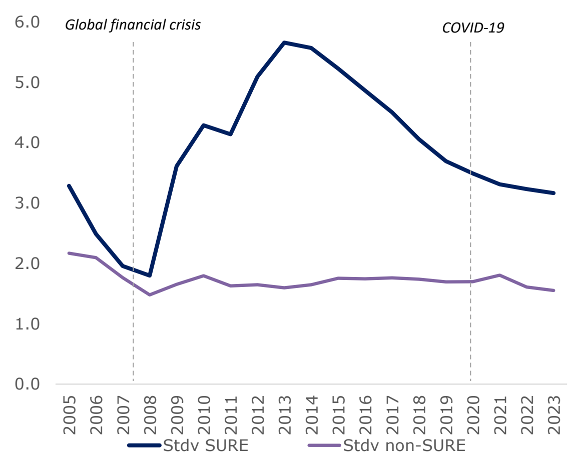
Table III.1: **Key determinants of the change in unemployment rate - panel regression results**

Key factor	Estimator		Set of independent		Dep. var.
Dependent variable	Δ UR	Δ UR	Δ UR	Δ UR	Δ ER
Estimator	LSDV	FD-GMM	FD-GMM	FD-GMM	FD-GMM
	(1)	(2)	(3)	(4)	(5)
Real GDP growth rate	-0.255***	-0.283***	-0.281***	-0.215***	0.152***
	(-4.636)	(-3.949)	(-4.117)	(-3.412)	(3.515)
Δ labour force participation rate			0.557	0.859*	1.054
			(1.453)	(1.862)	(1.746)
Δ EPL (ind. and collective dismissa				0.665*	-0.775*
				(1.853)	(-1.901)
Number of countries	18	18	18	14	14
Observations	315	315	315	224	224
R-squared	0.63				
Wald time dummies	0	0	0	0	0
Wald country dummies	0.17				
AR(1) (p-value)		0.03	0.03	0.05	0.07
AR(2) (p-value)		0.40	0.45	0.62	0.33
Hansen (p-value)		0.90	0.85	0.82	0.88
Number of instruments		25	27	26	25

Note: The panel estimation includes EU countries benefitting from SURE, covering the period 1999 to 2019. The following two dependent variables are used, namely the change in the unemployment rate (Δ UR) and the change in the employment rate (Δ ER). The specification controls for the endogeneity of output with internal instruments by using a first-difference GMM estimator (FD-GMM). ***/**/* indicates statistical significance at the 10%/5%/1% level. The reduced country sample for the last three regressions is due to data availability.
Source: Authors' calculations based on the AMECO vintage of the Commission Autumn 2020 forecast.

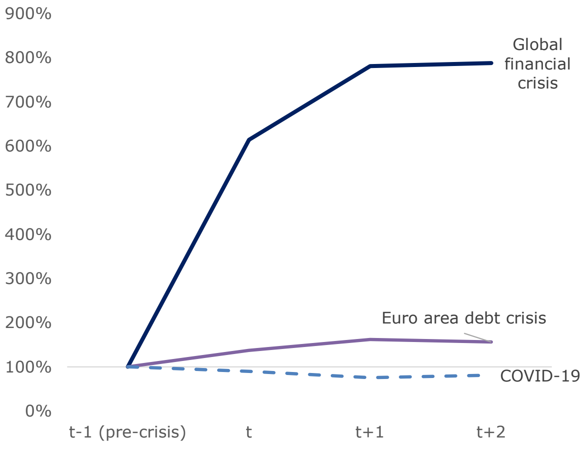
The heterogeneity of unemployment rates, both among SURE beneficiary Member States and between SURE beneficiary and non-beneficiary Member States, was also lower than in previous crises. The global financial crisis that began in 2008 led to a significant divergence of outcomes across the EU, in particular with respect to the labour market. The most-affected Member States saw large and persistent rises in unemployment. Graphs III.9 and III.10 show the rapid rise in the heterogeneity of unemployment rates across SURE beneficiaries after 2008 (as measured by the standard deviation), whereas this heterogeneity in fact declined after the pandemic struck in 2020, preventing a (labour-market-led) rise in inequality across SURE Member States. Graph III.11 shows that, while the unemployment rate rose significantly more in SURE beneficiaries than non-SURE beneficiaries in the aftermath of the Global Financial Crisis, the unemployment rates in both groups followed a similar pattern during the COVID-19 crisis. This suggests that SURE may have contributed to preventing a strong rise in unemployment in countries who had suffered more labour market scarring and thus had more vulnerable labour markets. This also points to the fact that SURE's beneficiaries included the Member States whose labour markets needed SURE the most, namely those that suffered the most during the global financial crisis.

Graph III.9: **Historical disparity of unemployment rates in SURE and non-SURE EU countries**



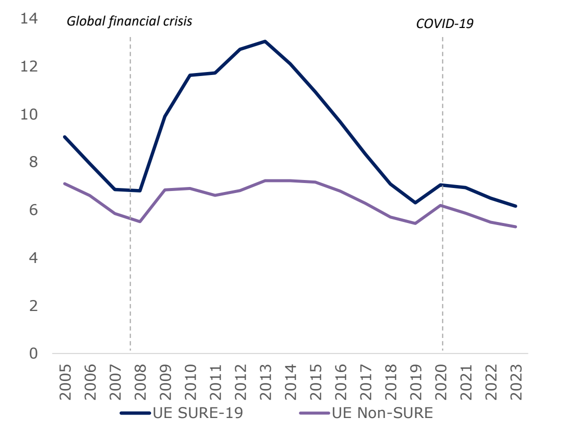
GFC refers to global financial crisis. Stdv refers to the standard deviation of the unemployment rate of SURE and non-SURE beneficiary EU Member States, which is calculated for each year.
Source: Ameco.

Graph III.10: **Relative impact of crises on labour market heterogeneity between SURE and non-SURE EU countries**



(1) The relative divergence in unemployment between SURE beneficiaries and the rest of the EU is calculated as the difference between the standard deviation of unemployment rates between SURE and non-SURE beneficiary EU Member States. This measure is presented as an index equalling 100% in the period 1 year before the three crises considered (t-1).
Source: Ameco.

Graph III.11: **Comparative evolution of the average unemployment rate between SURE and non-SURE EU countries**



Source: Ameco

III.3.2. How did SURE contribute to the recovery in 2021? The rebound effect prevailing over lower labour mobility

The policies supported by SURE had two opposing effects in 2021: facilitating the rebound while also reducing job mobility. On the one hand, by maintaining the link between employers and employees during lockdowns, short-time work schemes and similar measures created the conditions for a rapid recovery as the skills of underemployed staff could be re-mobilised immediately upon the resumption of activity. This would also avoid substantial scarring of the labour market (i.e. hysteresis effects). On the other hand, it could be argued that short-time work schemes reduced labour mobility, keeping people employed in firms (and the self-employed engaged in activities) they would otherwise have left and preventing a potentially more efficient reallocation of resources.

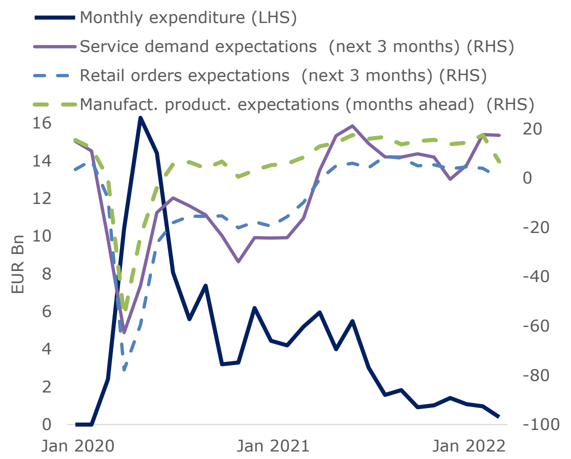
The following analysis provides evidence to identify which of the two effects prevailed. To that end, this paper will consider outturn data (GDP, unemployment) as well as survey data. Overall, the analysis set out below indicates that any potential friction preventing the reallocation of labour appears to have been motivated by the protection of sectors still badly hit by the pandemic in early 2021 and, importantly, turned out to be short-lived. This is also confirmed by the rapid economic rebound facilitated by SURE, which was particularly strong by historical standards.

Targeted support in 2021 and no evidence of lasting reduction of job mobility

First, the uneven recovery in the first half of 2021 still required continued public policy support to retain jobs in some sectors. Subsequent waves of the pandemic required many Member States to reintroduce restrictions at various stages in 2021. Although the economic impact of these waves was smaller than the first, certain sectors were more affected than others, particularly in services sectors, justifying the targeted retention policy to prevent a disproportionate hike in unemployment.

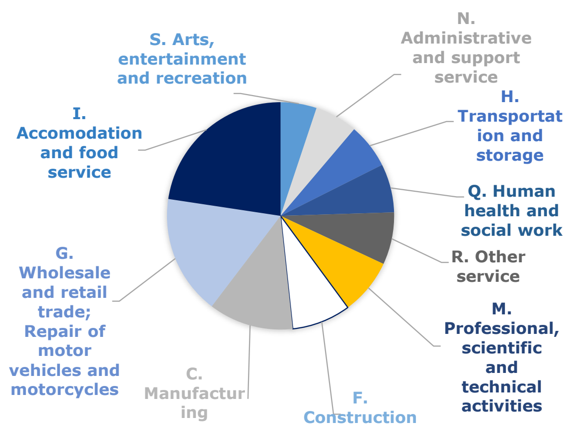
This is confirmed by survey data. The EU Business and Consumer Survey showed that the services sectors most affected by COVID-19 in SURE beneficiary Member States (accommodation, food and beverage, travel agencies, sports activities and other personal services) continued to suffer from weak demand and confidence in the first half of 2021 in particular (Graph III.12). In contrast, manufacturing was less affected by the restrictions in early 2021 and performed better. As shown in Graph III.13, the sectors accounting for the largest share of SURE expenditure were wholesale and retail trade and accommodation and food services, confirming that SURE addresses the most pressing needs by supporting the worst hit sectors.

Graph III.12: **Services sectoral demand and SURE expenditure**



(1) For services, average index shown for accommodation, food and beverage, travel agencies, sports activities and other personal services.
Source: EU Business and Consumer Survey Programme March 2022, Member State reporting tables.

