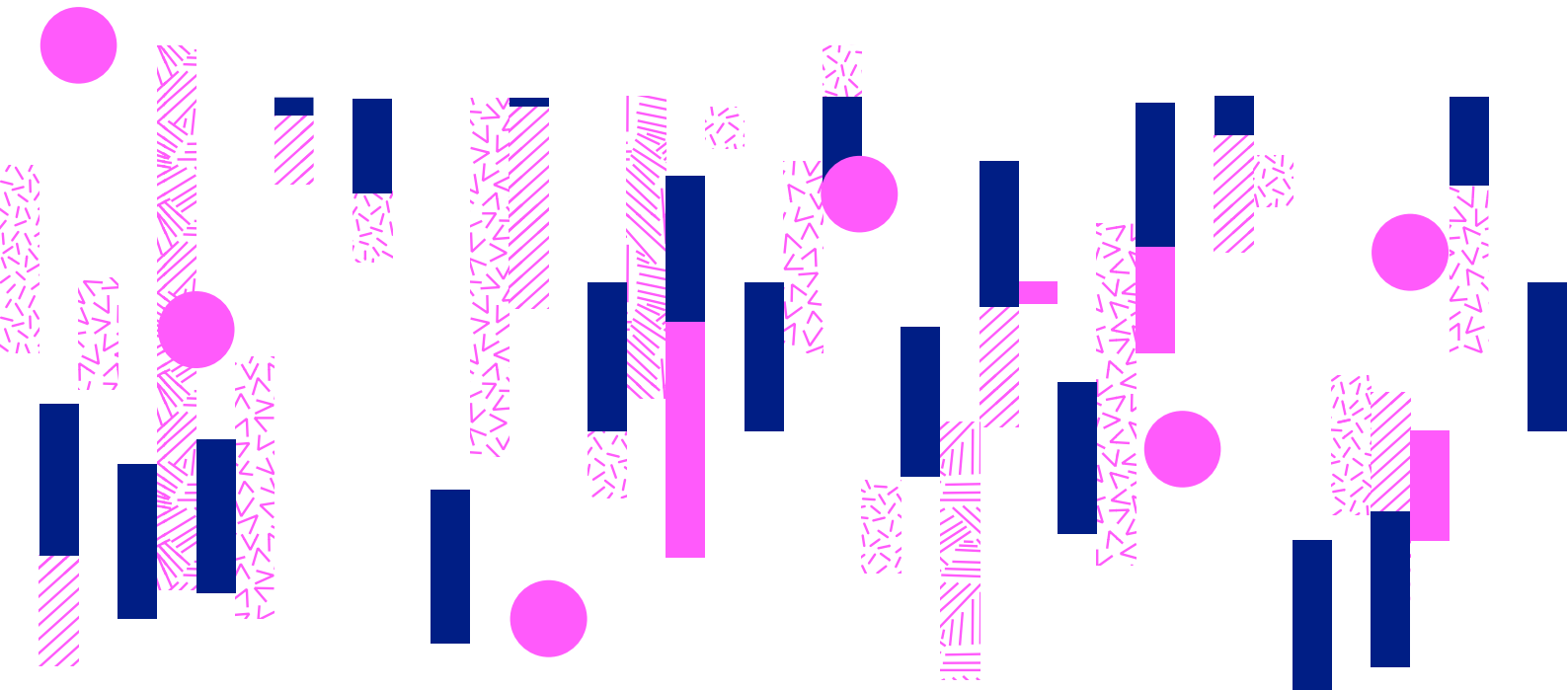# Recent trends in EU corporate demography and policy:
COVID and beyond

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Executive Summary[1]

Objectives

The COVID-19 crisis had a deep and ongoing impact on European firms, especially SMEs. In response, national governments and the EU deployed massive policies aiming notably at preserving businesses. Despite a shared understanding of the importance of the policy response, its impact on corporate demographics is yet understudied.[2] The objective of this paper is to provide a comprehensive picture of the evolution of EU corporate demography during the crisis by:

1. Assessing the impact of the COVID-19 crisis on the demography of SMEs and Mid-caps via its effect on bankruptcies and firm creations, and
2. Assessing the mitigating impact of the public policy response.

This paper explores the effects of the crisis on EU corporate demography and tries to establish potential causal links. Results are decomposed by country, sector, and firm age. We also provide first insights into the effectiveness of mitigating policies.

Data

We use a unique dataset that combines data on corporate demography and policy responses. Concerning corporate demography, we use weekly observations on bankruptcy and corporate establishment rates from January 2015 to March 2021. This granular data is retrieved from Bureau Van Dijk's Orbis database.[3] Albeit with certain limitations, it allows to decompose the effects of the crisis in time and between types of firms. We match this demographic data with COVID-19 fiscal policy responses from January 2020 to March 2022, which we compiled from the ESRB COVID measures database. Policies were classified by instruments and target population. Information on the timing of policies allows us to match them contemporaneously with corporate demographics at country-level.

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[2] A number of studies provided simulated impact assessments.

[3] The timeframe is limited to March 2021 because of the availability of Orbis statistical data.

Results

The crisis initially affected business creation rates more than bankruptcy rates

- In the long term, Orbis data shows that EU business creation rates decreased and bankruptcy rates increased between 2015 and 2019. In 2020, the COVID crisis started.
- This crisis deeply affected EU firms in the 12 months following March 2020:
    - We find a sizable impact on corporate demography:
        - Bankruptcy rates decreased by 22% then got back to historical trends at the end of 2020. This led to a 0.62% *increase* in EU corporate population.
        - Business creations rates decreased by 11% compared to a counterfactual situation without COVID. This led to a 1.38% *decrease* in EU corporate population.
        - The overall share of "missing" firms is 0.77% of our Orbis data, i.e. around 293,000 firms. This is equivalent in Orbis to the number of all Hungarian firms or of all German agricultural firms.
    - We observe major divergences in impact:
        - Between countries: from 8% missing firms to 4% additional firms.
        - Between sectors: from 3% missing firms to 4% additional firms.
        - Between firm ages (for bankruptcies): from 0.25 to 1.5% additional firms.
        - The overall differences in impact, especially for bankruptcies, are driven by country-differences rather than by sectors. This suggests the role of national policies in driving those divergences.
- Between the second half of 2021 and the end of 2022, Eurostat data points to:
    - A recovery of business creations but still below pre-COVID trends, and with significant heterogeneities between countries. This recovery would not be enough to compensate for the missing firm creations due to the crisis.
    - A recent record increase in bankruptcies never seen before in recent statistics: +27% in Q4 2022.
    - At this stage, it hence seems that the crisis will lead to important long-term scarring of the European economy.

So far, the policy response was effective at limiting bankruptcies

- The policy response was dominated by credit guarantees pledged by big countries.
- Countries which pledged more policy support experienced less GDP growth over 2020-2021. The more pledged policies, the more unemployment increased. The direction of causality is however uncertain in both cases.
- The bigger the policy support was, the more bankruptcies were avoided.
- We observe a weaker correlation between policy support and the impact of the crisis on establishments. Finally, worse impacts on establishments are associated with worse impacts on unemployment.

Policy implications

Policy support was mostly designed to prevent bankruptcies and, so far, was effective in reaching this goal. Policies promoting firm creations were less prominent. Bigger amounts of COVID policies seem to have failed at limiting rises in unemployment above a certain level of spending. An insufficient support to business creations likely explains part of the 9 GDP points difference the EU and US recoveries. Additionally, large differences in GDP impact, policy support, and firm creations, could exacerbate divergences within the EU moving forward. Excessively prolonged support to low-productivity firms could lead to risks of zombification.

The results of our analysis underline the necessity of policy action. EU and national policies should foster business creations in order to support the ongoing recovery. Policy measures can streamline firm establishments, reduce uncertainty, and increase financing options. From an EIF-perspective, depending on the type of company, a variety of instruments can be effective in this respect, notably equity financing, venture debt, targeted guarantees, or microfinance. The diverging impact of the crisis on corporate demographics will likely increase broader economic divergences between EU States. In this context, EU institutions have a crucial role to play to foster convergence between countries.

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1 | Introduction

A need to better assess the impact of the COVID-19 crisis

The impact of the Coronavirus Disease 2019 (COVID-19) crisis on firms has been staggering throughout the EU. Corporate vulnerability in Europe at the onset of the crisis was higher than after the 2008 shock (Gardo et al., 2020), and more heterogeneous between countries (Maurin, 2021). The first risk is a bankruptcy wave. The second risk is a decrease in the creation of new firms over the short and long run.

There is a growing need to better map the impact of the crisis on corporates in order to identify vulnerabilities and adapt current policies. The end of COVID-19 support programmes opens space for thought on how to best support Small and Medium-Sized Enterprises (SMEs). However, assessing the situation of firms at European level with a reasonable time lag is challenging. An analysis of the current evolution of firms' demographics, including firms' creations and bankruptcies, should both encompass the European level and be decomposable along firms' characteristics. It should also compare crises episodes with past trends, and be updatable at close intervals. Although the economic impact of COVID-19 has been extensively researched, there is a research gap on the impact of the crisis on firms' bankruptcies and creations. Assessments of the mitigating impact of the policy response suffer from similar gaps.

This working paper uses a unique dataset which combines data on corporate demography and policy responses. First, we use the Bureau van Dijk's Orbis database to propose an harmonized EU evaluation of the impact of the COVID-19 crisis on corporate demography, focusing on excess bankruptcies and missing firms' creations caused by the crisis. We compare the crisis to 2015-2019 weekly averages using a methodology inspired by the difference-in-differences approach. We exploit the seasonality of our data and the exogenous nature of the World Health Organisation (WHO)'s announcement that COVID-19 is a global pandemic. 2020/21 trends are compared to historical 2015-2019 trends. To do so in a methodologically sound way, we correct for differences between the initial weeks of 2020 and past years. Our results are then decomposed by countries, sectors, and firms' ages.

Second, we use European Systemic Risk Board (ESRB) data to build weekly series of policy responses by countries and policy types. This allows us to provide first insights into the mitigating impact of policy responses on GDP growth, unemployment, bankruptcies, and firm creations.

The rest of the paper is organized as follows. Section 2 presents existing evaluations of the impact of the crisis and of the policy response. Section 3 presents our framework of analysis. Section 4 presents our results and decomposes them between countries, sectors, and firms' ages. Section 5 concludes.

2 | Existing evidence

The coronavirus (COVID-19) pandemic and its vast impact on the economy affected businesses throughout the world. In this unprecedented situation, many industries experienced simultaneously a negative demand and supply shock. Many businesses risked insolvency in the short run.

2.1 | Impact of the crisis

The impact of the crisis was deep, long, scarring, and divergent. The recession in most of the world's developed economies was the steepest since the Second World War. EU GDP fell by 5.6% in 2020, then grew by 5.4% in 2021, meaning an overall decrease of 0.5% (Eurostat). For comparison, US GDP fell by 2.8% in 2020 and grew by 5.9% in 2021, meaning an overall *increase* of 8.4% (World Bank). In parallel, EU public debt rose by 29% (Dukic et al 2021). EU unemployment decreased in 2020 due to deployed policies, but then grew higher in 2021 in most EU countries. The impact of the crisis was characterized by divergence. Spain had the highest GDP fall of 2020 at -11%, followed by Italy at -9%, then Croatia and France at around -8%. Ireland, a headquarter of international tech corporations which benefitted from lockdowns, had the only positive GDP growth of the EU in 2020.

2.1.1 | Impact on firms

The microeconomic impact was also clear. Corporate value-added is thought to have decreased by about 25% in the EU during the first lockdown, and turnover by 20% (Maurin, 2021). The shock was very heterogeneous across sectors. Surveys showed that less productive firms tended to be more impacted (Harasztosi and Savsek, 2022). Large firms were mostly able to smooth out the effect of the shock by drawing on their credit line (Gourinchas et al., 2021). Such was not the case of SMEs.

Prior crises have shown that smaller businesses are more vulnerable to significant liquidity problems during supply shocks (Iyer, et al., 2014). They indeed depend on less diversified supply chains. Facing a decline in trading activity and profits, many small businesses generally become reliant on their liquidity reserves to cover fixed costs. Their limited financial assets and collaterals typically restrain their external borrowing (Cowling, et al., 2021). This makes them more prone to bankruptcy (Dörr, et al., 2021).

Indeed, at world level, early statistics indicate that over nine million small businesses disappeared in 2020 (Djankov and Zhang, 2021). 30% of SMEs are thought to have experienced negative profits during the first half of 2020, against 17% for large firms. Firms with declining sales and non-

digitalised firms were hit hardest (Coad et al., 2023). The most vulnerable firms seem to have been young and less productive SMEs (Altomonte et al., 2021). However, this impact was not the same everywhere. Early evidence points to a quick recovery of the start-up ecosystem in the US and UK.

2.1.2 | Impact on corporate demography

Bankruptcies

Existing statistics of bankruptcies and firm creations in the EU and US are in absolute numbers, not as a share of the underlying corporate population. They don't allow for statistically sound intertemporal comparisons. We dwell deeper on their other limitations in section 3. They are however the first existing evidence on the impact of the COVID crisis.

In terms of bankruptcies[1], preliminary forecasts pointed at a risk of an increase in bankruptcy rates in 2020 of 13% in Italy, 9% for France, and 8% for Germany (Gourinchas et al., 2020). The most impacted sectors were forecasted to be Arts (+21%), Education (+21%), Accommodation (+11%) and Retail (+10%) (Gourinchas et al., 2020). Other forecasts were worse. Altradius (2020) forecasted an increase of 26%. The ESRB warned in April 2021 of the risk of a "tsunami" of bankruptcies, followed by a negative feedback loop and a recessionary dynamic (ESRB, 2021).
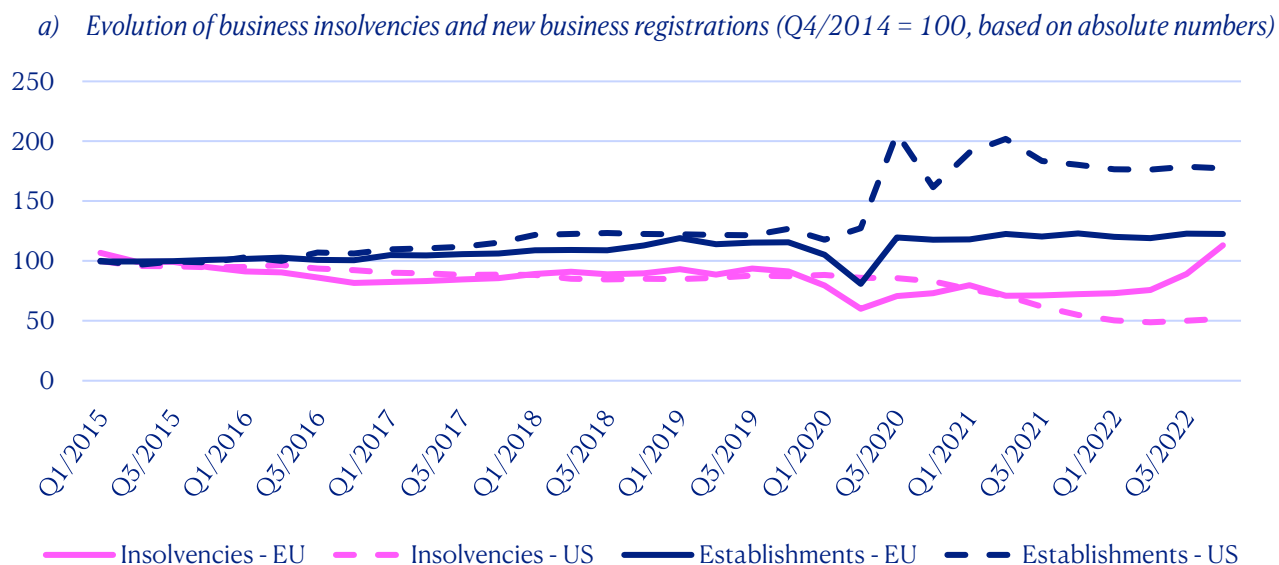
In reality, and unlike past crises, bankruptcies at first fell (**Figure 1**)**.** Eurostat gives general bankruptcy and establishment levels with no reference to the underlying population. It showed EU-level bankruptcies falling by 31% in the first half of 2020. This fall then would have continued till September 2022. Spain would have been the only exception with an early rise. Then, EU level bankruptcies increased in the second half of 2022 (Arnold, 2023). They were up by +27% in Q4 2022, the biggest increase in EU bankruptcies since records began in 2015 (Eurostat, 2023). The more impacted sectors would have been Transport and Hospitality. Concerning Spain, this early rise may have been caused by the early implementation in the country of a new EU directive on insolvencies in September 2022 which allowed for faster restructuring processes (Arnold and Jopson, 2023). This recent unprecedented rise in bankruptcies is leading to growing public concerns.