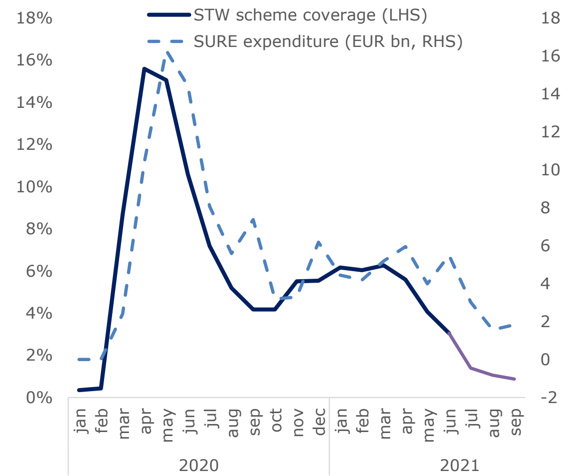
Graph III.13: **Sectoral coverage of SURE**



Source: Member States' reporting (January 2022).

With the ongoing but less widespread restrictions, the use of short-time work schemes remained substantial in early 2021, mirroring SURE support. The use of short-time work schemes hit an unprecedented peak during the first wave of the pandemic in 2020. However, a considerable number of workers continued to benefit from the schemes in the first few months of 2021 (Graph III.14) as the most-affected sectors continued to require support.

Graph III.14: **Share of employees benefiting from short-time work and assimilated schemes**



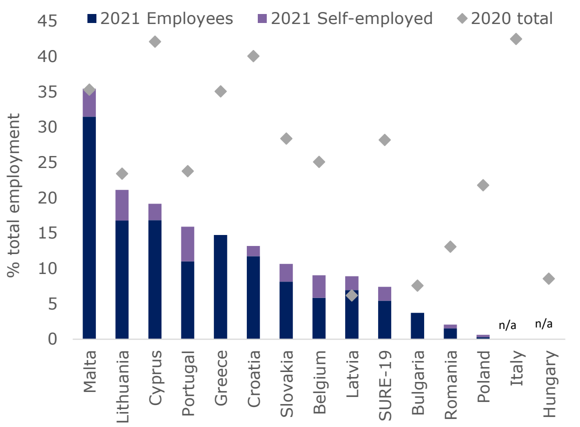
Source: EMCO-EPC monitoring report on the employment and social situation following the COVID-19 outbreak (Winter 2022).

Second, the unwinding of SURE spending and short-time work schemes clearly indicated that SURE expenditure was scaled back as the recovery took hold. The negative correlation between SURE expenditure and economic output is evident: when economic conditions improved, expenditure decreased, showing that the measures adapted to the reality on the ground. This would suggest that labour mobility was not impaired when demand was recovering and reallocation became feasible. Indeed, there was evidence of labour shortages emerging in hospitality and manufacturing, among the sectors most supported by SURE, in 2021 ([52]). The use of short-time work schemes also declined in the second half of 2021, reflecting the ongoing economic recovery, supported by the successful rollout of the vaccination campaigns. It is clear that SURE expenditure closely tracks the share of employees covered by short-time work schemes (Graph III.14).

This led to a quick reduction in SURE coverage in 2021, confirming that it did not stand in the way of job mobility when the recovery solidified. During this uneven recovery, SURE continued to significantly support jobs, but the number of people and firms covered by SURE declined sharply in 2021 compared to 2020, as economies adapted to COVID-19 and many

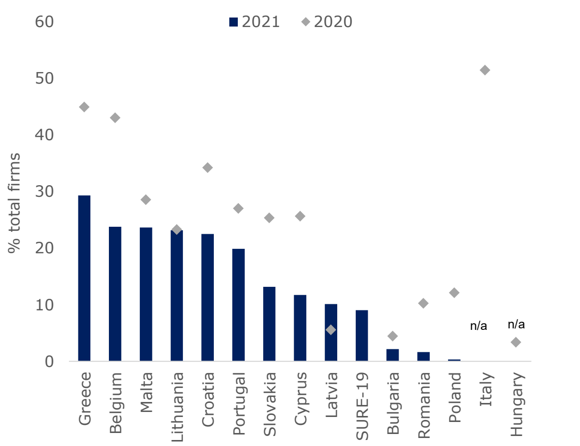
([52]) See European Commission (2021) : "Labour Market and Wage Developments in Europe 2021" sectors began to recover. SURE supported approximately 3 million people and over 400 000firms in 2021. This represents 6% of total employment and around 10% of firms in the 13 beneficiary Member States who continued to use it in 2021 (see Graphs III.15 and III.16). Indeed, six Member States did not use SURE after 2020. This again points to the fact that SURE did not support an excessive number of jobs and thus impair mobility in 2021.

Graph III.15: **Workers covered by SURE in 2021 (% of total employment)**



(1) Member States that spent the SURE financial assistance by the end of 2020 are not shown. n/a refers to Member States that did not report coverage for 2021.
Source: Member States' reporting (January 2022).

Graph III.16: **Firms covered by SURE in 2021 (% of total firms)**

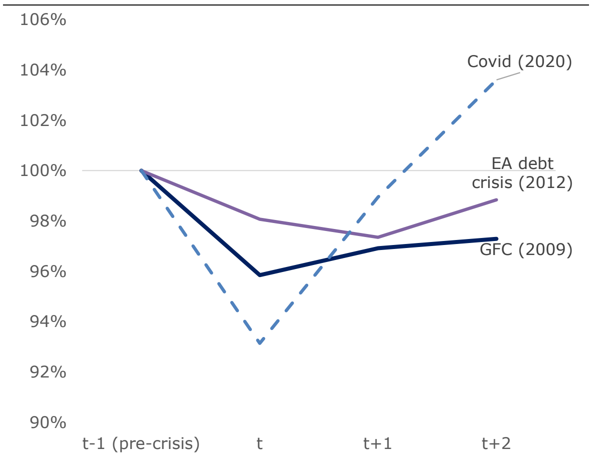


(1) See note to Graph IV.14
(2) Total firms excludes zero-employee firms
Source: Member States' reporting (January 2022)

SURE contributed to an exceptional economic rebound in 2021 and early 2022

The protection of employment at the start of the pandemic supported a very rapid recovery in 2021 by historical standards. Both GDP and unemployment recovered closer to their pre-crisis levels in SURE beneficiary Member States in 2021 compared to the global financial crisis and euro area crisis after the same period (see Graphs III.17 and III.18). The continued recovery in employment saw the unemployment rate fall below its pre-pandemic rate to a record-low of 6.4% in the EU. Total hours worked have risen, largely reflecting a further reduction in the use of job retention schemes, although they remain lower than before the pandemic. This suggests that keeping the available workforce connected with firms via short-time work schemes and similar measures has helped support the swift recovery, despite the challenging epidemiological situation still evident in 2021. Prior to Russia's invasion of Ukraine, it was expected that in 2022 the continued COVID-19 recovery would further outperform that of the previous crises (based on the Commission's winter forecast). This points to limited labour market scarring due to the COVID-19 crisis.

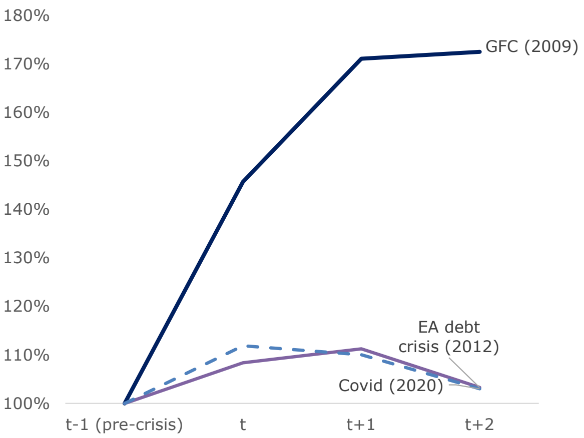
Graph III.17: **Historical comparison of the recovery in GDP after a crisis**



(1) Aggregate GDP for SURE beneficiary Member States shown. Time period t-1 refers to the year prior to the respective crises, implying that e.g. t+2 for the COVID-19 crisis refers to 2022. t=2009 for Global financial crisis (GFC); t=2012 for euro area (EA) debt crisis.
Source: Ameco (using the Commission's 2021 Autumn forecast), Eurostat.

SURE's confidence-boosting effect on economic agents is also likely to have supported the recovery. SURE received broad-based support from EU citizens. For example, 82% of euro area residents responding to the Eurobarometer survey published in December 2021 considered SURE loans to keep people in employment to be a good idea ([53]). This positive view of SURE holds across both beneficiary and guarantor countries (see Graph III.19), reaffirming the instrument's success both in supporting jobs and in improving confidence in the EU. The sizeable oversubscription of SURE bonds by investors also suggests that financial markets have trust in the efficiency of the instrument.

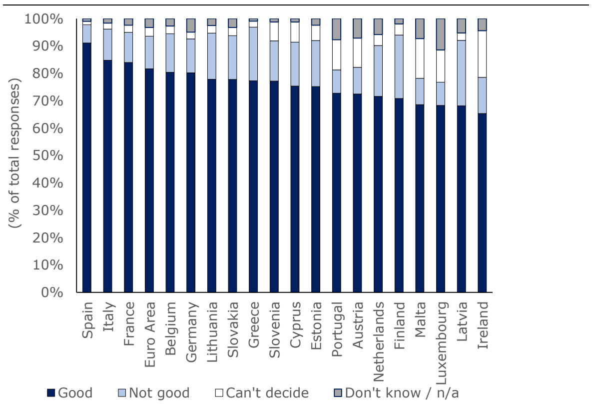
Graph III.18: **Historical comparison of the recovery in unemployment after a crisis**



(1) Average unemployment rate for SURE beneficiary Member States shown. Time period t-1 refers to the year prior to the respective crises, implying that e.g. t+2 for the COVID-19 crisis refers to 2022. t=2009 for Global financial crisis (GFC); t=2012 for euro area (EA) debt crisis.

Source: Ameco (using the Commission's 2021 Autumn forecast), Eurostat.

Graph III.19: **EU citizens' views on whether SURE loans were a good idea**

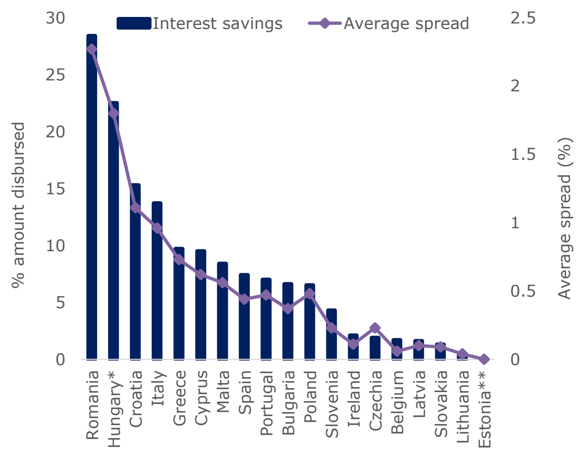


Source: Eurobarometer survey December 2021 publication, conducted in euro area countries in October and November 2021.

III.3.3. Another impact: sizeable interest savings from Member States

SURE has also generated a total of EUR 8.5 billion in savings on interest payments for Member States (Graph III.20)**.** These savings were generated as SURE loans offered Member States lower interest rates than those they would have paid if they had issued sovereign debt themselves, and this over an average period of close to 15 years. This is due to the EU's AAA credit rating and the liquidity of the SURE bonds. The largest savings were recorded by Member States with lower credit ratings. This estimate does not include any possible additional confidence effects of the new emergency instruments, including SURE, which likely prevented a rise in the interest rate spread for Member States' sovereign borrowing. The true interest savings are therefore likely to be even higher. Furthermore, Member States could reduce the volume of their own sovereign issuance in those funding periods, which likely improved the conditions they could achieve with that issuance.

Graph III.20: **Interest savings by Member State (% of loan amount received)**



(1) Based on the eight SURE bond issuances as of May 2022. Interest savings are computed bond by bond, and summed across issue dates and maturities. A detailed description of the methodology is available in McDonnell et al. (2021).
* No yield curve for euro-denominated bonds is available for Hungary. The yield curve in national currency was used instead.
** Estonia has issued only one outstanding 10-year bond, no data were available for other maturities. The spread with the EU SURE social bond at these other maturities is assumed to be close to zero.
Source: European Commission.

([53]) See: https://europa.eu/eurobarometer/surveys/detail/2289

III.4. Why was SURE a success? Three considerations

Three broad policy lessons can be drawn from the success of SURE.

Firstly, SURE responded to an emergency need that was both social and economic in nature. Amid the uncertainty at the outset of the pandemic, it was crucial for policymakers to take concrete steps to avoid long-term social and economic scarring due to a shock that had strong reasons to be assumed to be (correctly, as it turned out) of temporary nature. To that end, SURE served a real purpose, responding to a strong need identified by both Member States and the Commission, namely to retain workers in employment to protect their incomes and mitigate the economic and socio-economic damage of the pandemic. The social nature of this goal was emphasised by the issuance of social bonds by the EU for the first time, which has also proven popular with investors.

Accordingly, the scope of SURE was not based on a rigid institutional definition, but was purpose-based, i.e. supporting job retention. It was not limited to a narrow type of instrument that was only a means to an end. It included short-time work schemes but also other job retention measures (i.e. measures similar to short-time work schemes), in particular for the self-employed. The very purpose of SURE was to allow Member States to optimise their national labour market policy in the face of unprecedented and dramatic circumstances, by offering them EU support on a wide array of measures appropriate to retain jobs in firms, while providing income support. These measures included support for self-employed workers and wage subsidy schemes (which are not calculated in terms of hours not worked, but rather as a lump sum or a share of the wage bill). Other measures included various reductions in indirect labour costs (related to job retention), sick leave and special leave benefits, and other specific measures to extend the activity of atypical workers (e.g. intermittent or seasonal workers).

Secondly, in terms of governance, SURE showed the merit of the EU method, combined with light conditionality and flexible national implementation. SURE was initiated by the Commission following the EU Community method, rather than the intergovernmental approach. This ensured accountability and solidarity among Member States, while contributing to reducing any stigma. The Commission proposed light conditionality under SURE: the only condition was that Member States had faced a severe and sudden increase in spending on short-time work schemes and similar measures due to the pandemic. Together with the purpose-based scope of SURE, this light conditionality allowed Member States to retain ownership of the types and design of measures they implemented nationally, with SURE acting as a second line of defence.

Thirdly, the SURE instrument was underpinned by a robust financial construction. SURE came into existence based on a guarantee system provided by Member States. All Member States, including the eight that did not benefit from SURE, provided a total of EUR 25 billion of guarantees. These guarantees were provided voluntarily, and, once granted, became irrevocable, unconditional and on-call. This guarantee system is financially robust (while also a clear expression of solidarity through the EU budget). This system made SURE bonds highly credible to markets and credit rating agencies, paving the way for the strong investor demand that has materialised. The popularity of SURE, amongst both Member States and investors, has reduced the risk of stigma attached to the use of financial assistance by any particular Member State.

III.5. Conclusion

This section has provided an update on the use of SURE financial assistance up to 16 May 2022. It focuses on developments since the previous QREA article on SURE of July 2021. The section extends the analysis set out in the third biannual report on SURE, published in March 2022. The initial assessment of SURE's impact on job retention in 2020 has been confirmed with an updated and extended analysis, including that SURE contributed to preventing an estimated 1½ million people from becoming unemployed. The public policy support measures also prevented a divergence in unemployment across SURE beneficiary Member States.

Over the last 12 months, the pandemic has continued to evolve, requiring differing policy responses at various stages. In 2021, SURE's support for the rapid rebound appears to have outweighed any potential negative impact of impaired labour mobility. This has meant SURE has continued to be used in many Member States, and the effects of those policies will also become clearer as time goes on.

The section concludes by highlighting the three main reasons behind SURE's popularity and success, namely its social and economic purpose, its governance and its financial construction.

IV. Stress tests on the fiscal impact of extreme weather and climate-related events

By Nicola Gagliardi, Pedro Arevalo and Stéphanie Pamies

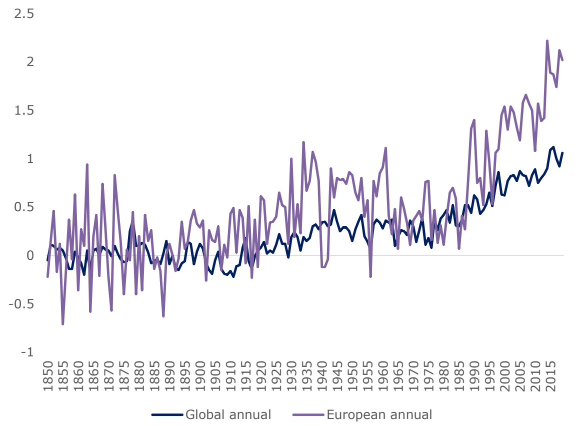
Abstract: *This section analyses the potential impact of climate change on public finances. We focus on the acute physical risks from climate change, with the aim of capturing the fiscal (debt) sustainability impacts associated with extreme weather and climate-related events. This is done by providing first, stylised stress tests in the context of the standard European Commission's Debt Sustainability Analysis (DSA) framework for selected EU Member States, using a comparative approach. Climate-related aggravating factors to fiscal (debt) sustainability are captured by drawing on information from a global natural disaster database as well as forward-looking estimates of economic losses from different climate events projected under different global warming pathways. Our results highlight that extreme weather and climate-related events may pose risks to fiscal (debt) sustainability in several countries, though the risks remain manageable under standard global warming scenarios. Our findings emphasise the importance of taking large-scale, rapid, and immediate climate mitigation and adaptation measures to dampen the adverse economic social and fiscal impacts of potentially more frequent and intense extreme events. This will reduce countries' exposure, vulnerability, and debt sustainability risks ([54]).*

IV.1. Introduction

Climate change is one of the biggest challenges of our times. There is broad scientific consensus that human activities are unequivocally responsible for the observed increases in greenhouse gases (GHGs) concentration in the atmosphere ([55]). The rise in anthropogenic GHGs generates a unique and global negative externality of the consumption of carbon-intensive goods, making climate change 'the greatest market failure that the world has ever seen' ([56]).

As a result, global temperature has been increasing markedly over the past century. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), emissions of GHGs from human activities are responsible for approximately 1.1°C of warming since 1850-1900, increasing at a rate of 0.2°C per decade since the 1970s. The impact has intensified over the last decade. Over 2010-2019, the global mean near-surface temperature was 0.9°C to 1.03°C warmer than the pre-industrial level. European land temperatures have increased even faster, by 1.7°C to 1.9°C, over the same period (Graph IV.1).

Graph IV.1: **Global and European temperature anomalies, 1850-2019**



(1) Temperature anomalies (i.e. degree Celsius differences) are presented relative to a 'pre-industrial' period between 1850-1899.
Source: European Commission, based on the European Environment Agency, Annual Global (Land and Ocean) temperatue anomalies - HadCRUT (degree Celsius) provided by Met Office Hadley Centre observations datasets.

Large-scale, rapid and immediate mitigation measures have the potential to limit climate change and its related effects. According to the IPCC's Sixth Assessment Report ([57]), average global temperature is expected to already reach or exceed 1.5°C of warming within the next 20 years. Under high (SSP3-7.0) and very high (SSP5-8.5) projected GHGs emission scenarios - i.e. assuming the world

([54]) This Section is an extract from Gagliardi *et al.* (2022), 'The Fiscal Impact of Extreme Weather and Climate Events: Evidence for EU Countries', European Economy Discussion Paper, European Commission, *forthcoming*, based on the related chapter published under the Fiscal Sustainability Report 2021, European Economy, Institutional Paper 171, April 2022, European Commission.

([55]) IPCC (2021), 'Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change', Cambridge University Press.

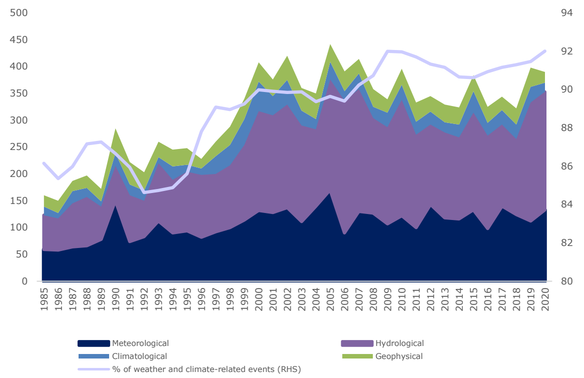
([56]) Stern, N. & Stern, N. H. (2007), 'The economics of climate change: the Stern review', Cambridge University Press.

([57]) IPCC (2021), *op. cit.*

would take a carbon-intensive pathway, in the absence of adequate mitigation policies - global warming of about 3°C to more than 5°C higher might occur by the end of the century. Limiting global warming to 1.5°C is expected to reduce risks to ecosystems and human activities ([58]).