The impact of the crisis on bankruptcies seems to differ greatly depending on the characteristics of firms. Dörr et al. (2021) shows that insolvencies rose more among young German SMEs with low credit ratings. Lalinsky and Pal (2021) show that in Slovakia small firms were hit more by the risk of insolvency.
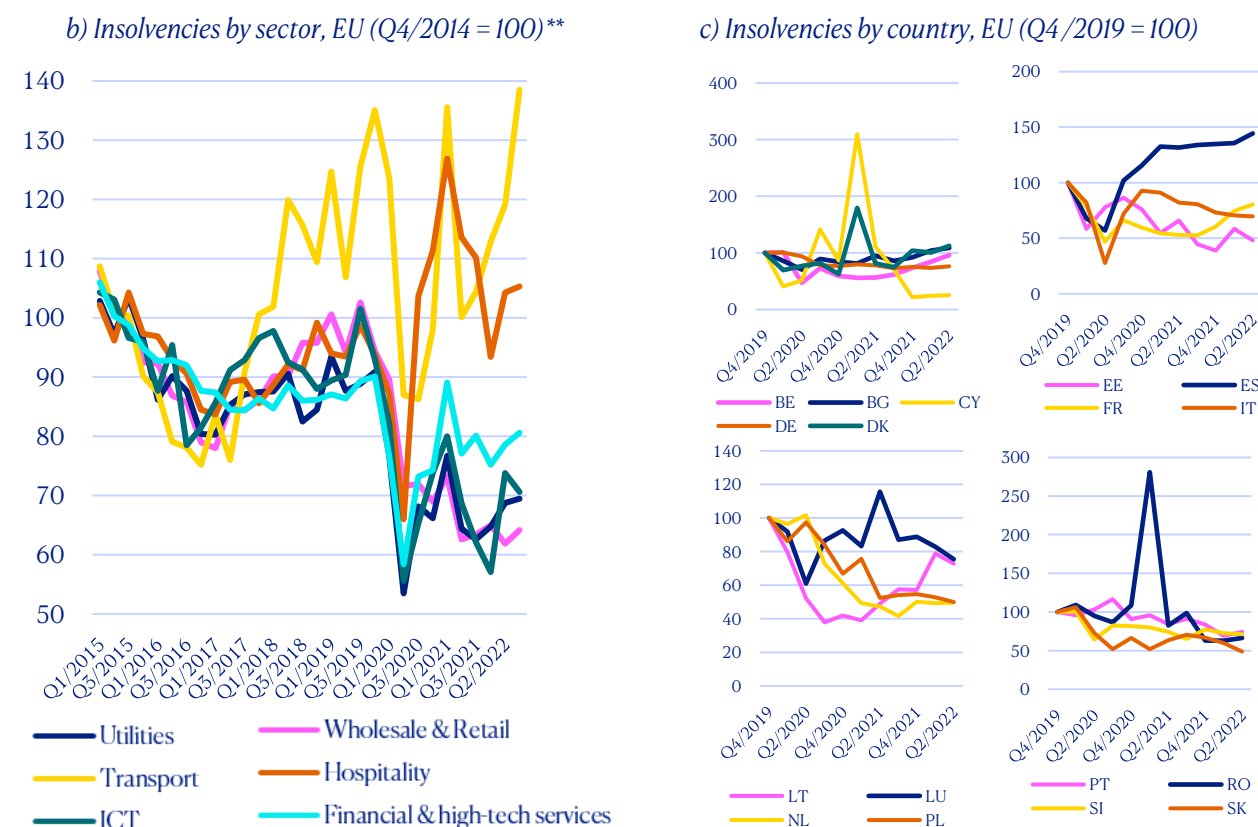
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[1] For the purpose of this analysis, we use interchangeably the expressions "insolvency" and "bankruptcy". As explained in section 3, our quantitative analysis merges all stages of insolvencies into one broader bankruptcy category.

Figure 1: Bankruptcies and establishments in the EU and US, 2015-2022 (Eurostat/NBER)*

a) Evolution of business insolvencies and new business registrations (Q4/2014 = 100, based on absolute numbers)

Insolvencies - EU   Insolvencies - US   Establishments - EU   Establishments - US

* A rise in absolute numbers does not translate into a rise in rates as the underlying population might increase.

*b) Insolvencies by sector, EU (Q4/2014 = 100)***

Utilities   Wholesale & Retail
Transport   Hospitality
ICT   Financial & high-tech services

c) Insolvencies by country, EU (Q4/2019 = 100)

BE   BG   CY
DE   DK

EE   ES
FR   IT

LT   LU
NL   PL

PT   RO
SI   SK

** For the EU, bankruptcies are defined as the number of legal units that have started the procedure of being declared bankrupt, by issuing a court declaration, at any time during the reference quarter. New registrations are defined as the number of entered legal units in the registration register at any time during the reference quarter Q, according to the respective administrative or legal procedure. The data on the absolute number of registrations of new businesses and bankruptcies on quarterly basis is provided by the national statistical institutes of the EU and EFTA Member States to Eurostat. Values per sector and country are given till Q2/2022.

Source: Eurostat, National Bureau of Economic Research based on US Court System, Krämer-Eis et al. (2022)

In the US, bankruptcies experienced a crash during the first lockdown, then continuously decreased down to -45% in September 2021, and again by -6% in 2022 (Martos-Vila and Shi, 2022, and US Courts, 2023). Policy support and issues with court proceedings are cited as the main drivers of this decrease. Iverson et al. (2020) estimate that the US would have needed to hire 86% more bankruptcy judges to allow for levels of bankruptcy proceedings equivalent to those of 2008. The US then seemed to follow the EU trend in rising bankruptcies in Q1 2023 (+17%), albeit with a delay of half a year (American Bankruptcy Institute, 2023). The decoupling between the EU and US is clear.

Firm creations

In terms of establishments[1], early simulations pointed to a risk of sharper decrease. Firm creations decreased during the Great Recession. They also decreased between 2015 and 2017 in the EU. For the COVID crisis, existing EU-level statistics point to a sharp fall in establishments in the first half of 2020. As of mid-2022, this drop has been recovered, but there was no clear rise which could have compensated for it. **Figure** 1 shows that the absolute number of EU establishments was stable or slightly increasing after 2020, but this does not necessarily translate into a growth in establishment rates, as the underlying corporate population also grows.

This recovery also appears highly heterogeneous between countries and sectors (Eurostat, 2022). In Germany, after a recovery, the absolute number of establishments fell by 6% from 2021 to 2022 (Metzger, 2023). The Trade and Accommodation sectors seem the most deeply impacted, whereas absolute establishment growth would have resumed in other sectors. The impact of lower firm creations on unemployment was projected to range from +0.5% to +0.85% by the Organisation for Economic Cooperation and Development (OECD), with significant sectoral heterogeneity (OECD, 2021).

Concerning US business creations, Djankov and Zhang (2021) show substantially higher entrepreneurship trends in the US and UK compared to the EU during the crisis. Creations would have jumped by an unprecedented 20% in 2020 according to Haltiwanger (2021). Rhyne (2021) sees peaks at +100% during lockdown, then at +60% in 2021, reaching levels never seen since statistics began 15 years ago. This trend would have continued till at least mid-2022 (Ferguson, 2023). A third of this surge would have been caused by e-commerce. Shares of female and black founders would have increased (Pardue, 2023). This would have reversed past trends by increasing the overall share of SMEs among American firms. The decoupling between the EU and US is hence also clear for establishments.

Outside of the EU and US, most countries of the world as well as OECD countries experienced a decrease in firm creations (Meunier et al., 2022). This decrease risks aggravating the already worrying decline in business dynamism observed in OECD countries since 2001 (Calvino et al., 2020).

This is a big concern, as firm creations support new employment, capital investments, innovation, and competition. Successful new firms expand quicker than existing ones, have greater

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[1] For the purpose of this analysis, we use interchangeably the expressions "business creations", "establishments" and "registrations".

productivity levels, and make significant contributions to aggregate productivity, output, and employment, especially in countries experiencing low productivity growth rates (see notably Foster et al (2021), Duncan et al (2020), Haltiwanger et al (2017), and Busso et al, (2013)). Even firms founded during a crisis are less likely to prosper after (Sedlacek & Sterk, 2017), with adverse impacts on labour markets and competition (Camino-Mogro, 2020). Finally, growth discrepancies between small and big firms tend to translate into higher levels of income inequality. The EU may not have fully grasped the opportunities of changing customer preferences and shifts towards e-commerce. The priority given to the protection of existing firms to the detriment of destructive creation and sectoral reallocation could lead to a "missing generation" of firms, with long-term social impact. Future rises in bankruptcies could also lead to a dangerous rise in unemployment.

2.2 | Policy response

In response to the crisis, policymakers in nearly all regions implemented numbers of initiatives to fortify the solvency positions of their domestic firms, notably SMEs (OECD, 2020). Most governments implemented fiscal policy measures beyond loan guarantees and reliefs, including wage subsidies and changes to bankruptcy regulations (Dörr, et al., 2021). Most recovery efforts and programs were focused on preserving firms and jobs. Assistance to new firm creations took second stage worldwide.

2.2.1 | Heterogeneity of the response

Policy responses appeared very heterogeneous between countries. This seems to have been caused by different fiscal capacities, partly linked to different levels of public debt. As massive announcements followed massive announcements, measures were compiled in repositories and databases further detailed down in section 3. Notably, the massive US policy response has led to a swifter recovery US recovery compared to the EU one (Brault and Signore, 2020). The U.S. provided extensive loans to start-ups via the Paycheck Protection Program. The UK and Switzerland offered customized plans to boost start-up creation.

Against this risk of divergence, the COVID-19 crisis led to an unprecedented response of EU institutions. The Next Generation EU Program financed urgent investments and employment. It was then replaced by the Recovery and Resilience Facility, which provides EUR 672 b. in financing from 2021 (Commission, 2020). This financing is aligned with the EU's objectives in green and digital transition, convergence, and resilience. Amid new difficulties triggered by the Russia-Ukraine conflict, the European Union's Recovery and Resilience Facility (RRF) then became critically important. The European Investment Bank (EIB) and European Investment Fund (EIF) are a crucial channel of this policy deployment.

2.2.2 | **Impact assessments**

Existing impact assessments of the impact of the COVID policy response can be divided between ex ante and ex post assessments.

Ex ante

Initial forecasts predicted that government interventions in OECD countries would transform a projected increase in bankruptcy rates of 72% down to a *decrease* (Gourinchas et al., 2020). Without policy support, the share of illiquid and insolvent European firms was thought to have doubled (Ebeke et al., 2021). Hinterlang et al. (2022) forecast the impact of German policy interventions and found mitigating effects in the short run. Subsidies to distressed businesses would have decreased the prevalence of defaults, but public investment would have had the most positive medium-run effects.

Gourinchas et al. (2021) and Demmou et al. (2022) provided the most thorough microeconomic forecasts. Gourinchas et al. (2021) forecast that 89% of policy support to firms would have been wasted on firms which did not need it to survive. The amount of policy support actually necessary to save firms at risk of insolvency would have been only 0.13% of GDP in advanced economies, at odds with the vast sums deployed. The prevalence of credit guarantees in the policy response led the authors to warn of the risk of credit overhang (Gourinchas et al., 2021). A forthcoming assessment nuances this claimed inadequacy in firm targeting (Coad et al., 2023).

In another paper, Demmou et al. (2021) use baseline scenarios to forecast the impact of the policy response on the financial vulnerability of firms. Their analysis is based on a sample of 1 million firms from Orbis chosen for their representativeness, with data extending until 2018. Absent public support, they estimate that 38% of firms would have depleted their liquidity buffers by the end of 2020. This share would have jumped to 50% for the Transport, Accommodation and Arts sectors. Highly leveraged as well as individual firms would have been especially at risk. 3.8% of their sample would have been close to bankruptcy. Policy support would have brought down the share of firms depleting their liquidity buffers by 13 to 19 points. They forecast furlough schemes to have been the most efficient at limiting corporate vulnerabilities.

Some study past episodes and extrapolate conclusions to the COVID crisis. Franco and Demmou (2021) use an Orbis sample of 700,000 EU firms from 2007 to 2018 and national-level credit guarantee series for 10 EU countries. They find that about 25% of firms would have been distressed in the absence of credit guarantees. Extrapolating, they find that COVID policy responses would have alleviated liquidity shortages of firms by between 20 to 25 percentage points. This decrease in liquidity shortages would have been more pronounced for low-productivity firms, confirming the COVID survey results of Harasztosi and Savsek (2022). The risk of zombification would remain small, but high guarantee volumes could lead to lower productivity enhancements. An increase of 1 GDP point in loan guarantees would lead to a decrease of one tenth of productivity-enhancing reallocation. Brault and Signore (2020) study past EU guarantee programmes. They show that they helped maintain and increase growth and employment at firm-

level. However, the impact on profitability was not unequivocal, and the effect on productivity ambivalent. They also identify divergences linked to national industrial landscapes.

Ex post

Ex post impact assessment is scarce as of yet. Deb et al. (2021) assess the impact of fiscal efforts on macroeconomic activity in 52 countries for the year 2020. They use Yale's COVID-19 Financial Response Tracker (Yale, 2021) to assess the country-level impact of daily fiscal announcements on exchange rates, stock market indicators, industrial production indices, unemployment rate, the OECD's Composite Leading Indicator, sovereign credit default swaps, and the OECD economic tracker.[1] They find significant positive effects of fiscal efforts, especially for advanced economies and for countries with lower levels of public debt. In line with the forecasts of Gourinchas et al. (2021), they find low multipliers. The multiplier effect would have been around 0.2 for industrial production, 0.38 for the Purchasing Manager Index, 0.1 for the OECD's Composite Leading Indicator, and 0.05 for sovereign credit default swaps spreads. They also find that emergency lifelines were especially effective during lockdowns, and demand support more effective during the relaxation of lockdowns.

In terms of microeconomic impact assessment, French credit guarantees represent one of the most significant policy pledges in volume in the EU. In a mostly descriptive report, the French Court of Audit finds that they improved the liquidity reserves of firms (Cour des comptes, 2022). A rare ex-post policy impact assessment was led for Slovakian wage subsidies for the March-June 2020 period by Lalinski and Pal (2021). They find relatively good targeting in terms of sectors, liquidity, and leverage. Firms benefited from more support if they were older, bigger, more productive, exporting more, if they were public suppliers, and if they experienced larger declines in sales. Higher environmental indicators decreased the probability of receiving support. The impact of policy support on the liquidity and solvency of firms was positive, especially for smaller firms. They also find indications of a positive impact on employment.

Critics of recovery plans were quick. Larry Summers accused the US administration of over-doing its policy response, thus causing excessive inflation (Summers, 2021, and Cassidy, 2022). He called for much bolder investment plans to prepare for future crises, especially in infrastructure and health. In the EU, recovery plans have been more limited in scope, and more focused on credit guarantees rather than actual disbursements. However, they have also been criticized for potential bad targeting, moral hazard risks and zombification down the road.

There is a gap in the literature on the firm-level impact of the crisis. One also needs to decompose the impact of the crisis between countries, sectors, and types of firms. Passing from simulations to observational data should allow for more thorough evaluations of the COVID policy response. Filling this gap is crucial in order to assess the efficiency of the COVID policy response, and to evaluate how future policies could be readjusted. This is all the more essential in the recent context of renewed corporate vulnerabilities due to rising interest rates and energy costs.

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[1] The OECD economic tracker is a nowcast of economic activity based on internet indicators.

3 | Framework of analysis

We propose a twin framework of analysis which allows to evaluate the impact of the crisis on EU corporate demography as well as fiscal responses at EU level.

3.1 | Corporate demography

Forecasts about the impact of the crisis have been led in several institutions. As seen in the previous sections, institutions such as the International Monetary Fund (IMF) and the EIB, and credit insurers such as Altradius, have been notably engaged in forecasts of SME failures and productivity (see notably Gourinchas et al. 2020 and 2021, Maurin 2021, Altradius 2020, and Cooper et al 2023). However, these are ex-ante simulations rather than ex-post assessments. Current statistics on corporate demography indeed suffer from various flaws, summarized in Annex 4. Most notably, Eurostat only provides quarterly indices of the absolute numbers of bankruptcies and establishments decomposable by countries and sectors. It does not give those numbers as shares of the underlying corporate population, and does not allow finer timing and deeper levels of decompositions by types of firms. The OECD and Eurostat do not provide decompositions by firm age. They also don't provide statistically sound intertemporal comparisons between the pre- and post-COVID period.

We are hence seeking weekly corporate demography data allowing statistically sound intertemporal comparisons, as well as decompositions by country, sector and firm age. Of particular interest are bankruptcy and firm creation rates. We use Bureau Van Dijk's Orbis database. Orbis is an aggregator of firm-level data gathered from over 75 national and international information providers. It allows access to roughly 38 million EU firms from 2015 to 2021. This database provides the advantage of a single harmonized EU-level dataset with deep levels of decomposition. It is possible to decompose the data according to countries, industries, and corporate characteristics, as well as combinations of any of these factors. As a first stage, we narrow corporate characteristics to firm age. We aggregate all the various stages of bankruptcy into one single category.

Orbis has several limits. First, to the date of March 2023, time lags limit this analysis to the 12 months which followed the March 2020 lockdowns. US Bureau of Labour Statistics data suffers from the exact same lag (Decker and Haltiwanger, 2022). Second, Orbis does not allow for straightforward ways to distinguish SMEs[1] from big firms. We choose to retain the category "SMEs and Mid-caps". Third, the distribution of Orbis' EU corporate population across national and sectoral clusters differs from the actual distribution of EU corporate demography due to differences in reporting requirements across States and sectors. Orbis contains 38 million EU firms, 12 million more than Eurostat. Notably, Eurostat excludes holdings, which our methodology

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[1] SMEs as defined by the European Commission Recommendation 2003/361/EC.

currently does not allow to do for Orbis. Indeed, it seems that Orbis contains more empty-shell companies, which tend to be created and go bankrupt less often than normal firms. All this pushes down Orbis' average bankruptcy and birth rates (3 and 6%) compared to Eurostat's (7 and 9%). Analyzing the impact of the crisis based on Orbis should hence lead to lower-end estimates. Finally, Orbis' weekly bankruptcies and firm creations suffer from significant levels of volatility due to various reporting lags (see Annex 2). Our analysis hence reflects Orbis, its advantages as well as its limitations.

Our methodology builds on the approach of Eckert et al. (2020) and Nielsen et al. (2021) by applying the demographic and medical concepts of excess mortality and excess births to corporate demography. It is similar to the approach of Banks and Xu (2020) who estimate the effects of COVID on mental health in the UK. In a first step, we smooth our data according to a methodology detailed in Annex 2. We then compare weekly bankruptcy and establishment rates between March 2020 and March 2021 with the estimated rates that would have been observed in the absence of the crisis, i.e. the counterfactual rates.[1] To estimate the latter, we take average weekly rates from January 2015 to December 2019. We then adjust the estimated pattern to reflect the dynamics observed in the first weeks of 2020 until March 11.

In this way, our methodology interprets the announcement by the WHO, on the week of the 11 of March 2020, characterizing COVID-19 as a "global pandemic", as the start of a "treatment" in an econometric setting inspired by difference-in-differences. The WHO announcement was indeed immediately followed by a spread of lockdowns which constitute the source of the COVID economic shock. The 'first difference' is the difference between bankruptcy and establishment rates on March 11 2020 and on March 11 2015-2019. The 'second difference' is the difference between post-March 11 bankruptcy/establishment rates and the average of 2015-2019 rates.

Withdrawing the first difference from the second difference provides insights into the effects of the COVID shock on demographic rates, all other things equal. We hence obtain differential bankruptcy and establishment rates corresponding to the impact of the crisis as the difference between the observed and counterfactual rates. Combining those two rates gives us the share of "missing firms" due to the COVID-19 crisis, i.e. firms which went bankrupt, or whose creation was prevented by the crisis. Orbis, like Eurostat, shows declining establishment rates over the 2015-2019 period. We are hence comparing post-COVID establishment rates to an already declining historical baseline. Box 1 details our steps further.

Box 1: Estimating the impact of the COVID-19 crisis on corporate demography

- Standardise ISO weeks into treatment periods: see Annex 3 for more details.
- Estimate mean historical weekly bankruptcy and firm creation rates for the pre-COVID period (2015-2019).

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[1] Issues with Orbis' data collection for Belgium means that Belgian data stops in October 2020.

Box 1 continued:

- Construct counterfactual bankruptcy and firm creation rates (i.e. the rates that would have been observed in the post-COVID period in the absence of COVID): We calculate the difference between average pre-COVID January-March rates and January-March 2020 rates. This difference is added to all pre-COVID rates in order to readjust historical rates to a level comparable to March 11 2020 rates.

- Compare the evolution of weekly historical and 2020/21 rates: We plot the adjusted historical rates and post-COVID rates. Confidence intervals reflect cross-clusters variations weighted by cluster sizes and are adjusted following Austin and Hux (2002). This method makes sure that confidence intervals do not overlap when the statistical difference between the two estimates is significant.

- Estimate weekly COVID impact: We calculate the difference between adjusted weekly historical rates and post-COVID rates. This differential rate is understood in this framework as the impact of the crisis on demographic rates. The difference-in-difference approach is illustrated in Figure 2:

Figure 2: Illustration of the difference-in-difference approach

where:
- the B-E line is the average weekly historical rates (2015-2019),
- the A-C line is the 2020-2021 weekly rates,
- the time of intervention is the WHO global pandemic announcement,
- the F-D line is the counterfactual post-COVID weekly rates,
- the impact of the crisis is the distance between points C and D.
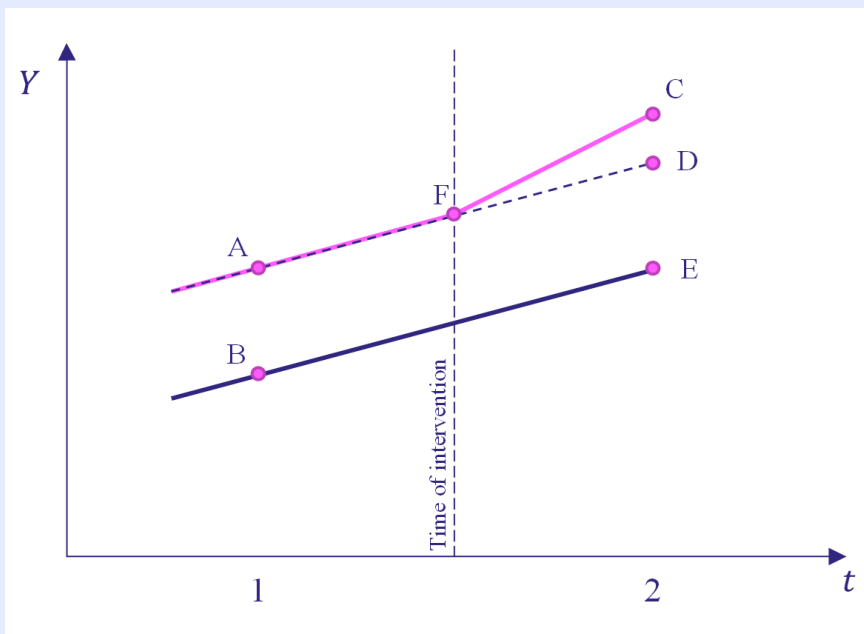
The weekly COVID impact is given following this equation:

$$y_{wt} = \beta_0 + \sum_w \beta_w T_t 1\{W=w\} + e_{wt}$$

Box 1 continued:

where:

- y_{wt} is the bankruptcy or establishment rate at week w and period t, where t can be either the post-COVID period or the counterfactual,
- T_t is an indicator function which takes a value of 1 for the post-COVID period and 0 otherwise,
- $1\{W=w\}$ is an indicator function which takes a value of 1 if the week w is equal to some W, for all weeks,
- β_w is the "difference-in-difference", i.e. the difference between counterfactual and post-COVID rates for each week.

- – Aggregate over time and decompose per cluster: Our clusters are each possible combinations of country, sector, and firm age. We run the same equation per cluster for the 12 months following the 11 March 2020. We multiply weekly differential rates with the weekly active corporate population of the cluster. We then combine these weekly differential numbers of firms over the 12 months period and divide the total by the population of the cluster on the 11 March 2020. The resulting aggregate differential rate is hence the share of the initial corporate population of the cluster which was destroyed – or added – by the COVID shock.

Empirical limitations remain. We do not control for confounding factors which could affect rates outside of the COVID crisis in the strict sense of it. Notably, the stringencies of lockdowns and the consequences of the pandemic on the enactment of corporate law varied between countries. We also assume that the 'treatment' occurred punctually on March 11, and that there was no significant difference between rates in the first quarter of 2020 compared to past trends. In reality, our data does not fully support this 'parallel trend' hypothesis in the case of firm creations. The first COVID-19 wave indeed did not suddenly begin with the WHO pandemic announcement. It was instead incorporated in the market in a progressive manner. This leads the impact to be over-estimated for clusters which experienced unusually high establishment rates in January and February 2020.[1] It should be possible in future research to encompass detailed data on national and sectoral lockdowns and the enactment of corporate law. This would allow to better encapsulate this progressivity of the shock.

3.2 | Fiscal policy

Next, we want to quantify fiscal policies which constituted a response to the COVID shock. Fiscal policies were forecast to have more impact on macro-indicators than monetary policy, as shown by Deb et al. (2021). We for now focus on pure economic policies, excluding pure health measures or social restriction measures, as well as regulatory changes such as evolutions in insolvency laws. Nonetheless, one must remember that changes in insolvency regulations probably had a strong

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[1] See notably the tail of the most impacted country-sector clusters in Figure 8.

impact on the evolution of corporate bankruptcies. For instance, Spain implemented a new EU directive on insolvencies in September 2022, allowing for faster restructuring processes (Arnold and Jopson, 2023).

Several sources propose statistics on COVID fiscal policies. National databases were used by Lalinski and Pal (2021) for Slovakia and the Cour des comptes (2022) for France. They however do not allow for EU-level analyses. We hence turn to aggregated databases. Bruegel (2020) proposed text lists of measures, which were not updated after 2020. The IMF (2023) and OECD (2023) both propose text lists of measures for all world countries. We provide a summary of IMF-based statistics at world level in Brault and Signore (2020). Converting these texts into a treatable database is a long and complex task. More importantly, the level of details for EU countries is below the ESRB database. The Yale (2021) database used by Deb et al. (2021) stops in November 2021. It seems to contain the same information as the ESRB database for Europe. The ESRB provides a viable solution in terms of consistency, ease of collection, time span, and depth.

The ESRB COVID measures database is an inventory of over a thousand policy measures deployed during the COVID-19 crisis by EU national governments from January 2020 to March 2022, as of June 2022 (ESRB 2022). Among those, we are interested in the 649 quantified fiscal measures. The dataset includes the days of announcement, implementation, and termination, of policies. Unlike Deb et al (2021), who do not encompass the announcement date. The announcement may have an effect on macro-indicators, but it is unlikely that it would be the case for SMEs. Additionally, the results of Deb et al. (2021) do not change when encompassing implementation dates instead of announcements. The ESRB policy classification system is deemed not consistent enough for our analysis. We develop our own three-levels classification system which presents similarities to the one of Deb et al. (2021), but provides further sub-levels of classification. Policy amounts are given as a share of 2019 GDPs.

The ESRB COVID measures database has several limits. The adjustment from pledges to actual disbursements is only very partially done. National policies financed by the EU are sometimes not flagged as such. Only COVID policies are available. Normal policies, which went on during the crisis, including existing automatic stabilizers, are not encompassed. The precise timing of disbursements is also not available. We hence assume that each policy was deployed evenly over all weeks between the start and end of the policy. Future studies with access to national-level weekly disbursements might be able to go beyond those limitations. For further details on the ESRB database, our collection methodology, and our classification system, please refer to Annex 5.

We also explore the relationship between public support and GDP, unemployment, and corporate demographics. We use quarterly Eurostat data for GDP growth. There was a change in the Eurostat definition of unemployment series at the end of 2020 which limits their usefulness for our analysis. Instead, we rely on OECD data for unemployment, which drops non-OECD countries but allows for more consistency. We first correlate the policy response to GDP growth and unemployment over the whole of 2020 and 2021, both years being covered by our policy data. We then correlate the policy response to the impact of the crisis on bankruptcy and establishment rates over the 12 months following March 11 2020, which are the 12 months for which we calculated differential demographic rates.

4 | Econometric results

4.1 | Corporate demography

4.1.1 | EU-level impact

EU bankruptcy rates decreased by 22% from March 2020 to March 2021. This led to a 0.62% *increase* in EU corporate population. Establishment rates decreased by 11%, leading to a 1.38 % *decrease* in EU corporate population. In other words, the impact of the crisis on EU corporate demography was negative due to less firm creations, but this impact was reduced because of less bankruptcies.

The global impact can be calculated by adding bankruptcy and establishment channels. The resulting share of "missing" firms caused by the crisis is 0.77% of our Orbis data, i.e. around 293,000 firms. This is equivalent in our Orbis sample to the number of all Hungarian firms, or of German agricultural firms. In OECD data, which has different coverage, it would be equivalent to between the corporate populations of Finland and Austria (OECD Structural business statistics). In any case, it is a significant number.

This final number has two limits which make it a lower-end estimate. First, firms preserved thanks to protections against bankruptcies would tend to be more fragile firms. On the contrary, firms whose creation was prevented would have tended to be more dynamic. The indicator thus understates the real impact of the crisis on economic dynamism. Second, the absolute level of Orbis' rates is lower than Eurostat's. This likely further underestimates the impact. Rather than on the absolute impact, we now focus our interest on its evolution in time and on its heterogeneity between countries, sectors, and firm ages.

4.1.2 | Time evolution

Figure 3 plots historical average annualized weekly bankruptcy rates over the 2015-2019 period, the blue line, and 2020 weekly bankruptcy rates, the pink line. The dotted lines are the confidence intervals of the estimates adjusted according to our methodology. Our analysis is consistent with data from national providers as well as from the OECD (Sandbu, 2020). EU bankruptcy rates have mostly been below historical averages in the year following the first lockdowns. Bankruptcy rates fell massively during the four months following March 11th, down to 1.3% compared to historical averages of 3%. They then stay mostly below average until the end of 2020, when the difference ceases to be statistically significant.