Human-induced climate change has increased the risks of *physical* hazards, which will continue to intensify and interact with other risks, endangering both human and other natural systems ([59]) ([60]). These risks may emerge via a gradual (and, often, irreversible) global warming-driven transformation of the environment (e.g., ecosystem collapse, global sea level rise, and melting ice sheets –called *chronic physical risks*). Or they may emerge via more intense and frequent extreme weather and climate-related events (e.g. storms, floods, droughts, heat waves – called *acute physical risks* – Graph IV.2) ([61]). Every additional 0.5°C of global warming is likely to cause a significant increase in both the *intensity* and *frequency* of extreme weather and climate-related events, such as severe heatwaves, heavy precipitation, and drought ([62]). The risk of non-linearities and tipping points may further increase the likelihood for catastrophic and irreversible outcomes to occur ([63]).

Graph IV.2: **Global number of natural disasters, 1985-2020**



(1) LHS: number of meteorological (e.g. exteme temperature, storms), hydrological (e.g. floods), climatological (e.g. drought, wildfires), geophysical (e.g. earthquakes) events.
(2) RHS: the % (in terms of total natural disasters) of weather and climate-related events (i.e. meteorological, hydrological, climatological), shows as a 5-year moving average.
Source: European Commission, based on the Emergency Events Database (EM-DAT; CRED, UCLouvain).

Climate-driven *physical* risks also entail economic and fiscal consequences ([64]). Adverse economic impacts may occur through shocks to the supply and demand side of the economy caused by damage and disruption to critical infrastructure and property, reduced labour productivity, lower consumption and investment, disruption to global trade flows and other effects. Public finances are likely to be equally affected via, for instance, increased public spending, contingent liabilities materialising, and/or output losses.

Given the unavoidable rise of climate pressures in the years ahead, it is essential to analyse the potential macroeconomic and fiscal sustainability implications of climate change. This section analyses the potential impact of climate-related risks on public finances. In particular, we aim to capture the fiscal (debt) sustainability impacts associated with *acute physical risks* of climate change, notably arising from extreme weather and climate-related events ([65]). To carry out the analysis, we

([58]) IPCC (2021), *op. cit.*; United Nations Framework Convention on Climate Change (UNFCC; 2021), 'Conference of the Parties serving as the meeting of the Parties to the Paris Agreement', Glasgow.

([59]) IPCC (2022), 'Summary for Policymakers. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press.

([60]) Natural hazards become *disasters* when 'human lives are lost, and livelihoods damaged or destroyed' (CRED (2020), 'The Human Cost of Disasters (2000–2019)', United Nations Office for Disaster Risk Reduction, p. 8). In this chapter, we focus on natural *hazards* and *disasters* caused by 'extreme weather or climate-related' events. Earthquakes are not included in our definition.

([61]) The distinction between *extreme weather* and *extreme climate* events is not clear-cut and mainly depends on the adopted time scale. In particular, 'extreme weather events are associated with changing weather patterns, that is, within time frames of *less than a day* to a *few weeks*'. Instead, 'extreme climate events happen on *longer time scales*, and can be the accumulation of (extreme or non-extreme) weather events (such as the accumulation of moderately below-average rainy days over a season leading to substantially below-average cumulated rainfall and drought conditions' (IPCC (2012), 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change', Cambridge University Press, p. 117).

([62]) IPCC (2021), *op. cit.*

([63]) Lenton, T. M., *et al.* (2019) 'Climate tipping points—too risky to bet against', *Nature*, pp. 592-595.

([64]) Batten, S. (2018), 'Climate change and the macro-economy: a critical review', *Bank of England Staff Working Paper*, No. 706.

([65]) In addition to risks from direct *physical* impacts, the transition to a low-carbon economy is also expected to have significant effects on the economy and public finances (i.e. *transition risks* from climate change). While *physical* and *transition risks* 'are not independent of each other but tend to interact' (Batten et al. (2020), 'Climate change: Macroeconomic impact and implications for monetary policy', *Ecological, Societal, and Technological Risks and the Financial Sector*, Palgrave Macmillan, p. 16), due to methodological reasons this chapter strictly focuses on the provide first, stylised, stress tests in the context of the standard European Commission's Debt Sustainability Analysis (DSA) framework for selected EU Member States.

This Section is structured as follows. Sub-Section IV.2 gives an overview of the main theoretical and empirical literature on the macroeconomics of disasters. Sub-Section IV.3 presents stylised facts on Europe. Sub-Section IV.4 describes our assumptions, the stress-test approach, and our main results. Sub-Section IV.5 concludes.

IV.2. The macroeconomics of disasters

In this sub-section, we provide an overview of the theoretical and empirical research on the macroeconomics of natural disasters [66]. While still at its infancy, this literature provides a useful starting point to examine the economic and related fiscal impacts of extreme weather and climate-related events. Our aim is to define a set of evidence-based assumptions to underpin our debt sustainability stress tests.

The emerging consensus in the literature is that, on average, natural disasters tend to exert adverse impacts on economic growth in the short term [67]. The effects can flow via several transmission channels, affecting the main growth drivers through unanticipated shocks to the supply and demand side of the economy. On the supply side, extreme weather and climate-related events may significantly affect the agriculture sector and cause loss or damage to buildings, technology and infrastructure. More generally, extreme events may lead to capital stock loss or disruption, with repercussions on labour productivity, input shortages, and price volatility. Concurrently, losses from extreme events may lead to shocks on the demand side of the economy, via reductions in wealth and financial assets, which has a knock-on effect on consumption and investment. Global links with affected trading partners may cause reduced trade flows, value chain disruptions, and inflationary pressures [68]. Supply and demand shocks are expected to interact and to cause, at least in the short term, an immediate disruption to output and growth.

However, over the medium to long term, countries' macroeconomic dynamics may be expected to follow three, alternative, paths [69]:

1. *Creative destruction*: After an initial shock following a disaster, a period of faster growth might occur. This is the outcome of reconstruction efforts, aimed at replacing lost capital with new, modern, and innovative units. The economy is set to be on a higher growth path than before the event;

2. *Recovery to trend*: Though growth is expected to slow down in the aftermath of a disaster, output should gradually converge to its pre-disaster trend via a catching-up effect. The negative impact on growth is therefore only temporary [70];

3. *No recovery*: A disaster is expected to restrain growth due to the destruction of productive capital and durable consumption goods. Under this scenario, output does not rebound and remains permanently lower over the long term.

Despite mixed empirical evidence, most studies appear to confirm that a high-intensity disaster has an immediate negative impact on growth. In the medium and long term, the '*no recovery'* hypothesis is the most supported [71]. However, recent works clearly emphasise the importance of adequate disaster insurance coverage to offset these drawbacks. In particular, *uninsured losses* appear to

macroeconomic and fiscal impact of *(acute) physical* risks from climate change.

(66) Batten, S. (2018), *op. cit.*

(67) Ibid.

(68) See Batten, S. *et al.* (2020), *op. cit.* for a detailed review of the macro-economic impacts as well as monetary policy implications of climate change.

(69) *Ibid.*; Batten (2018), *op. cit.*; Hsiang, S. M., and Jina, A. S. (2014), 'The causal effect of environmental catastrophe on long-run economic growth: Evidence from 6,700 cyclones', *National Bureau of Economic Research*, No. w20352.

(70) The 'recovery to trend' hypothesis argues that growth should temporarily suffer in the aftermath of a natural disaster but should eventually rebound, causing income levels to converge back to their pre-disaster trend. A rebound might be expected as the marginal product of capital would rise when capital and labor become relatively scarce after a disaster (due to destruction and mortality), causing individuals and wealth to migrate into devastated locations until output recovers to the regional trend. The underlying logic of this hypothesis has mixed empirical support (For details, see Hsiang, S. M., and Jina, A. S. (2014), *op.cit.*).

(71) This conclusion is reported as an average impact from available studies so far. The latter encompass a wide range of countries, including advanced economies. For an overview of the empirical evidence around the short- and long-term economic impact of natural disasters, see Hallegatte et al. (2020), 'From poverty to disaster and back: A review of the literature.' *Economics of Disasters and Climate Change*, 4(1), 223-247; Batten *et al.*, (2020) *op. cit.*; Batten (2018) *op. cit.*

be the main driver behind the adverse macroeconomic shocks of natural catastrophes, both in terms of their impact and over the long term, insofar as productive capital is not replaced. By contrast, sufficiently insured losses are shown to be inconsequential in terms of foregone output. Disaster insurance coverage plays an important cushioning role, minimising the adverse shock to output and at the same time supporting the recovery (72). In particular, adequate insurance coverage appears to support post-catastrophe recovery (e.g., funding reconstruction projects) and cushion the contemporaneous impact of the disaster (i.e. contributing to prevention and disaster risk management) (73) .

In turn, natural disasters are also likely to have different impacts on public finances (74). For extreme weather and climate-related events, there may be *direct* impacts via upward pressure on public expenditure. This could be due to costs incurred to replace damaged (and/or lost) assets and infrastructure, social transfers to help the affected populations, and relief aid to affected industries and businesses. Extreme events may also lead to the materialisation of both *explicit* (e.g. relief or disaster-specific transfers to local governments, government guarantees for firms and public-private partnerships) and *implicit* contingent liabilities (e.g. public support to distressed financial institutions).

At the same time, disasters can have *indirect* impacts on public finances. These may include reductions in tax revenues following disaster-driven disruptions to economic activity in climate-sensitive sectors and regions. Funding reconstruction projects and post-disaster outcomes through budgetary resources reallocation and/or additional domestic/external borrowing might also affect the country's capacity to meet debt payments over the medium term. Related to this, vulnerability to natural disasters might generate increasing risks of uncertainty, affecting a country's creditworthiness and access to international financial accessibility (75).

Empirical evidence on the fiscal impact of natural disasters, especially for advanced economies, is quite limited and often based on selected case studies. Recent research has covered the macro-fiscal impacts of earthquakes and floods in EU Member States (76) and the role of fiscal policy to moderate the effects of natural disasters in US states (77). Other works have highlighted a relatively small but negative fiscal impact of individual disasters, with respect to the size of the economy.

This research finds that selected natural disasters occurring in the US and the EU have had an overall fiscal impact between 0.3% and 1.1% of GDP (78). Studies on a wider sample of countries find similar results. An additional large scale extreme event implies a fiscal deficit increase ranging between 0.23% and 1.4% of GDP, on average, depending on the country group (79). Moreover, the research finds that the fiscal response differs by disaster and degree of insurance coverage (80). Nevertheless, these estimates may be prone to underestimating the effect, mostly due to

(72) Fache Rousová *et al.* (2021), 'Climate change, catastrophes and the macroeconomic benefits of insurance', *Financial Stability Report*, European Insurance and Occupational Pensions Authority, July 2021; Von Peter *et al.* (2012), 'Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes', *BIS Working Papers*, No. 394.