Our data stops in March 2021. Other sources can provide first insights into the following months. Gourinchas et al. (2021) forecast bankruptcy rates to be 30% higher in 2021 compared to pre-COVID averages. Eurostat showed for Q4 2022 the highest levels of bankruptcies since records began in 2015 (Eurostat, 2023). When the data becomes available, it is likely that Orbis bankruptcies would increase across the board like Eurostat's from the second half of 2022. Next updates will allow to see how "the (…) low rate of insolvencies (witnessed in 2020-2021) would then be similar to the sea retreating before a tsunami" (ESRB, 2021).

Those initial "missing" bankruptcies can be explained by two main factors. A first factor is delays in filing and reporting. Temporary suspensions of bankruptcy filings and impediments of sanitary measures on bankruptcy courts delayed bankruptcies. In many cases, these delays were extended by political will in order to forestall bankruptcy proceedings. Threshold limits on debt levels were raised in many countries. A second factor is the massive public liquidity support extending the life of firms under the form of tax deferrals, moratoria on debt repayments, credit guarantees, and various subsidies (IMF, 2020, and Banerjee et al., 2021). This led to an increase in leverage in the tourism and hospitality sectors of between 15 and 20%.

Figure 3: Annualized weekly EU bankruptcy rates from January 2020 to March 2021 and historical trend (non-financial firms)*
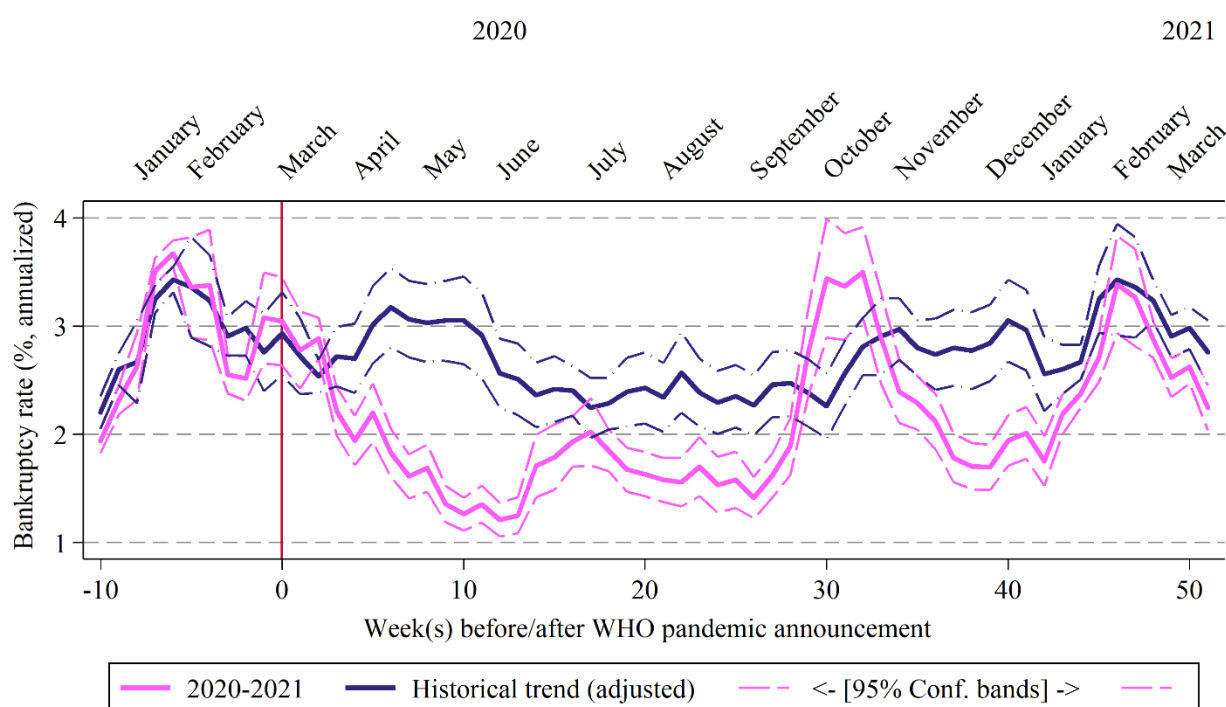
Source: Orbis and author's calculus (see text for details)
* Belgian data stops in October 2020.

Establishment rates[1] were divided by two in the three months following March 11th, compared to past trends (Figure 4). More importantly, the usual year-end peak in establishment reporting was halved in 2020. Overall, average weekly establishment rates were 11% lower than our

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[1] All weekly rates are annualized.

counterfactual over the 12 months following March 2020. The important initial fall is in line with findings from the OECD, which documents declines in business formations in April 2020 compared to April 2019 of 9% in Germany, 29% in the UK, 46% in Hungary, 54% in France, and 70% in Portugal (Calvino et al, 2020). The US experienced a 20% fall in the first months after March 2020. The effects of these evolutions on employment are likely to be important.

Figure 4: Annualized weekly EU establishment rates from January 2020 to March 2021 and historical trend (non-financial firms)*
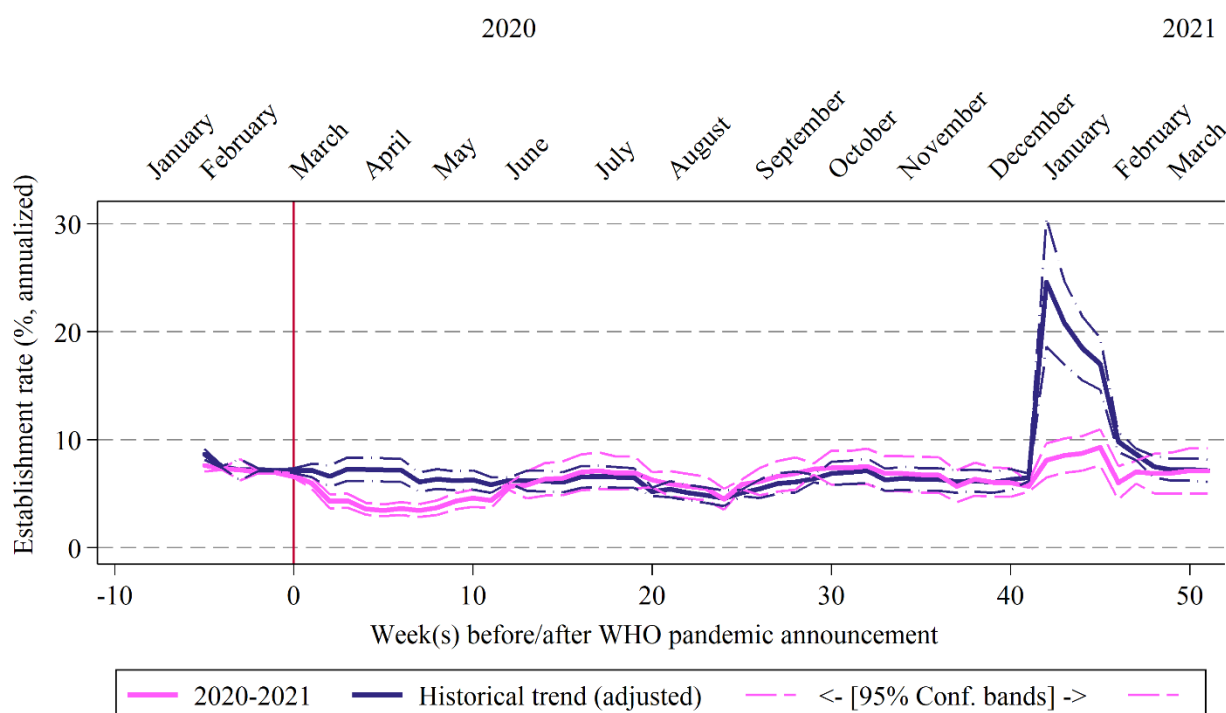
Source: Orbis and author's calculus (see text for details)

**Belgian data stops in October 2020.*

For the months after our data ends, Eurostat data points to a recovery of establishments between the second semester of 2021 and the end of 2022, but still below pre-COVID trends, and with significant heterogeneities between countries (Eurostat, 2022). This recovery would not be enough to compensate for the missing firm creations due to the crisis. At this stage, it hence seems that the crisis will lead to important long-term scarring of the European economy through this massive decrease in firms' creation rates. The last trends in EU bankruptcies and firm creations are all the more worrying that they are coupled with important heterogeneity. Even though more limited in time, our methodology allows deeper insights on the heterogeneity of the impact, between countries, sectors, and types of firms.

4.1.3 | **Decomposition**

The main question after a crisis, apart from the general magnitude of the impact, is the imbalances in impact. This is especially true for the European Union, which features large differences between

countries, sectors, and firms' ages. The 2008 shock impacted the European economy in a very asymmetric way. The 2020 crisis is even more likely to do so, considering the various national policy responses and the various levels of corporate fragilities.

Per countries

Our results show important cross-country heterogeneity (Figure 6) as predicted by Gourinchas et al. (2021). Around two thirds of EU countries experienced negative impacts of the crisis on their corporate population, and around one third a positive impact. Luxembourg and Ireland experienced a surge in firm creation in the financial sector linked to their harboring many tech multinationals benefitting from lockdowns. Hungary saw a rise in the creation of media companies which is likely to reflect statistical and political issues rather than genuine firm creations. Croatia, Lithuania, Cyprus and Malta saw a fall in bankruptcies driven by the Accommodation, Construction, and 'Other services' sectors, where businesses were shielded from the crisis. On the contrary, Greece experienced more business creations in those sectors. This might be explained not by more creations, but by more *incorporations* of *existing* informal businesses in order to receive State support. France stands out as an exception with excess establishments and high levels of avoided bankruptcies. All other countries lost firms.

These sizable heterogeneities may be explained by sectoral and political factors. First, different sectoral compositions could drive differences in the general impact of the crisis. For instance, countries hosting more digital start-ups centered on remote working technology would experience more firm creations, while countries centered on tourism would experience a fall in tourism-centered firm creations. Second, countries implemented various delays to legal filings during the pandemic. Countries also implemented policy programmes of various sizes and scopes. It is probable that all those factors played a role.

Figure 5: Impact of the COVID-19 crisis on EU corporate demography per country, graph*
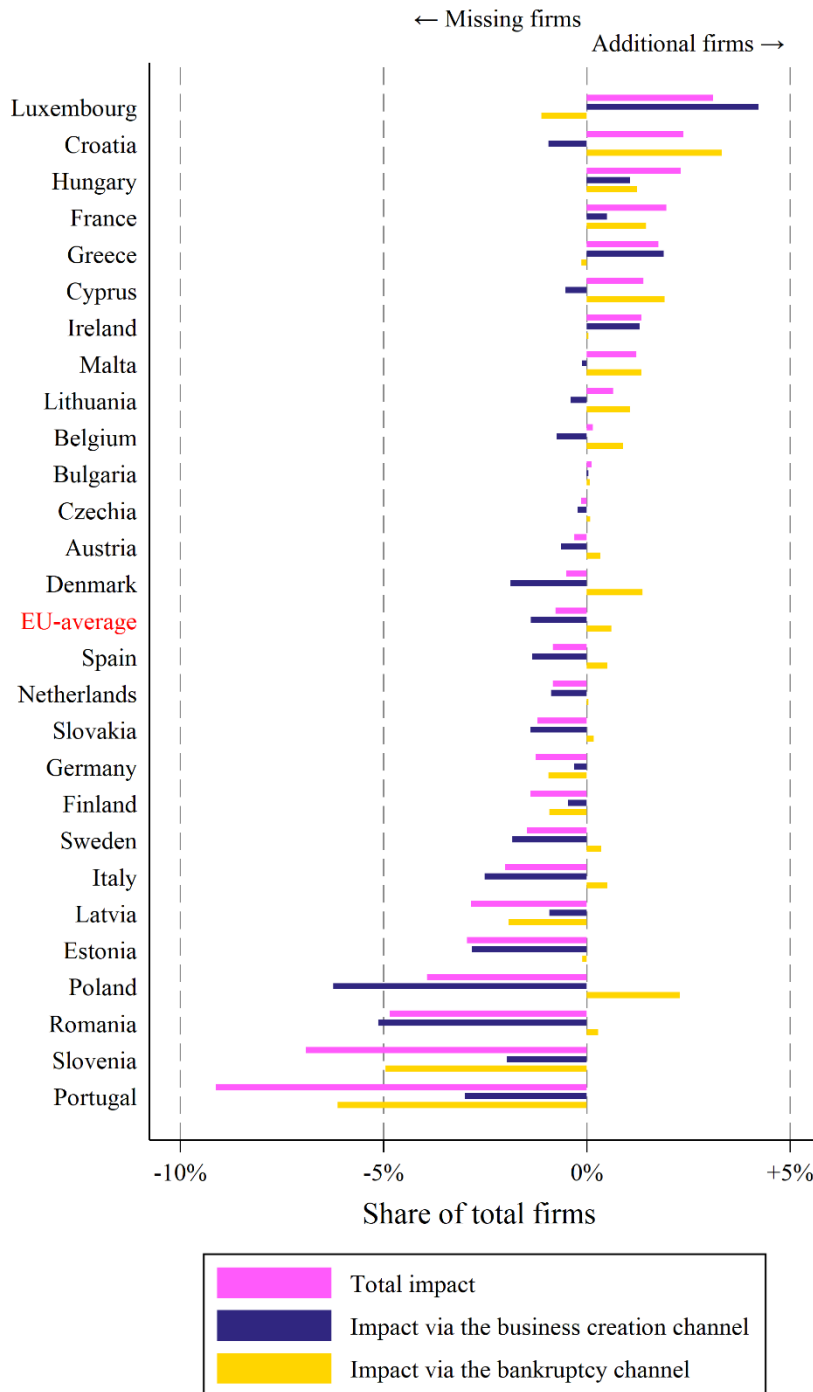
How to read: Luxembourg experienced a positive **total impact** of the crisis on its corporate demography (pink bar). This impact can be decomposed into:
- the **impact via the business creation channel** (blue bar): *more* business creations resulting in *additional* firms,
- the **impact via the bankruptcy channel** (yellow bar): *more* bankruptcies resulting in *missing* firms.

Source: Orbis and author's calculus (see text for details)

* Percentage changes in corporate populations between post-pandemic and historical averages. Belgian data stops in October 2020.

Figure 6: Impact of the COVID-19 crisis on EU corporate demography per country, map*
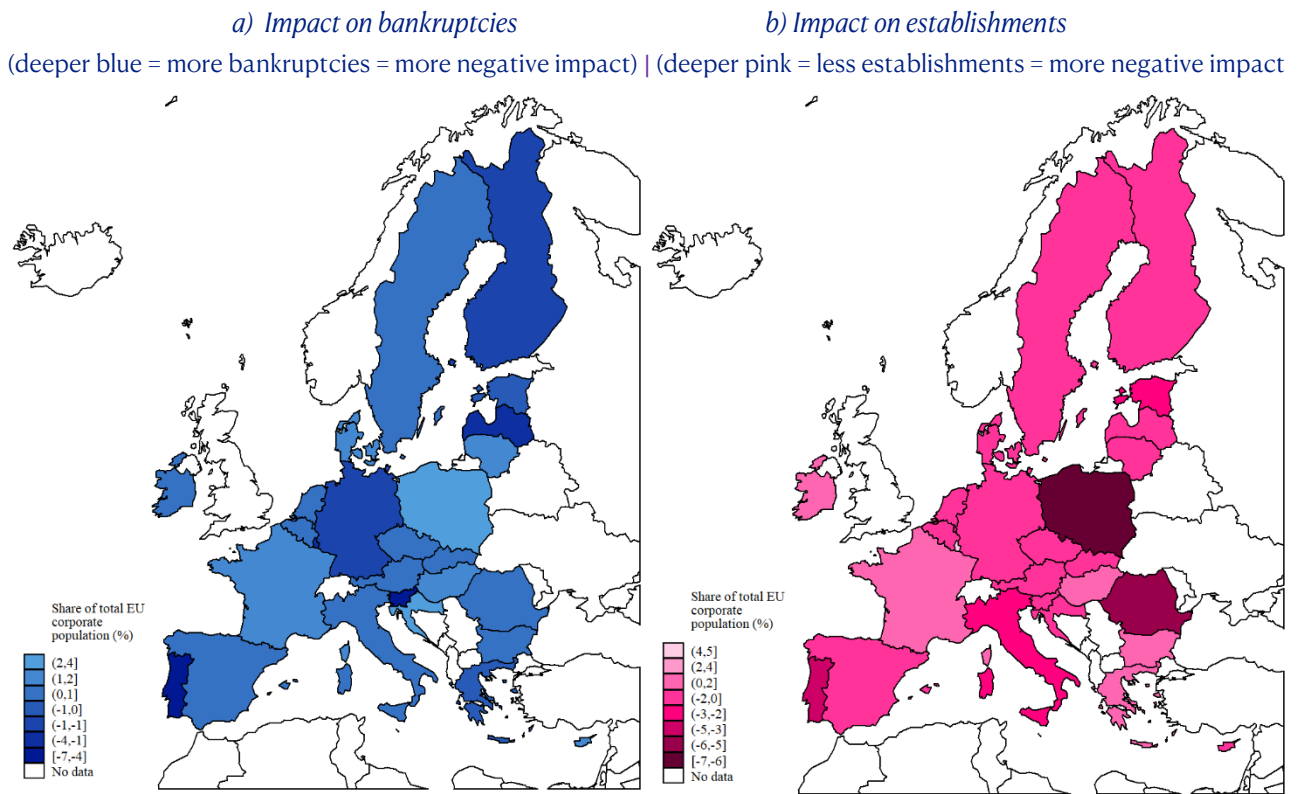
a) Impact on bankruptcies　　　　　　　　　*b) Impact on establishments*

(deeper blue = more bankruptcies = more negative impact) | (deeper pink = less establishments = more negative impact

Source: Orbis and author's calculus (see text for details)

* Percentage changes in corporate populations between post-pandemic and historical averages. Belgian data stops in October 2020.

Per sectors

This divergence in impact is also found between sectors (Figure 7). Apart from the Transport and Trade sectors, all sectors lost firms. The increase in the Transport sector may be due to changes in forms of mobility after lockdowns as well as to incorporations driven by State support. The Trade sector was exempt from many lockdown requirements. Unsurprisingly, the 'Accommodation and food services' sector as well as the Arts sectors are the most impacted. Interestingly, bankruptcies increased for all sectors. Heterogeneities in the bankruptcy impact were indeed driven by country characteristics.

Per firm age

Building indicators of sizes of firms according to the EU classification system based on Orbis requires extensive time and computations. As a first stage, we focus on ages of firms, an easily accessible indicator. Our results show that younger firms experienced less bankruptcies than usual because of the crisis (Figure 7). This is likely explained by the mix of delays and public support targeted at SMEs described earlier. However, this relationship is not linear. The youngest firms, aged 0 to 2 years old, experienced a smaller decrease in bankruptcies than "middle-aged" firms, aged 2 to 5 years old. This happened, even though this youngest category should have been more resilient, since it did not receive as much inflows of newly created, more fragile firms. If Orbis

bankruptcies would increase across the board like Eurostat's in the second half of 2022. These weaknesses of youngest firms could then transform into higher levels of bankruptcies.

Figure 7: Impact of COVID-19 on EU corporate demography per sector and age

a) Per sectors   *b) Per firm age (bankruptcies)*
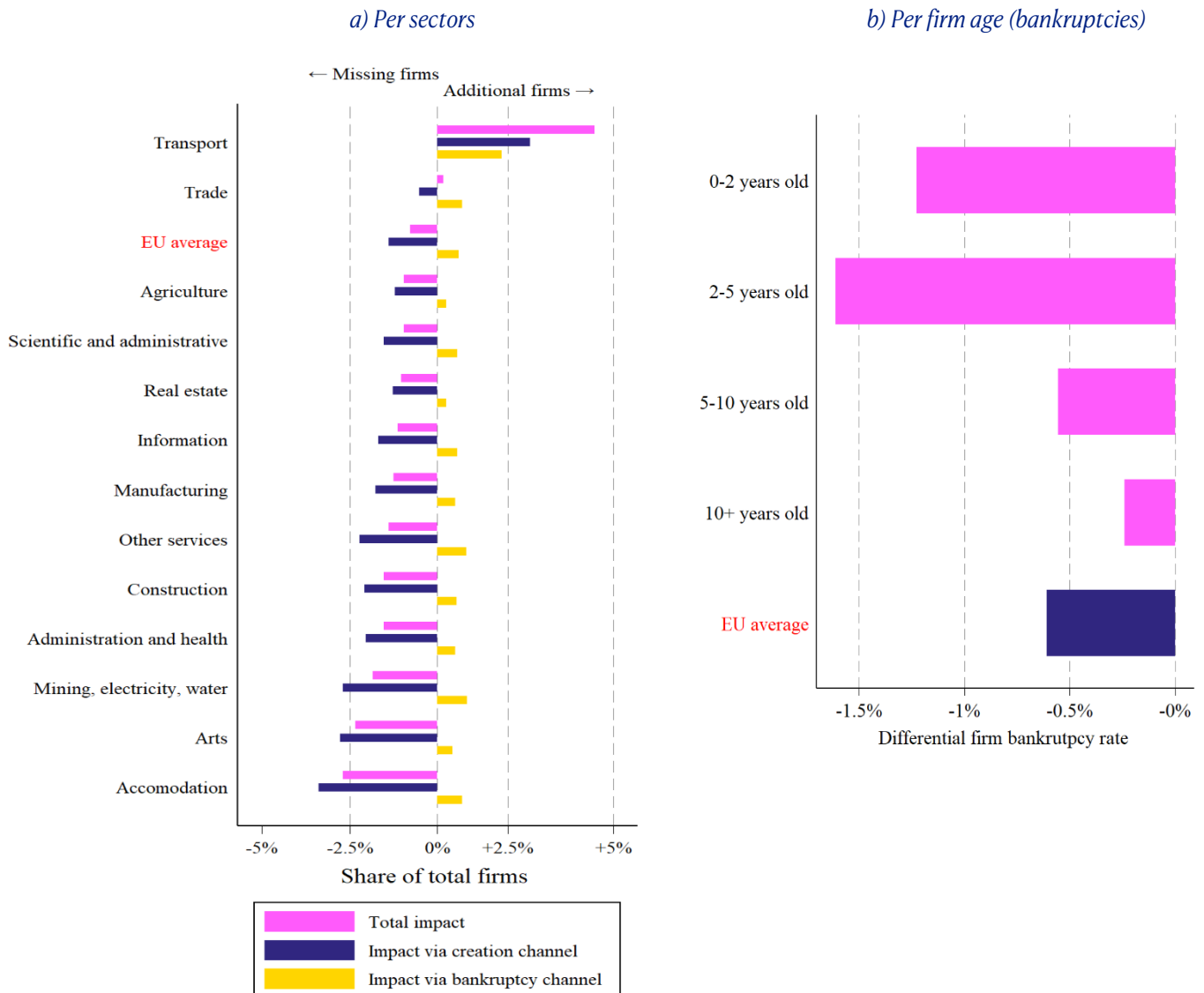
How to read: The Agriculture sector experienced a negative **total impact** of the crisis on its corporate demography (pink bar). This impact can be decomposed into:
- the **impact via the business creation channel** (violet bar): *less* business creations resulting in *missing* firms,
- the **impact via the bankruptcy channel** (yellow bar): *less* bankruptcies resulting in *additional* firms.

Source: Orbis and author's calculus (see text for details). NB: Belgian data stops in October 2020.

Deeper decompositions

We can provide a finer mapping of the impact of the crisis by decomposing results by combinations of countries and sectors. We give a full decomposition in Figure 9Figure 10, where we represent a deeper impact of the crisis, i.e. more bankruptcies or less firm creations, by deeper colors. Looking at most and least impacted clusters (Figure 8) confirms the diversity in potential underlying factors. Country-sectors with the most positive establishment impact either benefited from the crisis ('Scientific and administrative' in Luxembourg, 'Real estate' in Austria) or likely correspond to firms incorporated to access public support ('Construction' in Malta, 'Other services' in Greece). The tail of more negatively impacted clusters in terms of establishments confirms the issue of insufficient pre-March 11 'parallel trend', leading to artificially inflated results. However, the number of affected clusters remains small.

Figure 8: Most and least impacted country-sector clusters*
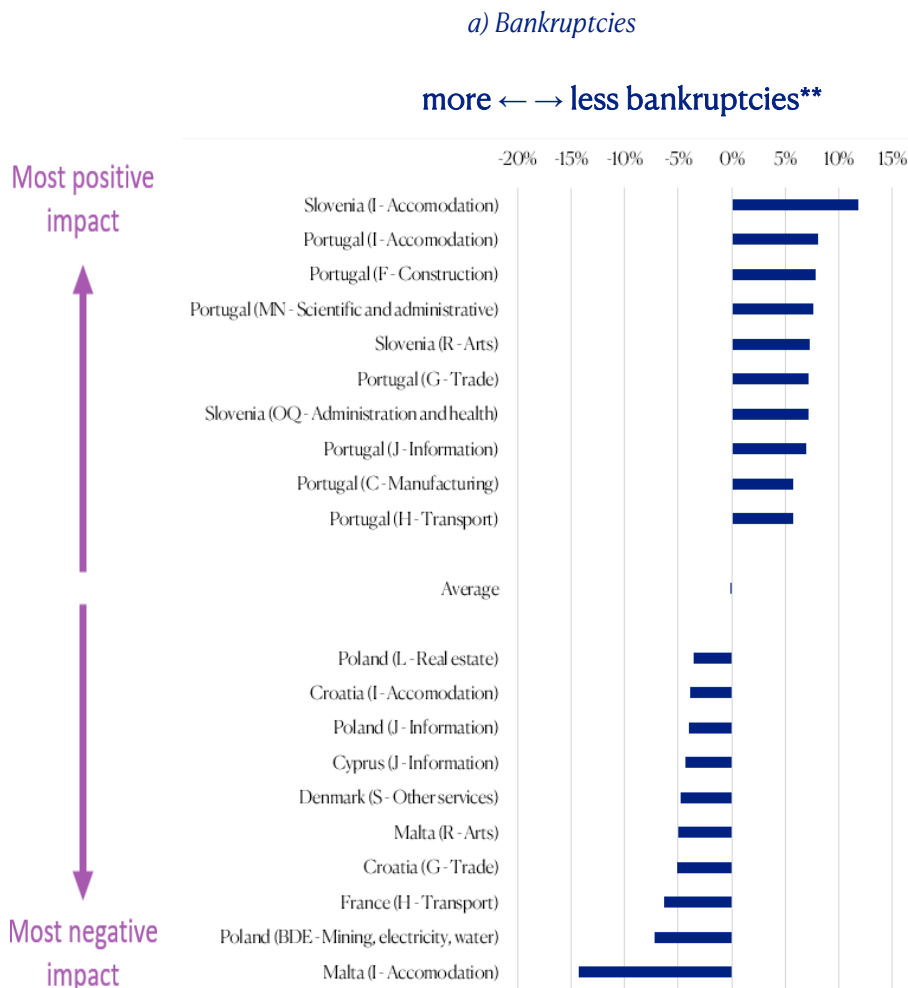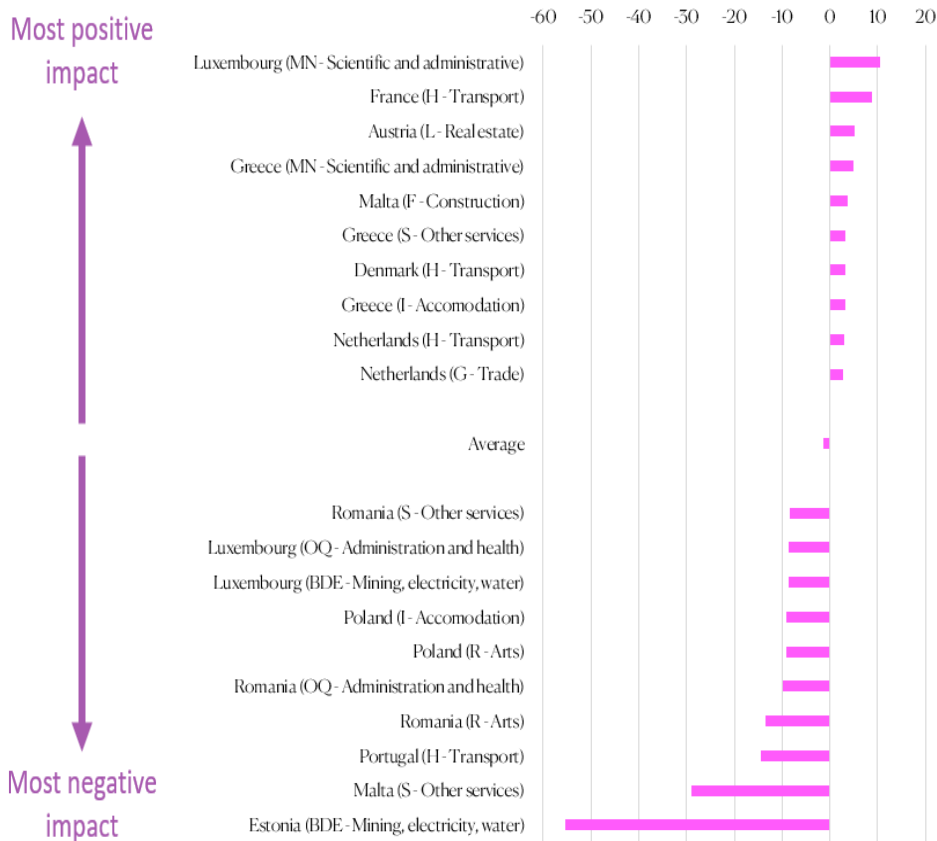
a) Bankruptcies

more ← → less bankruptcies**

b)   Establishments

Country-sectors with the most negative bankruptcy impact were vulnerable clusters ('Accommodation' in Malta), but sometimes also experienced record establishments at the same time ('Transport' in France) (Figure 8). Country-sectors with the most 'positive' bankruptcy impact were in fact clearly shielded from the shock as of now ('Accommodation' in Portugal and Slovenia), suggesting the risk of future rises in insolvencies down the road. Detailing all explanatory factors is beyond the scope of this paper. However, judicial and political factors are likely to have played a big role in driving those differences. In the case of bankruptcies, we can further decompose the impact by ages of firms, as shown in Annex 1. These decomposed results allow to further test the heterogeneity of the COVID impact on corporate demography at country-sector level.

Figure 9: Impact of the COVID-19 crisis on EU bankruptcies, per country and sector.