(73) This may be due, for instance, to insurance companies requiring specific building codes and disaster risk management practices to (also) limit the extent of their own liabilities (Von Peter et al., 2012, op. cit., p. 16).

(74) This section focuses on the economic and fiscal impacts of extreme weather and climate-related disasters. However, public finances may also be subject to (direct and indirect) impacts from climate change policies (i.e. adaptation and/or mitigation). For an overview of these, see the 'Debt Sustainability Monitor 2019', European Economy, Institutional Paper 120, January 2020, European Commission.

(75) Radu, D. (2021), 'Disaster Risk Financing: Main Concepts and Evidence from EU Member States', European Economy, Discussion Paper 150, October 2021, European Commission; Zenios, S. A. (2021), 'The risks from climate change to sovereign debt in Europe', Available at SSRN 3891078.

(76) World Bank (2021), 'Financial Risk and Opportunities to Build Resilience in Europe', World Bank.

(77) Canova, F. and Pappa, E. (2021), 'Costly Disasters and the Role of Fiscal Policy: Evidence from US States', European Economy — Fellowship Initiative Discussion Paper 151, November 2021.

(78) Heipertz, M., and Nickel, C. (2008), 'Climate change brings stormy days: case studies on the impact of extreme weather events on public finances', Available at SSRN 1997256.

(79) Lis, E. M., and Nickel, C. (2010), 'The impact of extreme weather events on budget balances', *International Tax and Public Finance*, 17(4), 378-399. The identification of natural disasters differs across studies, depending on data availability. Heipertz and Nickel (2008) focus on the four most extreme weather events in the EU since 1990 and the two most extreme events that occurred in the US since 1990, for which the direct budgetary impact could be gathered. Lis and Nickel (2010) only consider large-scale events that meet at least one of the following criteria: (i) the number of persons affected is no less than 100,000, (ii) the estimated damage costs of the extreme weather events are no less than 1 billion US dollars (in constant 2000 dollars), (iii) the number of persons killed is no less than 1,000, (iv) the estimated damage costs are above 2% of GDP.

(80) Melecky, M., and Raddatz, C. E. (2011), 'How do governments respond after catastrophes? Natural-disaster shocks and the fiscal stance', *Natural-Disaster Shocks and the Fiscal Stance* (February 1, 2011), World Bank Policy Research Working Paper, 5564.

inherent difficulties in quantifying economic and fiscal outcomes. This may be due to the use of simplifying assumptions, differences in data, estimation methods, and identification approach ([81]). More importantly, all these estimates may be somewhat outdated, given the recent and expected increasing risk of disasters caused by human-induced climate change.

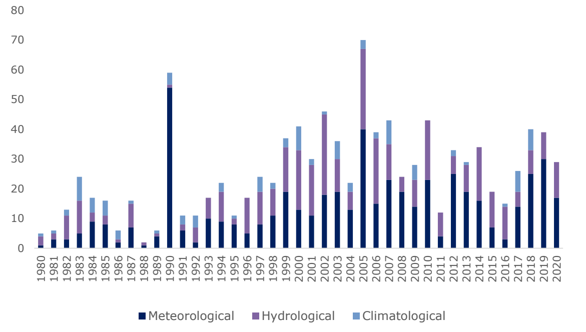
IV.3.Stylised facts on Europe

This Sub-Section describes the exposure of EU countries to extreme weather and climate-related events and the corresponding economic losses these events would cause. Our aim is to identify the most exposed and vulnerable countries for which it would be relevant to run stress tests under the DSA.

Trends of weather and climate-related events in the EU

Over the period 1980-2020, the EU experienced a total of 1,040 weather and climate-related disasters (out of 1,117 natural disasters) (Graph IV.3). Meteorological events were the most reported type of disaster, with 543 events recorded over that period, followed by hydrological (389) and climatological (108) ones. Storms and floods accounted for almost 70% (i.e. 35% each) of all reported disasters, alongside extreme temperature episodes (18%) and, to a lesser extent, wildfires (8%), droughts (3%), and landslides (2%) ([82]).

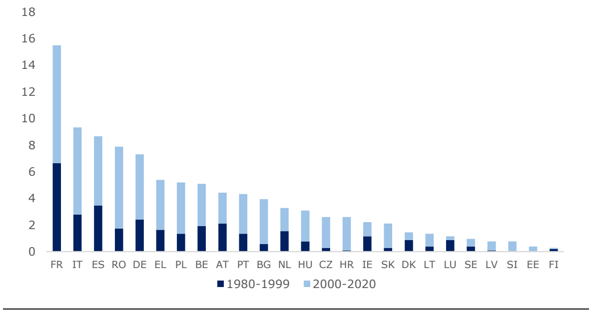
Graph IV.3: **: Number of weather and climate-related disasters in the EU, by disaster sub-group, 1980-2020**



(1) Meteorological (e.g. extreme temperature, storms), hydrological (e.g. floods), climatological (e.g. drought, wildifires)
Source: European Commission, based on the Emergency Events Database (EM-DAT; CRED, UCLouvain).

A country-level analysis shows that the events recorded over the 1980-2020 period were distributed quite unevenly across countries (Graph IV.4). France was the most struck country, reporting around 15% of all reported events, followed by Italy (9.3%), Spain (8.7%), Romania (7.8%), and Germany (7.3%). An average of around 5% of all disasters were reported in Greece, Poland, Belgium, Austria and Poland. The remaining countries recorded an average of around 3% each, with the exception of Sweden, Latvia, Slovenia, Estonia, and Finland, which recorded less than 1% of disasters.

Graph IV.4: **Geographical distribution (% of EU total) of weather and climate-related events in the EU, 1980-2020, per decade**



(1) Information for MT and CY is missing.
Source: European Commission, based on the Emergency Events Database (EM-DAT; CRED, UCLouvain).

Over the past 20 years, central-eastern European countries recorded a significant increase in the number of disasters (Graph IV.4). This has been particularly the case for Croatia, Czechia, Latvia, Slovakia, Bulgaria, Romania, and Hungary, alongside some southern European countries (Italy,

([81]) For instance, Heipertz and Nickel (2008) only focus on selected natural disasters and rely on long-term averages of budgetary elasticities to translate the economic damage (as % of GDP) into implied deficit increase. More sophisticated estimation methods data structures are used in both Lis and Nickel (2010) as well as in Melecky and Raddatz (2011). However, the former are not able to distinguish between direct and indirect fiscal impacts of extreme events. Instead, the fiscal response to natural disasters using annual (rather than higher frequency data), as in Melecky and Raddatz (2011), may lead to potential identification issues.

([82]) In the EM-DAT database, weather and climate-related disasters are identified in three main disaster subgroups (meteorological, hydrological, and climatological). In turn, each disaster subgroup encompasses main disaster types. In particular, meteorological events include episodes of extreme temperature, fog, and storms. Hydrological events include floods, landslides, and wave actions. Last, climatological events include episodes of drought, glacial lake outburst, and wildfires. For details, see https://www.emdat.be/classification.

Greece, and Portugal). Meteorological and hydrological events (mainly driven by storms and floods) were the main disaster types accounting for this increase.

Looking ahead, climate change is expected to lead to a significant increase in the frequency and strength of many types of weather and climate-related events ([83]). Evidence from literature shows projected increases in the severity, duration, and/or extent of several events, particularly heat waves, heavy precipitation, floods, droughts, and wildfires. However, the impacts are not expected to be felt evenly across Europe ([84]).

Economic losses from weather and climate-related events

Current available data indicate that, on average, the economic impact of weather and climate-related events should be contained. Over the period 1980-2020, economic losses accounted for a total of 3% of GDP in the EU. The annual average economic losses amount to less than to 0.1% of GDP ([85]). Although these figures may not (yet) appear as macro-economically significant, they are also very likely to suffer from underreporting of the actual effects ([86]). In addition, annual economic losses mask distributional impacts, with significant variations over time and across countries, depending on the occurrence of natural disasters.

Over the period 1980-2020, total economic losses ranged from almost 8% of GDP in Spain, 7% of GDP in Czechia, 5% in Romania and Portugal, to less than 1% of GDP in the Netherlands, Estonia, Lithuania, Sweden, Belgium, and Ireland. The effect of natural disasters on the overall economic losses has not been even over time as, quite often, single events have caused a significant share of total reported economic losses (Table IV.1).

Table IV.1: **Selected major weather and climate-related disasters and associated economic losses, by country, type and year**

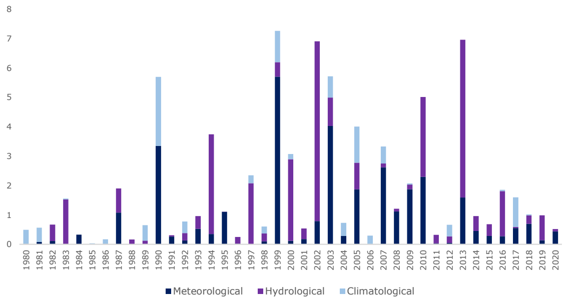
Country	Year	Disaster type	Related economic losses, % GDP	Total economic losses over 1980-2020, % GDP
BE	1990	Storm	0.5	0.8
BG	2005	Flood	1.5	3.3
CZ	1997	Flood	3.0	6.9
DK	1999	Storm	1.5	3.0
DE	2002	Flood	0.6	2.2
EE	2005	Storm	0.9	0.9
IE	1990	Storm	0.2	0.6
EL	1990	Drought	1.0	3.6
ES	1983	Flood	2.3	7.7
FR	1999	Storm	0.8	2.8
HR	2000	Extreme temp.	1.1	2.6
IT	1994	Flood	0.9	3.2
LV	2005	Storm	1.9	1.9
LT	2006	Drought	0.7	0.9
LU	1990	Storm	2.9	3.1
HU	1986	Drought	2.0	4.3
NL	1990	Storm	0.5	1.2
AT	2002	Flood	1.1	2.4
PL	1997	Flood	2.2	4.3
PT	2003	Wildfire	1.0	4.9
RO	2000	Drought	1.3	5.0
SI	2007	Storm	0.8	1.7
SK	2004	Storm	0.9	2.4
FI	1990	Storm	0.0	0.0
SE	2005	Storm	0.7	0.8

(1) 'Related economic losses' stand for the economic losses associated with each weather and climate disaster reported in the table. Total economic losses are the total reported for the country over the period 1980-2020. Data for CY and MT are missing.
Source: European Commission, based on the Emergency Events Database (EM-DAT; CRED, UCLouvain).