Countries	Sector average	A - Agriculture	BDE - Mining, electricity, water	C - Manufacturing	F - Construction	G - Trade	H - Transport	I - Accomodation	J - Information	L - Real estate	MN - Scientific and administrative	OQ - Administration and health	R - Arts	S - Other services	Cluster population (share of EU)
EU average	-0.6%	-0.5%	-0.8%	-0.5%	-0.5%	-0.7%	-1.8%	-0.7%	-0.6%	-0.3%	-0.6%	-0.5%	-0.4%	-0.8%	
Austria	-0.3%	-0.5%	0.7%	-0.3%	-1.2%	-0.2%	-2.5%	-1.0%	-0.1%	0.6%	-0.1%	0.0%	-0.6%	0.5%	1.0%
Belgium	-0.9%	-1.0%	0.2%	-1.1%	-1.0%	-0.9%	-1.0%	-0.8%	-0.5%	0.1%	-1.2%	-0.5%	-0.7%	-1.1%	3.5%
Bulgaria	-0.1%	-0.1%	0.1%	-0.1%	-0.1%	0.0%	-0.1%	0.0%	0.1%	-0.2%	-0.1%	0.1%	0.1%	0.0%	3.2%
Croatia	-3.3%	-0.9%	-3.5%	-3.0%	-3.1%	-5.1%	-1.3%	-3.8%	-2.5%	-2.9%	-3.5%	-2.0%	-3.1%	-2.1%	0.8%
Cyprus	-1.9%	0.6%	1.3%	-3.0%	-3.0%	-2.2%	-0.3%	-0.3%	-4.4%	-2.1%	-1.4%	-0.4%	-2.1%	2.3%	0.1%
Czechia	-0.1%	0.0%	-0.3%	-0.1%	0.0%	-0.1%	-0.1%	0.0%	0.0%	-0.3%	-0.1%	-0.1%	0.0%	-0.1%	4.1%
Denmark	-1.4%	0.0%	-0.8%	0.5%	0.0%	-0.5%	-1.6%	-1.6%	-0.8%	0.1%	-1.5%	-0.6%	-1.1%	-4.8%	1.9%
Estonia	0.1%	-0.2%	0.0%	-0.1%	0.0%	0.0%	-0.1%	0.2%	0.5%	0.2%	0.2%	0.5%	0.2%	0.1%	0.6%
Finland	0.9%	0.2%	1.2%	0.5%	1.0%	1.3%	0.7%	1.8%	2.0%	1.0%	1.0%	0.7%	0.1%	0.5%	1.6%
France	-1.5%	-0.5%	-0.5%	-1.6%	-1.8%	-2.1%	-6.3%	-2.2%	-1.7%	-0.3%	-1.9%	-0.8%	-0.8%	-0.7%	28.1%
Germany	0.9%	0.6%	0.7%	0.7%	1.2%	0.9%	1.4%	1.4%	1.4%	0.5%	0.9%	0.9%	0.8%	0.6%	7.6%
Greece	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.2%	0.2%	0.1%	0.2%	0.1%	0.5%	0.5%	0.4%	0.1%
Hungary	-1.2%	-1.5%	-2.2%	-0.5%	-1.3%	-1.5%	-1.6%	-1.7%	-1.0%	-0.7%	-1.1%	-0.5%	-1.2%	-1.8%	2.6%
Ireland	0.0%	-0.2%	-0.9%	-0.6%	0.2%	-0.4%	-0.2%	0.2%	-0.2%	-0.2%	0.2%	0.1%	0.1%	-0.1%	0.4%
Italy	-0.5%	-0.1%	-1.1%	-0.6%	-0.4%	-0.5%	-0.4%	-0.6%	-1.4%	-0.5%	-1.0%	-0.8%	-0.7%	-0.3%	13.5%
Latvia	1.9%	1.5%	-0.4%	2.0%	3.2%	2.5%	1.2%	1.2%	1.7%	0.7%	2.1%	0.5%	1.4%	1.9%	0.6%
Lithuania	-1.1%	-0.8%	-2.5%	-2.2%	-0.4%	-0.8%	-1.0%	-0.6%	0.0%	0.1%	-0.3%	-3.5%	-1.3%	-2.0%	0.5%
Luxembourg	1.1%	2.5%	0.9%	3.2%	0.4%	2.1%	1.4%	1.4%	0.9%	-0.7%	1.6%	2.9%	1.3%	0.0%	0.2%
Malta	-1.5%	-1.0%	NA	-1.2%	-1.3%	-0.9%	1.5%	-14.5%	-0.1%	NA	-1.7%	0.7%	-5.0%	-1.0%	0.0%
Netherlands	0.0%	-0.4%	3.1%	-0.6%	-0.5%	0.5%	-0.9%	-2.4%	1.6%	-0.4%	0.7%	-0.6%	-0.3%	-0.7%	6.8%
Poland	-2.5%	-2.5%	-7.2%	-1.5%	-1.0%	-3.0%	-1.5%	-2.5%	-3.9%	-3.6%	-2.6%	-1.2%	-2.6%	-3.4%	5.9%
Portugal	6.1%	2.9%	4.6%	5.8%	7.9%	7.2%	5.8%	8.0%	6.9%	5.0%	7.6%	3.9%	2.0%	1.8%	1.5%
Romania	-0.3%	-0.5%	-0.2%	-0.4%	-0.5%	-0.2%	-0.2%	-0.5%	-0.8%	-0.2%	-0.2%	-0.5%	-0.4%	-0.4%	4.1%
Slovakia	-0.2%	-0.1%	0.0%	-0.1%	-0.2%	-0.5%	-0.4%	-0.3%	-0.1%	-0.1%	-0.1%	-0.5%	-0.1%	-0.1%	1.6%
Slovenia	4.9%	2.6%	0.6%	5.1%	2.6%	5.4%	3.2%	11.8%	4.2%	3.1%	5.4%	7.1%	7.3%	3.5%	0.7%
Spain	-0.5%	-0.4%	-1.8%	-0.5%	-0.4%	-0.4%	-0.2%	-0.5%	-0.2%	-0.8%	-0.4%	-0.7%	-0.6%	-1.0%	5.5%
Sweden	-0.4%	-0.5%	-0.4%	-0.4%	-0.3%	-0.5%	-0.3%	-0.5%	-0.7%	0.0%	-0.4%	-0.4%	-0.2%	-0.3%	5.6%

Source: Orbis and author's calculus. NB: Percentage points differences between pre- and post-pandemic rates. Deeper colours deeper impact. For cluster populations, deeper blues mean a higher population.

Figure 10: Impact of the COVID-19 crisis on EU corporate establishments, per country and sector

Countries	Sector average	A - Agriculture	BDE - Mining, electricity, water	C - Manufacturing	F - Construction	G - Trade	H - Transport	I - Accomodation	J - Information	L - Real estate	MN - Scientific and administrative	OQ - Administration and health	R - Arts	S - Other services	Cluster population (share of EU)
EU average	-1.4%	-1.2%	-2.7%	-1.8%	-2.1%	-0.5%	2.6%	-3.4%	-1.7%	-1.5%	-1.5%	-2.0%	-2.8%	-2.2%	
Austria	-0.6%	1.9%	1.7%	0.2%	0.2%	0.9%	-0.8%	0.3%	0.7%	5.2%	-2.4%	-0.3%	0.0%	1.1%	1.0%
Belgium	-0.7%	-0.1%	-1.9%	-0.6%	-0.5%	0.1%	0.6%	-1.2%	-2.0%	-0.5%	-1.2%	-1.0%	-1.0%	-0.6%	3.5%
Bulgaria	0.0%	0.5%	-0.5%	-0.2%	-0.3%	0.0%	0.4%	0.0%	0.0%	0.0%	0.2%	0.1%	0.1%	0.2%	3.2%
Croatia	-0.9%	-0.2%	-1.3%	-0.3%	-0.2%	-0.1%	-4.4%	-1.6%	1.4%	-3.5%	-1.5%	0.5%	-3.6%	0.4%	0.8%
Cyprus	-0.5%	-1.3%	0.9%	-0.5%	-0.8%	-0.5%	-0.4%	-2.1%	1.9%	-1.1%	-0.2%	-3.9%	1.8%	0.8%	0.1%
Czechia	-0.2%	-0.5%	0.5%	-0.2%	-0.5%	0.4%	-0.4%	-1.2%	0.0%	-0.8%	0.1%	-1.0%	-0.8%	-0.7%	4.1%
Denmark	-1.9%	-0.2%	-2.6%	0.5%	-0.5%	1.8%	3.3%	-3.5%	0.3%	-0.1%	-1.0%	-2.5%	-1.2%	-6.2%	1.9%
Estonia	-2.8%	2.1%	-55.3%	0.6%	-0.6%	-1.5%	0.5%	-0.3%	-1.5%	-1.9%	-1.6%	-2.6%	-2.0%	-2.2%	0.6%
Finland	-0.5%	0.5%	1.1%	-0.1%	-1.5%	0.6%	-4.6%	-2.1%	0.3%	-0.2%	-0.1%	0.8%	-0.8%	-0.5%	1.6%
France	0.5%	-0.5%	0.6%	-0.7%	-1.2%	1.0%	8.8%	-2.6%	0.3%	-1.2%	0.1%	0.1%	-1.5%	-0.6%	28.1%
Germany	-0.3%	-0.1%	1.2%	-0.1%	-0.4%	0.0%	-0.4%	-1.9%	-0.2%	-0.1%	-0.1%	-0.1%	-0.7%	-0.4%	7.6%
Greece	1.9%	-0.2%	-2.5%	-0.2%	1.0%	1.7%	1.0%	5.2%	1.4%	-1.0%	4.9%	2.2%	-2.1%	3.5%	0.1%
Hungary	1.1%	2.1%	-3.8%	0.9%	0.3%	0.4%	0.9%	-0.7%	2.1%	0.8%	1.9%	1.4%	1.1%	1.0%	2.6%
Ireland	1.3%	2.5%	1.0%	0.9%	1.1%	1.5%	1.4%	1.7%	1.5%	0.5%	1.4%	1.5%	0.6%	1.4%	0.4%
Italy	-2.5%	-0.9%	-2.6%	-2.2%	-2.2%	-2.3%	-2.0%	-4.6%	-1.7%	-1.5%	-3.1%	-2.0%	-3.8%	-5.4%	13.5%
Latvia	-0.9%	-0.4%	0.3%	0.8%	-1.5%	0.1%	-6.5%	0.0%	-0.6%	-0.2%	-1.2%	0.1%	-0.5%	-0.5%	0.6%
Lithuania	-0.4%	-0.3%	-0.7%	-1.0%	-1.6%	0.1%	-0.9%	0.6%	-1.8%	1.1%	-0.3%	-0.4%	-0.6%	-0.4%	0.5%
Luxembourg	4.2%	-1.7%	-8.7%	2.4%	0.1%	0.8%	-0.6%	-0.1%	-4.0%	1.6%	10.5%	-8.5%	-3.2%	-0.9%	0.2%
Malta	-0.1%	0.6%	NA	0.7%	3.7%	-1.0%	2.4%	0.3%	0.7%	NA	1.1%	-0.6%	-1.7%	-29.1%	0.0%
Netherlands	-0.9%	-1.1%	1.1%	-0.1%	-2.3%	2.8%	3.0%	-4.0%	-0.9%	0.1%	-1.5%	-2.8%	-2.8%	-0.8%	6.8%
Poland	-6.2%	-5.8%	-4.6%	-4.0%	-5.6%	-4.7%	-8.0%	-9.0%	-5.9%	-5.9%	-7.5%	-6.9%	-9.2%	-6.5%	5.9%
Portugal	-3.0%	1.2%	-2.3%	-0.6%	-2.6%	-0.2%	-14.5%	-3.8%	-2.3%	-4.5%	-1.7%	-2.1%	-3.5%	-2.0%	1.5%
Romania	-5.1%	-6.3%	-2.3%	-6.1%	-3.1%	-2.7%	-3.6%	-5.6%	-4.6%	-2.4%	-5.3%	-9.8%	-15.4%	-8.5%	4.1%
Slovakia	-1.4%	0.1%	-1.4%	-2.2%	-1.8%	-0.2%	-1.4%	-5.4%	-2.9%	-1.3%	-0.9%	-0.9%	-0.4%	-2.1%	1.6%
Slovenia	-2.0%	-1.5%	1.3%	-1.7%	-2.6%	0.3%	-0.5%	-4.0%	-3.7%	-5.1%	-1.4%	-1.5%	-1.6%	-2.3%	0.7%
Spain	-1.3%	0.5%	-1.1%	-0.1%	-0.7%	-0.4%	-0.1%	-5.1%	-0.6%	-1.8%	-2.0%	-2.1%	-5.2%	-2.0%	5.5%
Sweden	-1.8%	-0.5%	-3.1%	-1.3%	-2.5%	0.0%	-1.2%	-1.5%	-2.9%	-1.7%	-2.5%	-3.1%	-2.5%	-1.8%	5.6%

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Source: Orbis and author's calculus. NB: Percentage points differences between pre- and post-pandemic rates. Deeper colours deeper impact. For cluster populations, deeper blues mean a higher population.

4.1.4 | **Significant divergences**

Simple statistical techniques can be used as a first assessment of the significance of such divergences between country-sector clusters. Differential bankruptcy rates have a mean of -0.09% and a standard deviation of 2.18. Differential establishment rates have a mean of -1.28% and a standard deviation of 4.16. This suggests heterogeneity across country-sectors outcomes. It also suggests that heterogeneity of the impact was higher for establishments than for bankruptcies. To test if these heterogeneities are significant, we rank differential rates from lowest to highest and associate a dummy to each quartile. We then regress differential rates on those dummies. The dummy coefficients correspond to quartile averages. The averages in the lower two quartiles are negative and significantly different from zero. For both establishments and bankruptcies, the average in the upper quartile is positive and statistically significant. This confirms the presence of heterogeneity.

Additionally, we regress country-sector differential rates on a set of country and sector dummies. In order to do so, we need to select a benchmark country and a benchmark sector which will act as a reference point. Our regression then allows to assess whether the impact of the crisis on bankruptcy and firm creations was significantly different in a specific country or sector *compared to* the chosen benchmark. We use the biggest countries in our sample in terms of number of firms, France and Italy, and the biggest sectors, 'Trade' and 'Scientific and Administrative', as benchmarks. For bankruptcies, we find that 37% of countries experienced an impact different from Italy, and 78% from France. We don't find any difference between sectors. For establishments, 19% of countries have an impact different from France, and 33% from Italy. 33% of sectors had an impact different from Trade, and 17% from 'Scientific and administrative'. These results are significant at the 90% level.

In other words, heterogeneity seems to stem from countries more than from sectors, especially for bankruptcies. It is indeed likely that differences in bankruptcies were mostly driven by diverging national policy responses and insolvency processing. On the other hand, differences in establishments are likely to have been less affected by administrative changes and a policy response which was mostly targeted at preserving businesses. As such, the wider standard deviation of the impact on establishment seems to reflect genuine heterogeneities in the initial impact of the crisis.

Moving forward, the risk is to see those divergences increase. The recent rise in bankruptcies observed in Eurostat data could indeed lead to a "tsunami" of bankruptcies. However, rather than a tsunami, our analysis suggests that it could turn out to be series of asymmetric waves, heterogeneous between countries, sectors, and types of firms. Bruegel notably forecasts high insolvency risks in countries with a high prevalence of zombie firms, mostly in Southern Europe (Altomonte et al., 2021). Allianz forecasts a rise in bankruptcies of 22% in Germany in 2023, but of 41% in France (Allianz Research, 2023). In order to better understand the origins of those heterogeneities and prepare for such potential outcome, we move to the likely central explanatory factor, COVID-19 fiscal policies deployed by governments.

4.2 | Policy impact

4.2.1 | Policy pledges

We have shown in previous work based on IMF data (Brault and Signore, 2020) the prevalence of credit guarantee pledges in the EU. The US focused more on tax reliefs, and Japan on subsidies. ESRB data allows to document vast discrepancies between countries within the EU. As mentioned above, one must however keep in mind the limitations of such data. These are policy *pledges*, i.e. announcements made by governments. These announcements were not necessarily followed by actual disbursements. This would especially be the case for credit guarantees, where actual disbursements would only happen if and when the firm defaults. This could happen years down the road. The ESRB adjusts for actual disbursements when the information is communicated by governments. However, such corrections are not consistently reported by national authorities. Further work will be necessary to dwell into detailed disbursed amounts drawn from national statistics.

A few big countries, mainly France, Germany, and Italy, concentrated most fiscal policy pledges (Figure 11). Pledged amounts correspond to 12% of EU GDP in 2020, in line with other advanced economies (Deb et al., 2021). They were then halved in the summer of 2021. They nearly disappear in 2022, which we do not display on the graph. Pledged policies as shares of national GDPs draw a more complex picture (Figure 13). Although the same big spenders are found at the top, two Eastern European countries, Czechia and Hungary, spent above EU average. For countries at the bottom of the list, some lacked fiscal space, such as Bulgaria, Romania, or Slovakia. Others were less impacted by the crisis, like Finland or Ireland. Overall, those divergences legitimate the way EU institutions deployed their own EU-level programmes in order to partially offset those asymmetries.

Distinguishing by types of policies, the prevalence of loans credit guarantees is evident, although it greatly decreases in the summer of 2021 (Figure 12). Next come subsidies, tax reliefs, and investments, the distribution between those three categories remaining constant over the period. Between loans and credit guarantees, the latter has the clear prevalence (Figure 14). Subsidies targeted mainly employees, although the ESRB does not allow to completely distinguish employee and firm subsidies. A decomposition of pledged policies by countries shows that national policy priorities diverged (Figure 15, and see also Annex 5). These divergences, along with divergences in national corporate landscapes, are likely to explain the significantly different impact of the crisis on bankruptcies and establishments on the continent. We hence need first insights into the potential mitigating impact of pledged policies.

Figure 11: Weekly pledged COVID-19 policies in the EU as a share of EU GDP from January 2020 to December 2021, per country
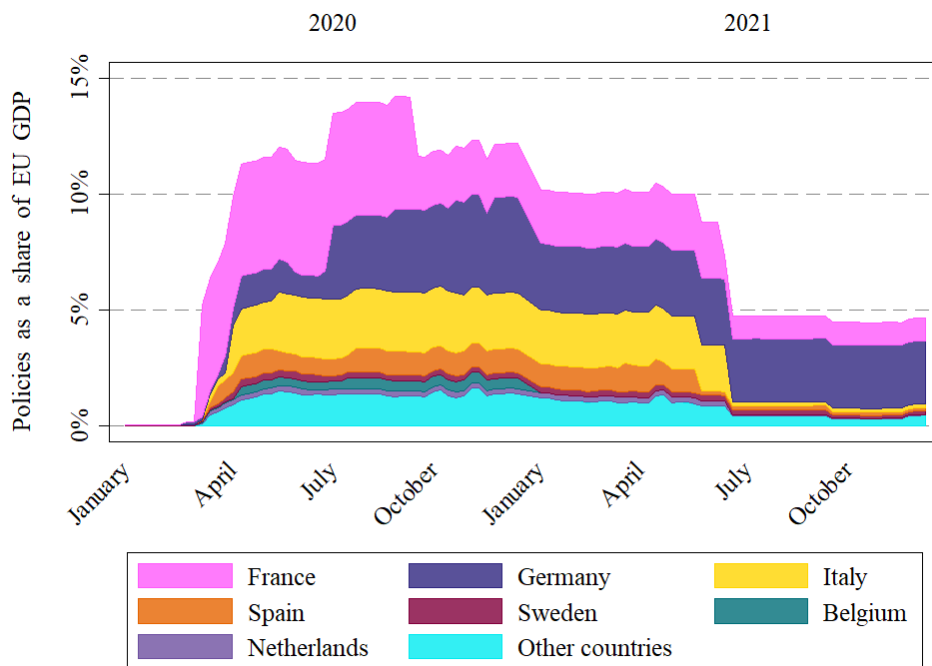
Source: ESRB (2023) and author's calculus (see text for details)

Figure 12: Weekly pledged COVID-19 policies in the EU as a share of EU GDP from January 2020 to December 2021, per types of policies
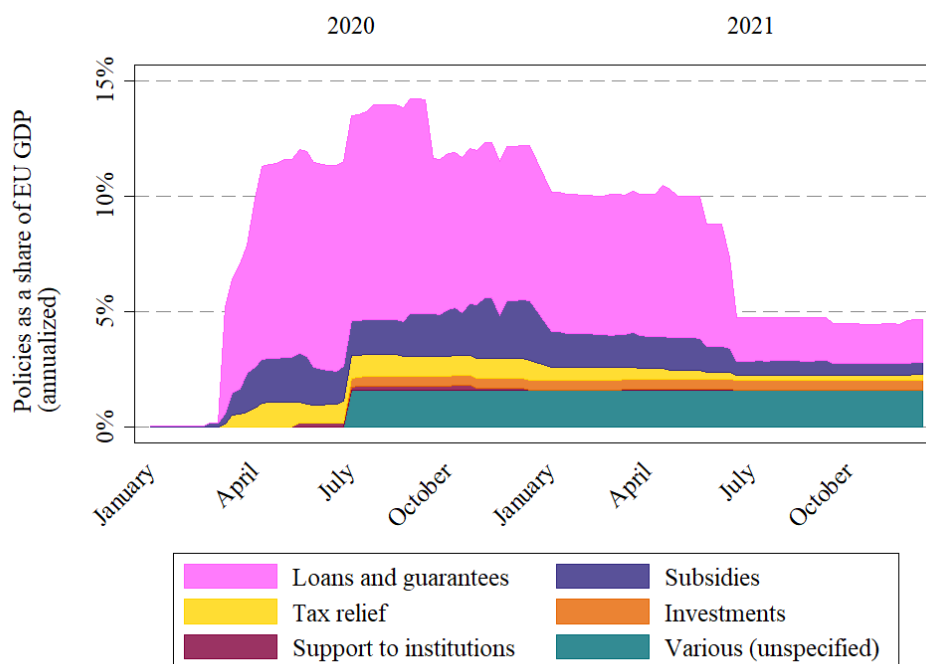
Source: ESRB (2023) and author's calculus (see text for details)

Figure 13: Pledged yearly COVID-19 policies as share of national GDPs
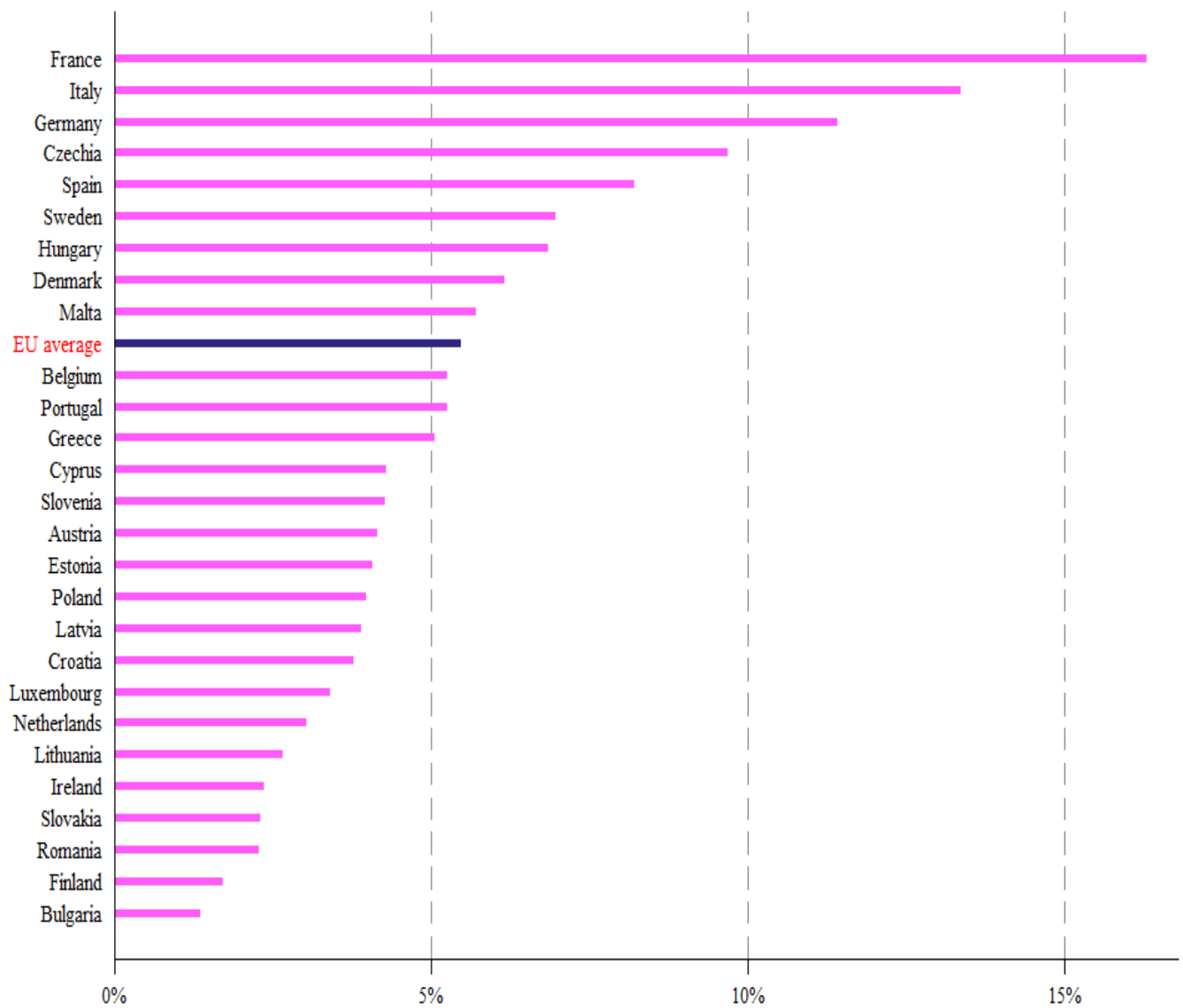
Figure 14: Pledged yearly COVID policies as a share of EU GDP per types and sub-types of policies
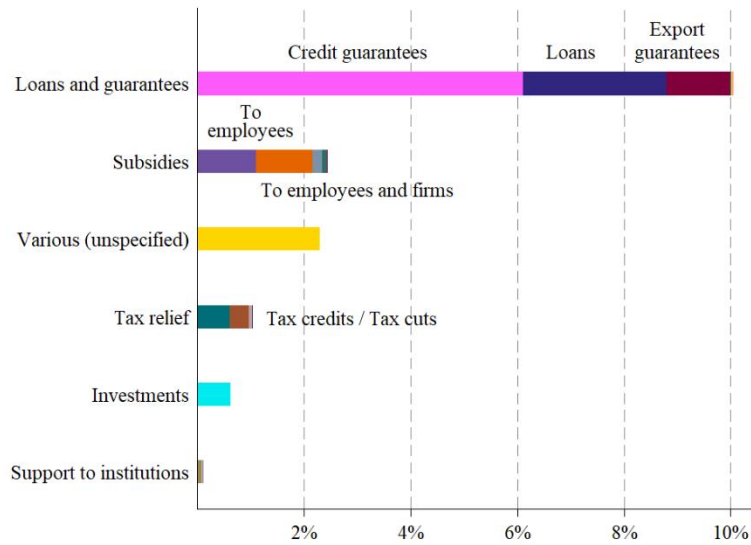
Source: ESRB (2023) and author's calculus (see text for details)

Figure 15: Pledged yearly COVID-19 policies as a share of EU GDP per countries and policies
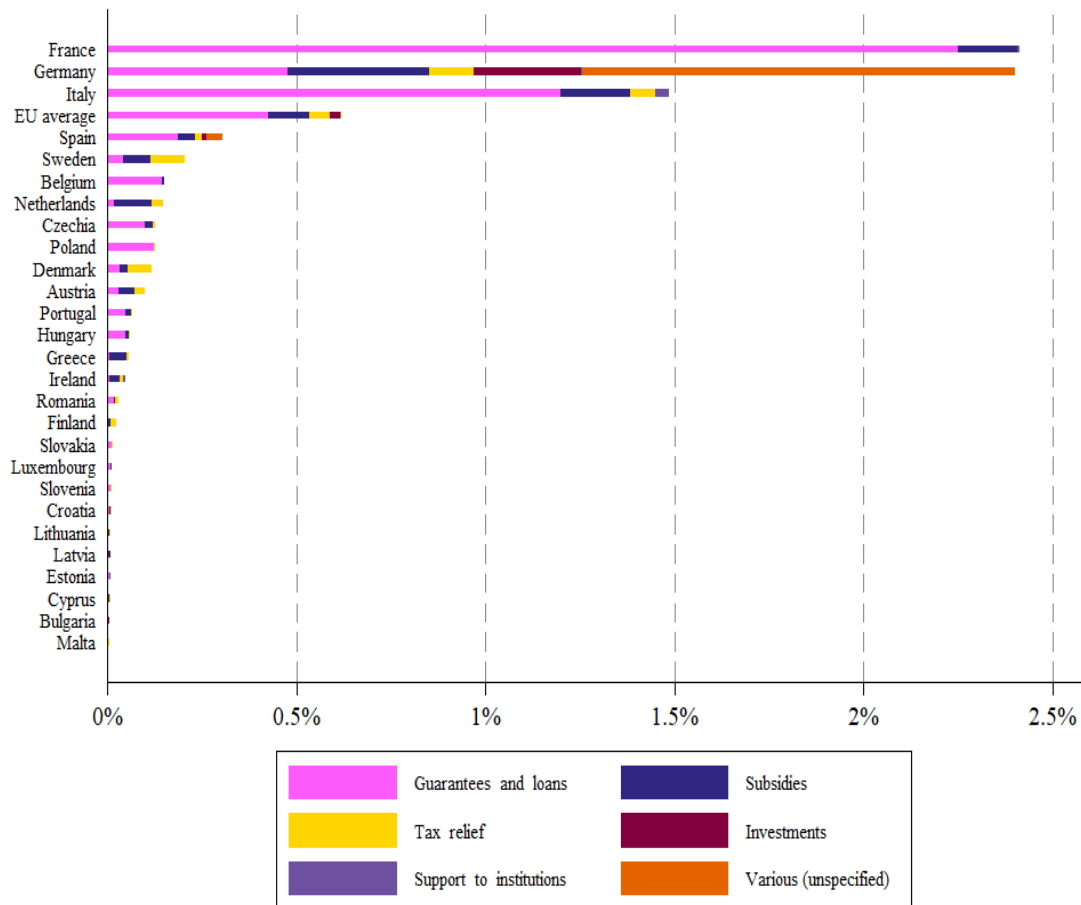
Source: ESRB (2023) and author's calculus (see text for details)

4.2.2 | Insights into the policy impact

The impact of pledged policies on GDP growth and unemployment can first be explored by simple plots (.

Figure 16). EU countries which pledged the largest policy response are also countries which suffered the largest GDP impact in 2020-21. This is true even when not considering the four biggest EU countries. The direction of causality is however unclear. Concerning unemployment, more COVID policies spent is correlated to an increase in unemployment, especially when excluding the four biggest EU countries. When doing so, each additional one percent of GDP spent on COVID policies is associated with an additional 0.5 percentage point of increase in the unemployment rate. On average, unemployment tends to increase once more than 7.5% of GDP was pledged on COVID policies.

The impact of pledged policies on bankruptcies and establishments is of special importance and might provide some explanatory clues. Plotting pledged policies against differential bankruptcy rates for the 12 months following March 2020 reveals a positive correlation between pledged policies and less bankruptcies. It is also possible that countries which deployed the biggest amounts of policies would also have been the countries which enacted the biggest changes in insolvency proceedings. The correlation between pledged policies and the impact of the crisis on establishments is also positive, but less strong. Additionally, worse impacts of the crisis on establishments are correlated with more negative variations in employment.