In the EU, hydrological and meteorological events have caused the majority of losses from weather and climate-related disasters. The impact has even increased over the past 20 years, with weather and climate-related events accounting for a cumulative 50% of total reported economic losses from natural disasters, compared to around 29% observed during the 1980-1999 period (see Graph IV.5).

([83]) IPCC (2021), *op. cit.*
([84]) EEA (2017), 'Climate change, impacts and vulnerability in Europe 2016 - An indicator-based report', European Environment Agency.
([85]) Based on the Emergency Events Database (EM-DAT; CRED, UCLouvain). The total estimated economic losses are defined as the value of all damages to property, crops, and livestock, as well as other losses related to the disaster. The registered figure corresponds to the value at the time of the event (https://www.emdat.be/Glossary).
([86]) This relates to data collection challenges and to the specific aim of different global natural disaster databases (See Box II.2.1, Part II, Chapter II, Fiscal Sustainability Report 2021, European Economy Institutional Paper 171, April 2022, European Commission)

Graph IV.5: **Economic losses from extreme weather and climate-related events in the EU (% of total events), by disaster subgroup, 1980-2020**



(1) Meteorological (e.g. extreme temperatures, storms), hydrological (e.g. floods), climatological (e.g. droughts, wildfires). Total events also include earthquakes.
Source: European Commission, based on the Emergency Events Database (EM-DAT; CRED, UCLouvain).

Economic losses from natural disasters are projected to increase at least two-to-threefold in the EU, by mid-century. By the end of the century, losses may increase by a further multiple (87). In particular, projections show that, compared to baseline climate conditions (88), economic losses are expected to be 1.9 times bigger by mid-century if global warming were contained to the (more ambitious) Paris Agreement target (1.5°C) by mid century. The impact would be 2.5 times bigger under the 2°C target, within the same horizon. The expected factor increase in projected economic losses for the EU's main regional aggregates are shown in Table IV.2.

In the longer term (by the end of the century), meeting the Paris target of 1.5°C will prove essential to contain increases in economic losses (Table IV.3). Losses are expected to rise threefold under the more favourable warming scenario, but to reach almost eight-to-fifteen times higher in the 2°C and 3°C warming scenarios. This is largely linked to the greater exposure of people and assets, driven by future socioeconomic development (i.e. linked to the growth of the size of the economy). Moreover, these figures mask significant differences across regions.

Table IV.2: **Factor increase in economic losses for the 1.5°C and 2°C warming scenarios, by mid-century, regional aggregates**

Regional aggregate	MF 1.5°C scenario	MF 2°C scenario
Mediterranean	x2.0	x2.3
Atlantic	x2.3	x3.4
Continental	x1.7	x2.1
Boreal	x1.6	x2.3
EU	**x1.9**	**x2.5**

(1) Mediterranean (PT, ES, IT, MT, CY, SI, HR, EL); Atlantic (IE, FR, BE, NL, LU); Continental (AT, DE, DK, PL, CZ, SK, RO, BH, HU); Boreal (FI, SE, LT, LV, EE).
(2) Factor increases are built with respect to baseline climate conditions (1981-2010) used in the PESETA IV project and represent the expected increase in economic losses from natural catastrophes under different global warming scenarios.
Source: European Commission, based on the PESETA IV project (Feyen et al., 2020, op.cit.)

Table IV.3: **Factor increase in economic losses for the 1.5°C, 2°C, and 3°C warming scenarios, by the end of the century, regional aggregates**

Regional aggregate	MF 1.5°C scenario	MF 2°C scenario	MF 3°C scenario
Mediterranean	x3.2	x6.6	x10.8
Atlantic	x3.8	x13.9	x25.1
Continental	x2.6	x5.4	x11.0
Boreal	x2.6	x5.6	x12.8
EU	**x3.0**	**x7.9**	**x14.9**

(1) Mediterranean (PT, ES, IT, MT, CY, SI, HR, EL); Atlantic (IE, FR, BE, NL, LU); Continental (AT, DE, DK, PL, CZ, SK, RO, BH, HU); Boreal (FI, SE, LT, LV, EE).
(2) Factor increases are built with respect to baseline climate conditions (1981-2010) used in the PESETA IV project and represent the expected increase in economic losses from natural catastrophes under different global warming scenarios.
Source: European Commission, based on the PESETA IV project (Feyen et al., 2020, op.cit.)

Nevertheless, the projected economic impacts do not include all potential consequences from climate changes. They do not include other key items (e.g. irreversible damage to nature and species losses) and the consequences of passing tipping points. In addition, they do not capture the full effects of extreme events in all sectors. Hence, these projections are only meant to serve as a *lower bound* of expected adverse economic impacts from climate change in the EU (89).

(87) Feyen *et al.* (2020), 'Climate change impacts and adaptation in Europe', JRC PESETA IV final report (No. JRC119178), JRC Science for Policy Report, Joint Research Centre, European Commission. Projections of economic losses (in 2015 values) in the PESETA IV project are provided on the basis of a dynamic assessment', evaluating how natural catastrophes combined with different global warming levels would impact EU society 'as projected for 2050 and 2100 according to the ECFIN Ageing Report 2015 projections of population and the economy.

(88) In the PESETA IV project, projections of economic losses are calculated against specific 'baseline climate conditions', identified as the period 1981-2010 (Feyen *et al.*, 2020).

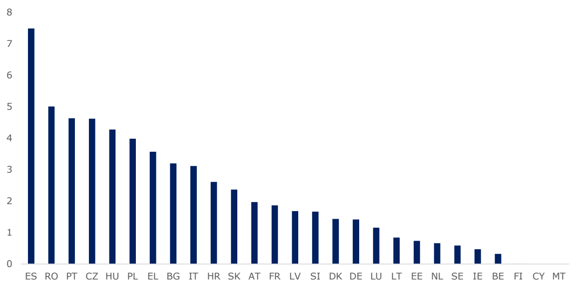
(89) Ibid.

The role of insurance coverage

Adequate insurance coverage can reduce the adverse economic impacts of natural disasters. Though they do not prevent the loss of assets, well-designed climate risk insurance policies help countries better manage and mitigate the economic impact of disasters, by acting as a safety net and buffer after an extreme event while, at the same time, promoting risk awareness ([90]).

In turn, the distribution of *uninsured* economic losses, or the 'climate protection gap' provides a more comprehensive overview of EU countries' past relative economic exposure to extreme weather and climate-related events (Graph IV.6).

Graph IV.6: **Cumulative uninsured economic losses from weather and climate events (% of country GDP), by country, 1980-2020**



(1) The figures reported come from EM-DAT, which provide data on total and insured economic losses. As also documented in the Fiscal Sustainability Report (Part II, Chapter II), this dataset is likely to suffer from underreporting. However, this is the only publicly available dataset with a broad coverage on extreme weather and climate-related events.
(2),Information for CY and MT is missing.
Source: European Commission, based on The Emergency Events Database (EM-DAT; CRED, UCLouvain).

This shows that in terms of countries' economic size, the southern and eastern European countries appear to have been the most exposed. This is the case for Spain (with cumulated uninsured economic losses representing 7.5% of GDP over 1980-2020), Romania (5% of GDP), Portugal, Czechia, Hungary (4.5% of GDP), followed by Poland (around 4% of GDP) and an impact ranging from 3% to 3.5% of GDP for Greece, Bulgaria, and Italy. By contrast, countries with sufficient insurance coverage, despite having relatively high occurrences of natural disasters, have a lower economic exposure (e.g. Germany, Belgium, and Austria) ([91]).

IV.4.Stress tests

The following section provides first stylised stress tests on the fiscal impact of *acute physical risks* from climate change. This is done by drawing upon our review of the literature and the stylised facts presented above. Our purpose is to capture risks associated with *one-off* extreme weather and climate-related events over the medium term, in the form of aggravating factors to debt sustainability.

Assumptions and methodology

In our stress tests, we adopt a comparative approach. We illustrate, in a given country, the deviation from the Commission's 10-year baseline debt-to-GDP projections, should a past extreme event reoccur in the medium term. However, to account for potential interactions between climate change and the expected intensity/frequency of extreme events, we then further calibrate the impact according to different global warming scenarios (1.5°C and 2°C). In each scenario, we assume the specific extreme event to simultaneously exert both a *direct* impact on government accounts (i.e. via the primary balance), thus affecting the debt level, and an *indirect* impact via GDP (growth and level) effects (also affecting the debt ratio, via denominator effects) ([92]).

The *direct* shock to public finances (via the primary balance) is calculated based on past country-specific exposure to extreme events, augmented by the expected increase in economic losses from extreme events due to climate change. We first rely on the annual distribution (from 1980 to 2020) of the *uninsured* economic losses (% of GDP) available

([90]) Cebotari, A., & Youssef, K. (2020). Natural Disaster Insurance for Sovereigns: Issues, Challenges and Optimality, *IMF Working Paper*, WP/20/3, Schäfer et al., (2016), 'Making climate risk insurance work for the most vulnerable: seven guiding principles', *Policy report 2016, No.1,* UNU-EHS Publication Series, European Commission (2013), COM(2013) 213 final.

([91]) For additional stylised facts on exposure to weather and climate-events in the EU, see Gagliardi et al. (2022), *op. cit.*

([92]) The intuition behind our 'extreme event stress test' scenarios partly draws on the work by International Monetary Fund (IMF) and the World Bank, which recently brought in a tailored stress test for natural disasters in their revised Joint Debt Sustainability Framework for Low-Income Countries (see the Guidance Note on the Bank-Fund Debt Sustainability Framework for Low Income Countries, 2017). However, their 'natural disaster' stress test relies on the EM-DAT database and is tailored to the country-specific history, but not to future expected impacts from climate change. Our stress tests take a novel approach, both in terms of calibration methodology and country selection criteria (see Sub-Section IV.4 for details).

for all EU countries from the EM-DAT database [93]. Then, for each country, we identify the *maximum* of the annual distribution as an instance of 'extreme' (or 'tail event') occurrence [94]. Subsequently, in order to account for the likely increase in economic losses from climate events due to a warmer climate, we calculate the overall direct fiscal impact by interacting the country-specific extreme value (i.e. the maximum) with a given factor increase [95].

In our stress tests, we take a medium-term perspective. So we calculate the *direct* fiscal shock by relying on the factor increase computed for the 1.5°C and 2°C medium-term scenarios (Table IV.2) [96]. In each scenario, our assumed *direct* fiscal impact (i.e. country-specific extreme value multiplied with the corresponding factor increase see Table IV.4) is translated into a *one-off* adverse shock on the country's debt trajectory via an impact on the primary balance. This is applied in the first year after the European Commission's government debt forecast horizon (i.e. in 2024) [97] [98].

Table IV.4: **Assumed direct fiscal impact of a one-off extreme event (% GDP), by country and warming targets (1.5°C and 2°C),**

	1.5°C scenario	2°C scenario
BE	0.4	0.5
BG	2.7	3.2
CZ	4.3	5.2
DK	0.9	1.0
DE	0.9	1.1
EE	1.2	1.7
IE	0.4	0.6
EL	2.0	2.4
ES	4.5	5.3
FR	1.2	1.7
HR	2.4	2.8
IT	1.7	2.0
CY	n.a.	n.a
LV	2.7	3.8
LT	1.2	1.7
LU	2.4	3.4
HU	3.5	4.3
MT	n.a.	n.a
NL	0.5	0.8
AT	1.6	2.0
PL	3.4	4.1
PT	2.1	2.4
RO	2.8	3.4
SI	1.6	1.9
SK	1.6	1.9
FI	0.0	0.0
SE	0.9	1.2

(1) For instance, in CZ, the fiscal shock in the 1.5°C scenario amounts to 4.3% of GDP. This value is obtained as follows: the maximum value of uninsured losses (% GDP) in Czechia was recorded in 1997 and amounted to 2.5% of GDP. In our stress tests, this value is multiplied by a factor increase of 1.7 (corresponding to the factor increase identified under the 1.5°C scenario for the country's corresponding regional aggregate (i.e. Continental - see Table IV.2). The direct fiscal shock is then translated into a *one-off* adverse shock on the debt trajectory, via an impact on the primary balance, applied in the first year after the European Commission's government debt forecast horizon (i.e. in 2024).
Source: European Commission, based on The Emergency Events Database (EM-DAT; CRED, UCLouvain) and the PESETA IV project (Feyen et al., 2020, op.cit.).

As for *indirect* shocks to GDP (i.e. both growth and level), we rely on recent empirical evidence. Given our focus on *uninsured* economic losses, we first assume an adverse shock to growth to occur in the aftermath of a disaster. To this end, we rely on estimates from a recent study of the European Insurance and Occupation Pensions Authority on OECD countries [99]. The study finds that large-scale disasters with low insurance coverage have, on average, an adverse effect (of around -0.5%) on annual GDP growth rate. In turn, we assume, for each country, a reduction in actual GDP growth (i.e. an impact of -0.5% compared to the baseline)

[93] Information on Malta and Cyprus is not provided in the EM-DAT database. In line with the literature presented in Section IV.2, *uninsured losses* appear to be the main driver behind the adverse macroeconomic shocks of natural catastrophes.

[94] While there is no single definition for what is meant by extreme events, they are generally defined as 'either taking *maximum* values or *exceedance* above pre-existing high thresholds' (Stephenson, D. B. et al. (2008). 'Definition, diagnosis, and origin of extreme weather and climate events.' *Climate extremes and society*, 340, p. 12).

[95] Our factor increase is constructed on a regional basis. Following the PESETA IV project (Feyen *et al.* (2020), *op.cit.*), we identify four regional aggregates: *Mediterranean*, *Atlantic*, *Continental*, and *Boreal*.

[96] The PESETA IV (*ibid.*) study projects economic losses under the 1.5°C and 2°C scenarios as expected to occur by mid-century. Economic losses associated with the 3°C scenario are only projected for the end of the century. While the medium-term projections (i.e., by mid-century) are more forward-looking than our debt projection horizon (2021-2032), recent evidence shows that the 1.5°C limit is already likely to be reached as early as 2030 and the early 2050s, unless concerted action is taken to reduce greenhouse gas emissions (IPCC, 2018). The absence of any significant mitigation measures may also increase the likelihood of a closer 2°C warming scenario.

[97] A country's (initial) primary balance may already include some provisions for natural disasters, and common emergency funds (e.g. EUSF) may partly cover some damages. However, for the sake of simplicity, we show what would be the approximate overall impact on public finances, should a past extreme event reoccur in the medium term, in the absence of significant climate mitigation and adaptation measures. The calibration of the shock based on *uninsured* losses allows to already account for potential risk-sharing between the private and public sector.

[98] For references of alternative assumptions used in empirical studies on the fiscal impact of extreme events, see the Debt Sustainability Monitor 2019, *op. cit.* Our stress tests are based on the European Commission's Autumn 2021 macroeconomic and fiscal forecast.

[99] Fache Rousová *et al.* (2021), *op. cit.*

in the same year of the direct fiscal shock (i.e. 2024). In addition, we assume that the adverse effect on GDP growth translates into permanently lower levels of GDP, compared to the baseline ([100]). This is in line with recent empirical evidence of the long-term macroeconomic consequences of uninsured natural catastrophes, pointing to '*no recovery*' effects – with post-disaster output continuing to grow in the long term, but on a lower trajectory ([101]).

Main results

The stress tests are only carried out for a set of highly exposed and vulnerable countries ([102]). These are Spain, Romania, Portugal, Czechia, Hungary, Poland, Greece, Italy, Austria, France, Belgium, Germany, and The Netherlands.

The stress tests show non-negligible fiscal impacts in some countries. The results of the simulated debt projections for the selected countries are reported in Table IV.5 and Graph IV.7.

- *Spain* is one of the most affected countries. The debt-to-GDP ratio is projected to be higher, in 2032, by 4.5 pps of GDP and 5.2 pps of GDP in the 1.5°C and 2°C scenarios respectively, compared with the baseline, also given the high debt level.

- Similar results are found for *Czechia*, with a difference of 4.0 pps of GDP and 4.7 pps of GDP respectively by 2032 compared with the baseline, and for *Hungary*, where the 1.5°C (2°C) warming scenario is projected to result in 3.1 (3.7) additional percentage points in the debt-to-GDP ratio by 2032.

([100]) In our stress tests, this translates into an adverse effect on potential GDP growth.
([101]) Batten (2018), *op.cit.*; Von Peter *et al.* (2012), *op.cit.*
([102]) We rely on specific selection criteria. In particular, out of the EU countries that had over the 1980-2020 period (according to the EM-DAT database) the highest overall share of *uninsured* economic losses (% GDP) and the highest overall number of natural disasters, we select those countries that: i) have experienced at least 2 peaks in the number of reported events, and; ii) have experienced an increase in the number of reported events over the last 20 years, and; iii) are at 'medium-to-high' vulnerability to acute physical risks in the long term, according to the SwissRE Climate Economic Index ('The economics of climate change: no action not an option.', Swiss RE institute, April 2021). A peak is identified if the number of natural disasters, for a given country and in a given year, is higher than the corresponding upper end (i.e. 90[th] percentile) of the country's annual number of observed events over 1980-2020.

Table IV.5: **Debt-to-GDP projections of selected countries, baseline versus 1.5°C and 2°C warming scenarios**

Debt-to-GDP projections					
Spain	**2021**	**2023**	**2024**	**2032**	**2032 change**
Baseline	120.6	116.9	120.3	126.1	
1.5°C scenario	120.6	116.9	125.4	130.6	4.5
2°C scenario	120.6	116.9	126.2	131.3	5.2
Romania	**2021**	**2023**	**2024**	**2032**	
Baseline	49.3	53.2	54.3	76.9	
1.5°C scenario	49.3	53.2	57.4	79.6	2.7
2°C scenario	49.3	53.2	57.9	80.1	3.2
Portugal	**2021**	**2023**	**2024**	**2032**	
Baseline	128.1	122.7	121.8	126.2	
1.5°C scenario	128.1	122.7	124.5	128.6	2.4
2°C scenario	128.1	122.7	124.9	129.0	2.7
Czechia	**2021**	**2023**	**2024**	**2032**	
Baseline	42.4	46.3	48.0	67.1	
1.5°C scenario	42.4	46.3	52.6	71.1	4.0
2°C scenario	42.4	46.3	53.5	71.8	4.7
Hungary	**2021**	**2023**	**2024**	**2032**	
Baseline	79.2	76.4	74.9	68.1	
1.5°C scenario	79.2	76.4	78.8	71.3	3.1
2°C scenario	79.2	76.4	79.5	71.9	3.7
Poland	**2021**	**2023**	**2024**	**2032**	
Baseline	54.7	49.5	48.2	48.3	
1.5°C scenario	54.7	49.5	51.8	51.1	2.8
2°C scenario	54.7	49.5	52.5	51.7	3.4
Greece	**2021**	**2023**	**2024**	**2032**	
Baseline	202.9	192.1	185.9	154.7	
1.5°C scenario	202.9	192.1	188.8	157.3	2.6
2°C scenario	202.9	192.1	189.2	157.5	2.8
Italy	**2021**	**2023**	**2024**	**2032**	
Baseline	154.4	151.0	150.6	161.6	
1.5°C scenario	154.4	151.0	153.0	163.9	2.2
2°C scenario	154.4	151.0	153.3	164.1	2.5
Austria	**2021**	**2023**	**2024**	**2032**	
Baseline	82.9	77.6	76.9	76.3	
1.5°C scenario	82.9	77.6	78.9	77.9	1.6
2°C scenario	82.9	77.6	79.2	78.1	1.9
France	**2021**	**2023**	**2024**	**2032**	
Baseline	114.6	112.9	114.2	122.3	
1.5°C scenario	114.6	112.9	116.0	123.8	1.5
2°C scenario	114.6	112.9	116.5	124.2	1.9
Belgium	**2021**	**2023**	**2024**	**2032**	
Baseline	112.7	114.6	116.5	133.6	
1.5°C scenario	112.7	114.6	117.5	134.4	0.8
2°C scenario	112.7	114.6	117.6	134.5	0.9
Germany	**2021**	**2023**	**2024**	**2032**	
Baseline	71.4	68.1	67.0	61.6	
1.5°C scenario	71.4	68.1	68.3	62.6	1.0
2°C scenario	71.4	68.1	68.4	62.8	1.1
The Netherlands	**2021**	**2023**	**2024**	**2032**	
Baseline	57.5	56.1	56.0	62.8	
1.5°C scenario	57.5	56.1	56.8	63.5	0.7
2°C scenario	57.5	56.1	57.1	63.7	0.9

(1) The 2032 change measures the difference, in 2032, between debt-to-GDP in the 1.5°C and 2°C scenarios, respectively, compared to the baseline.
Source: European Commission, based on The Emergency Events Database (EM-DAT; CRED, UCLouvain) and the PESETA IV project (Feyen et al., 2020, op.cit.).

- *Poland, Romania*, and *Greece* follow (with an average of 2.7 pps of GDP and 3.1 pps of GDP difference in 2032 compared with the baseline, in each scenario, respectively).

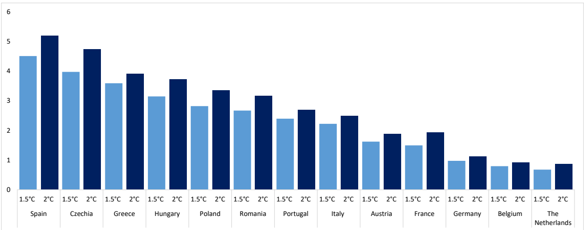
- In *Italy*, both the 1.5°C and 2°C scenarios are expected to lead to a difference of 2.2 pps of

GDP to 2.5 pps of GDP by the end of the horizon, compared to the baseline projections.

- The impact will also be quite significant for *Austria* and *France*, with projected difference of 1.5 pps of GDP and 1.9 pps of GDP compared with the baseline.

- *Germany*, *Belgium*, and *The Netherlands* report the lowest difference in debt-to-GDP ratios by the end of the horizon, in each warming scenario.

Graph IV.7: **Debt-to-GDP difference (pps.), 1.5°C and 2°C scenarios compared to the baseline, 2032**



Source: European Commission, based on The Emergency Events Database (EM-DAT; CRED, UCLouvain) and the PESETA IV project (Feyen et al., 2020, op.cit.)

Our stress tests confirm the macroeconomic relevance of climate-related disasters and the related risks to government finances, although remaining manageable under limited, medium-term, global warming scenarios. Despite the still favourable interest-growth rate differentials assumed in the projections, and the *one-off* nature of the simulated shock, the negative impact on debt projections appears significant and persistent over time. However, our results are likely to represent an underestimation of the expected fiscal impact. This is due to potential underreporting of economic losses in global disaster databases (unable to fully reflect damages to uninsured public assets), the use of *lower bound* estimates of the expected adverse economic impact from climate events in the EU, as well as unaccounted risks from non-linearities and tipping points, potential negative feedback effects across sectors, and/or adverse spillover effects across countries, combined with our medium-term perspective. Overall, our results support calls for increased policy attention to address the 'climate protection gap' as well as the need to strengthen climate-related risk management and financing frameworks, both at national and EU levels.

IV.5.Conclusion

This section illustrates stylised stress tests on the fiscal impact of extreme weather and climate-related event for selected EU countries. The tests are designed as shocks to public finances and growth, in the context of the European Commission's standard DSA framework. Our results highlight that *physical* risks from climate change may pose some risks to countries' fiscal (debt) sustainability. The findings underscore the need to take large-scale, rapid, and immediate mitigation and adaptation policies, including insurance and climate-resilient debt instruments, to boost countries' financial resilience to climate change and dampen the fiscal impact of climate-related events. Concerted action towards ambitious global and EU climate targets remains essential to reduce countries' exposure and vulnerability to climate change.

As documented, practical caveats remain. Modelling limitations and current data availability constitute important challenges. The present assessment necessarily builds on several simplifying assumptions and only provides a partial perspective of climate-related fiscal (debt) sustainability risks, given the focus on fiscal impact of *acute physical* risks. Relatedly, the existing international datasets recording extreme weather and climate-related events are not (fully) publicly available, and/or often provide a partial reporting of impacts. In addition, the reporting of total economic losses is not done following a common standard, which makes it difficult to disaggregate the total losses between private and public sector, with consequences on the estimation of related fiscal impacts.

Going forward, in addition to factoring in the risks from direct *physical* events, a broader assessment will need to encompass the net fiscal impact of mitigation policies aimed at supporting the transition to climate-neutral economies. It should also encompass adaptation policies, aimed to anticipate the adverse effects of climate change and to take appropriate action to prevent or minimise the damage they can cause. Overall, the development of standard harmonised reporting frameworks at EU level remains an essential aspect to build fiscal resilience. This includes better reporting and assessments of the macroeconomic impacts of extreme events, planned climate mitigation and adaptation policies, and the related potential fiscal risks.

Annex. The euro area chronicle

The Commission, the Ecofin Council and the Eurogroup regularly take decisions that impact the functioning of the Economic and Monetary Union (EMU). In order to keep track of most relevant decisions, the QREA features a chronicle of major legal and institutional developments, presented in a chronological order with references. This issue of the chronicle covers developments between mid-March 2022 and mid-July 2022. In May, the European Commission provided Member States with guidance for their macroeconomic policy. In June, the Commission adopted the 2022 Convergence Report, concluding that Croatia was ready to adopt the euro on 1 January 2023 and the Eurogroup agreed on the release of the seventh tranche of policy-contingent debt measures for Greece ([103]).

Recovery fund disbursement to Portugal. In the second quarter of 2022, the European Commission continued to transfer funds under the Recovery and Resilience Facility (RRF). On 25 January 2022, Portugal submitted to the Commission a payment request under its recovery and resilience plan based on the achievement of the 35 milestones and targets of the first instalment of the non-repayable support and three milestones of the first instalment of the loan support. The milestones cover reforms in health, social housing, social services, investment and innovation, qualifications and skills, forestry, the blue economy, the bio-economy, renewable gases (including hydrogen), public finances and public administration. Several targets also concern investments in infrastructure, decarbonisation of industry and digital education. On 25 March 2022, the Commission adopted a positive preliminary assessment of Portugal's request ([104]). Following a discussion between Member States, including in the Economic and Financial Committee, the Commission transferred EUR 1.16 billion to Portugal.

Economic policy guidance for euro area Member States. On 23 May, the Commission adopted a package providing Member States with guidance for their macroeconomic policy, two years on from the first impact of the COVID-19 pandemic and in the midst of Russia's ongoing invasion of Ukraine ([105]). The package links the European Semester (the process for coordinating Member States' macroeconomic policies), the RRF and REPowerEU. The objective of the Commission's REPowerEU, adopted on 18 May ([106]), is to rapidly reduce the EU's dependence on Russian fossil fuels. Fast-forwarding the clean transition and achieving a more integrated energy system would make the euro area more resilient and would reduce the negative impact of external energy shocks on inflation and monetary policy. The RRF will continue to drive Member States' reform and investment agendas for the years to come. It is the main tool to speed up the twin green and digital transition. The country-specific recommendations adopted in the context of the European Semester provide guidance to Member States to adequately respond to persisting and new challenges and deliver on shared key policy objectives. This year, they include recommendations for reducing the dependency on fossil fuels through reforms and investments, in line with the REPowerEU priorities and the European Green Deal.

Assessment of macroeconomic imbalances. The Commission has also assessed the existence of macroeconomic imbalances for the nine-euro area Member States (Germany, Ireland, Greece, Spain, France, Italy, Cyprus, the Netherlands, and Portugal). Overall, vulnerabilities are receding and are falling below their pre-pandemic levels in various Member States and notable policy progress has been made in addressing existing macroeconomic imbalances, justifying a revision of the classification of imbalances in two countries, Ireland and Croatia. In these two countries, debt ratios have declined significantly over the years and continue to display strong downward dynamics. Five euro area Member States (Germany, Spain, France, the Netherlands, and Portugal) continue to experience imbalances, and three Member States (Greece, Italy, and Cyprus) continue to experience excessive imbalances.

([103]) Annex compiled by Jakub Wtorek. The cut-off date for this annex is 19 July 2022.
([104]) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1965
([105]) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3182
([106]) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

Fiscal policy guidance. The country-specific recommendations adopted in May also provide orientations for the Member States' fiscal policy going forward. The specific nature of the macroeconomic shock caused by Russia's invasion of Ukraine, as well as its long-term implications for the EU's energy security needs, call for a careful design of fiscal policy in 2023. Fiscal policy should expand public investment for the green and digital transition and energy security. Full and timely implementation of the recovery and resilience plans is key to achieving higher levels of investment. Fiscal policy should be prudent in 2023, by controlling the growth in nationally financed primary current expenditure, while allowing automatic stabilisers to operate and providing temporary and targeted measures to mitigate the impact of the energy crisis and to provide humanitarian assistance to people fleeing from Russia's invasion of Ukraine. Moreover, Member States' fiscal plans for next year should be anchored by prudent medium-term adjustment paths reflecting fiscal sustainability challenges associated with high debt-to GDP levels that have increased further due to the pandemic. Fiscal policy should also stand ready to adjust current spending to the evolving situation. On 11 July, the Eurogroup adopted a statement on the budgetary situation in the euro area and fiscal policy orientations for 2023, in which the Ministers called to focus fiscal support on the most vulnerable, and that the measures are temporary, targeted and not stimulating further demand for energy.

Agreement on policy-contingent debt measures for Greece. On 23 May 2022, the Commission adopted the 14th enhanced surveillance report for Greece ([107]). The report assesses Greece’s progress on policy commitments made at the Eurogroup in June 2018. On 16 June, the Eurogroup welcomed the EU institutions' assessment that Greece had met the conditions needed to release the seventh tranche of policy-contingent debt measures, worth EUR 748 million. The Eurogroup also welcomed the Commission’s intention not to prolong enhanced surveillance after its expiration on 20 August 2022, given the successful delivery of the bulk of Greece’s policy commitments.

Preparations to enable Croatia to adopt the euro. On 1 June 2022, the Commission adopted the 2022 convergence report assessing the progress that Bulgaria, Czechia, Croatia, Hungary, Poland, Romania and Sweden had made in joining the euro area ([108]). The report concluded that Croatia was ready to adopt the euro on 1 January 2023, bringing the number of euro area Member States to 20. In particular, Croatia fulfils the four nominal convergence criteria (on price stability, public finances, exchange rate, and long-term interest rate) and its legislation is fully compatible with the requirements of the Treaty on the Functioning of the EU and the Statute of the European System of Central Banks / European Central Bank (ECB). The ECB’s own convergence report complemented the Commission’s assessment ([109]). On 16 June, the Eurogroup recommended that Croatia become the 20th member of the euro area. The process was concluded on 12 July when the Economic and Financial Affairs Council adopted the three legal acts that were necessary to enable Croatia to introduce the euro, ([110]) including the act setting the conversion rate between the euro and the Croatian kuna at 7.53450 kuna per 1 euro.

([107]) https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/financial-assistance-eu/which-eu-countries-have-received-assistance/financial-assistance-greece_en
([108]) https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3312
([109]) https://www.ecb.europa.eu/pub/convergence/html/index.en.html
([110]) https://www.consilium.europa.eu/en/meetings/ecofin/2022/07/12/

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