Figure 16: Correlations between policy responses and GDP growth, unemployment rate variation, bankruptcy impact, and establishment impact

a) Policy response vs GDP growth
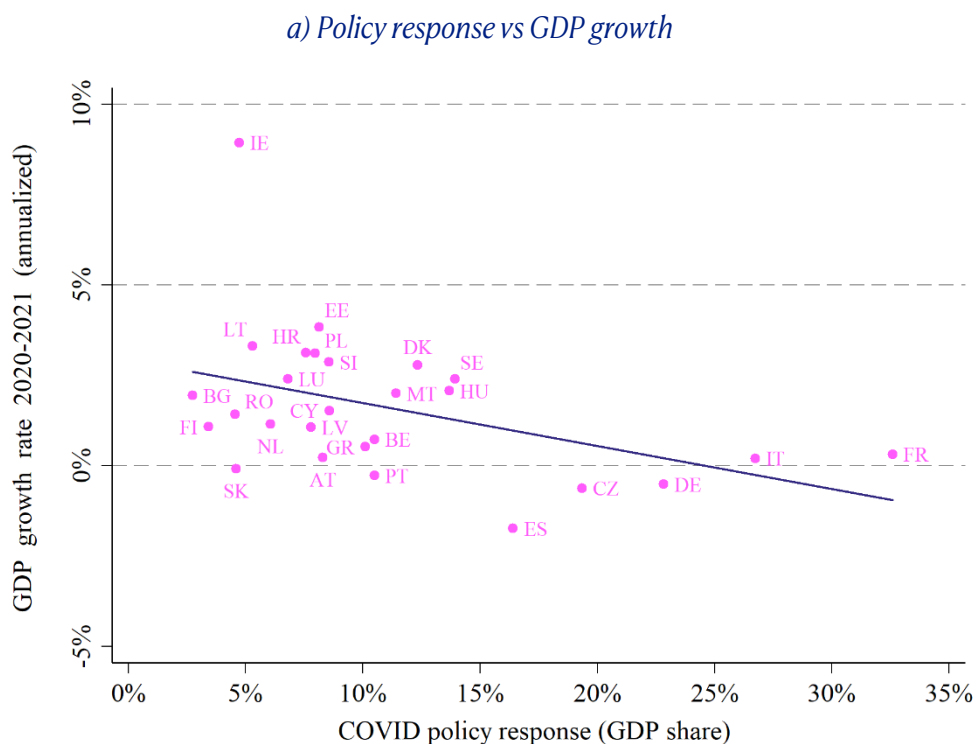
b) Policy response vs Unemployment rate variation

c) Policy response vs Impact on bankruptcies
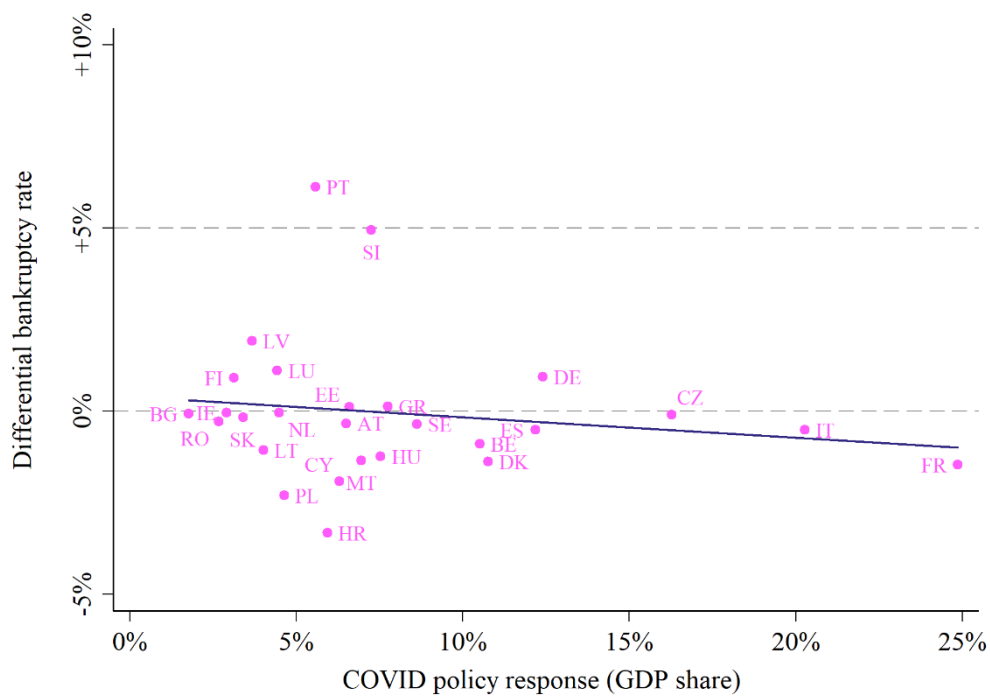
c) Policy response vs Impact on establishments
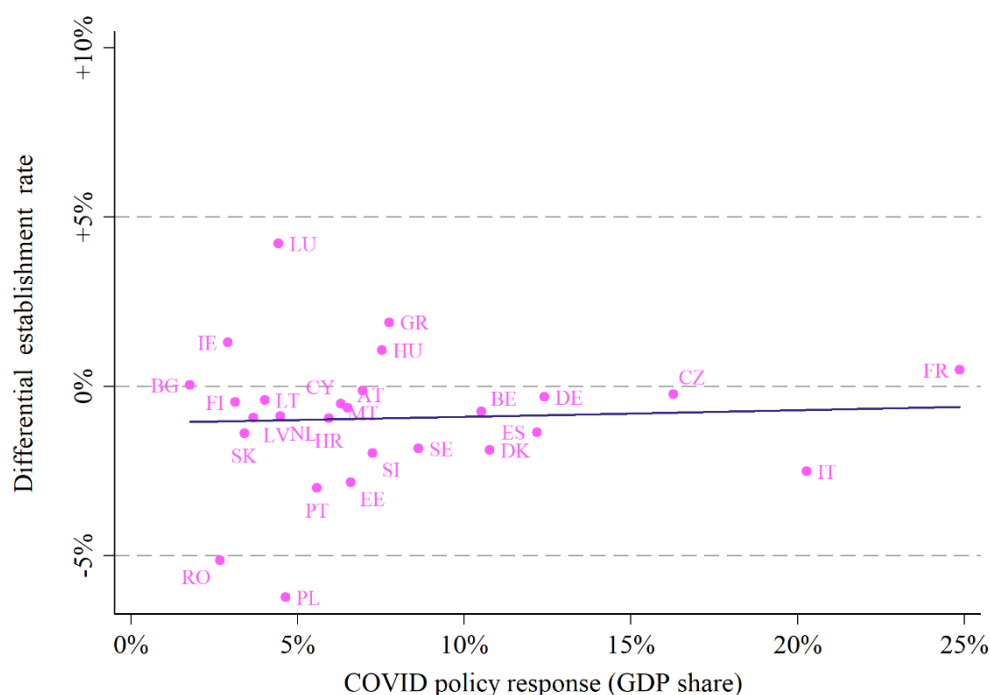
COVID policies primarily targeted existing firms in order to prevent their insolvency. They succeeded in this respect. However, they do not seem to have prevented rises in unemployment once a certain level of spending was reached. Policies promoting firm creations were less prominent. The link between policy support and establishments seems weaker than for bankruptcies. Lower establishment rates are correlated with a more negative evolution of unemployment. This is likely to explain the failure of big policy pledges at limiting the rise in unemployment. Indeed, firm creations are one of the main drivers of job creations, which, in turn, foster medium-term GDP growth. Support to firm creations seems to have been the missing piece in the puzzle of COVID policies. This probably explains part of the EU failure to catch-up to the swifter US recovery. In the end, bigger policy pledges are associated with lower GDP growth rates in the EU.

These correlations are a first step to further assess the mitigating impact of the COVID policy response in the EU. Further work will be needed in this area. Especially, the prevalence of credit guarantees calls for more insights into their effectiveness. The economic effects of national guarantee programmes might greatly differ by countries. Differences in national industrial landscapes have indeed been seen to increase or decrease the effectiveness of guarantees (Brault and Signore, 2020). The fiscal capacities of States to withstand potential future defaults on guaranteed loans also widely differ. These diverging risks are also true for subsidies and tax reliefs.

5 | Conclusion

We use Orbis data and compare the COVID crisis to 2015-2019 weekly averages using a methodology inspired by the difference-in-differences approach. We estimate the impact of the COVID-19 crisis on EU bankruptcy and corporate establishment rates from March 2020 to March 2021. We find that bankruptcy rates decreased by 22%, but got back to historical trends at the end of 2020. Establishment rates decreased by 11%. This happened in two steps, first in the first 3 months of the pandemic, then at the end of 2020. Overall "missing" firms due to this twin evolution represent around 0.77% of the total EU corporate population, i.e. 293,000 firms. We decompose results between countries, sectors, and firms' ages. Major divergences occur on all three levels. We provide first insights on the sources of these heterogeneities. The differences in impact seem to stem more from national rather than sectoral characteristics, especially for bankruptcies. This is likely because national policies mitigated the impact of the crisis on bankruptcies rather than on establishments.

To enlighten this question, we document COVID fiscal policies per countries and types of policies. Pledged policies primarily targeted existing firms and were effective at preventing insolvencies. Policies promoting firm creations were less prominent. The link between policy support and establishments seems weaker than for bankruptcies. Policy support also seems to have failed at limiting rises in unemployment above a certain level of spending. Bigger policy pledges are associated with lower GDP growth. Worse impacts on establishments are associated with worse employment outcomes. This insufficient support to business creations likely explains part of the post-COVID EU-US decoupling. Additionally, large differences in GDP impact, policy support, and firm creations, could exacerbate divergences between EU countries moving forward. Excessively prolonged support to low-productivity firms could lead to risks of zombification.

Moving forward, the results of our analysis underline the necessity of policy action. EU and national policies should foster business creations in order to support the ongoing recovery. Policy measures can streamline firm establishments, reduce uncertainty, and increase financing options. The diverging impact of the crisis on corporate demographics will likely increase broader economic divergences between EU States. In this context, EU institutions have a crucial role to play to foster convergence between countries.

From an EIF-perspective, depending on the type of company, a variety of instruments can be effective to support firm creation, notably targeted guarantees, equity financing, venture debt, venture capital, or microfinance. Public credit guarantees can help shield firms against early default, but also spur asset and employment growth, especially of young firms (Brault and Signore, 2019). Narrowing the targeting of COVID guarantees could enhance reallocation processes (Heinemann, 2022). Enhancing the transparency and efficiency of insolvency processes could be coupled with developing secondary markets for stressed assets (Altomonte et al., 2021). Public equity financing and venture debt have been shown to effectively support the creation of start-ups. Notably, public support to venture capital boosts the capital growth, revenues, employment, and access to finance of young start-ups (Pavlova and Signore, 2019). Microfinance can on its side reach individuals considering creating their business but short on funds or collateral.

After COVID, a second crisis was caused by the Russian invasion of Ukraine and the rise in energy costs, inflation, and interest rates. This "double-dip" crisis will potentially have long-term geopolitical and macroeconomic consequences. Highly leveraged SMEs which did not redirect enough of their energy supplies towards renewables are especially affected. As pandemic support programs are gradually being ended, SMEs vulnerable to liquidity shortages are facing a high risk of insolvency. Survey data showed that over 24% of European SMEs experienced significant financial issues before the Russia-Ukraine war, with great variations between countries. Banks are historically the main provider of external financing for European SMEs, however, they have recently started to tighten credit standards (Kraemer-Eis et al., 2022). The unwinding of credit guarantees could gradually transfer more risks to lenders. Zombie firms have so far not caused big issues for banks (Roulet, 2021). However, the recent collapse of the Silicon Valley Bank and of Crédit Suisse points to rising risks coming not so much from SMEs than from their lenders.

A long-term risk is the entry into a stagflation spiral accompanied by persisting debt overhang, a rise in low-productivity "zombie" firms and large long-run output gaps (see notably Summers, 2021, and Cassidy, 2022). Scarring effects are a defining feature of significant economic shocks. Based on a sample of 26 advanced OECD members covering the 1970-2020 timeframe, Larch et al. (2022) explored over 100 such downturns. They found that on average real GDP growth in the three to seven years after a crisis remained 2% below the pre-crisis trend. They also found that investment declines on average.

Future research could extend this analysis in time. It could be extended *forward* in time when the latest Orbis data becomes available in order to analyse the end of 2021 and the subsequent Ukraine shock. Our historical averages could also be extended *backward* in time by including the 2005-2015 period. This would allow to compare the 2020 crisis to the 2008 crisis. Eckert et al. (2020) notably show that the increase in corporate bankruptcies after 2008 was only gradually reflected in the data, which is coherent with our own observations about the 2020 crisis. Pre-2015 Orbis data is patchier and more imbalanced. We could address this issue by re-weighting corporate clusters according to their demographic weight in Eurostat. Second, it should be possible to further examine the causal link between post-COVID policies and corporate demographics. By comparing effects between types of policies and controlling for confounding factors, the most efficient policies could be identified relative to an array of objectives. To further this aim, results could be decomposed by additional corporate characteristics in order to better map the differentiated impact of the crisis. The impact methodology built for this paper will hence constitute an important steppingstone to further exploit the depth of Orbis' data in the future.

Annexes

Annex 1: Impact of the COVID-19 crisis on EU bankruptcies by country, sector, and age

Figure 17: Impact of the COVID-19 crisis on EU bankruptcies by country, sector, and age

Country	Sector	All ages	Age				Cluster population (share of EU)
			0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	
	All sectors	-0.61%	-1.23%	-1.61%	-0.55%	-0.24%	100.00%
	A - Agriculture	-0.26%	-0.26%	-0.26%	-0.63%	-0.15%	5.30%
	BDE - Mining, electricity, water	-0.85%	-0.57%	-0.39%	-1.85%	-0.46%	0.81%
	C - Manufacturing	-0.51%	-0.43%	-1.28%	-0.87%	-0.26%	6.39%
	F - Construction	-0.55%	-0.91%	-1.56%	-0.43%	-0.28%	11.23%
	G - Trade	-0.69%	-1.47%	-1.89%	-0.88%	-0.18%	18.64%
EU average	H - Transport	-1.83%	-5.72%	-3.50%	-0.79%	-0.19%	3.52%
	I - Accomodation	-0.69%	-0.33%	-2.07%	-0.49%	-0.43%	5.24%
	J - Information	-0.57%	-0.74%	-1.60%	-0.80%	0.01%	3.67%
	L - Real estate	-0.25%	-0.49%	-0.83%	-0.24%	-0.10%	10.84%
	MN - Scientific and administrative	-0.57%	-1.06%	-1.60%	-0.14%	-0.51%	15.96%
	OQ - Administration and health	-0.51%	-1.10%	-1.13%	-0.39%	-0.22%	6.54%
	R - Arts	-0.43%	-0.34%	-1.56%	-0.43%	-0.21%	4.11%
	S - Other services	-0.82%	-1.41%	-1.87%	-0.78%	-0.45%	7.74%
	All sectors	-0.33%	-1.78%	-0.71%	-0.17%	0.00%	0.95%
	A - Agriculture	-0.52%	-4.92%	-2.48%	0.42%	0.42%	0.01%
	BDE - Mining, electricity, water	0.73%	2.33%	0.26%	1.29%	0.47%	0.01%
	C - Manufacturing	-0.29%	-1.75%	-0.80%	0.13%	-0.15%	0.05%
	F - Construction	-1.18%	-3.94%	-3.84%	-1.07%	-0.13%	0.09%
	G - Trade	-0.24%	-2.98%	0.23%	-0.66%	0.16%	0.16%
Austria	H - Transport	-2.33%	-8.24%	-3.01%	-2.54%	-1.03%	0.03%
	I - Accomodation	-0.98%	-7.67%	-1.51%	-0.14%	-0.05%	0.06%
	J - Information	-0.07%	-0.92%	-0.76%	-0.55%	0.48%	0.04%
	L - Real estate	0.56%	0.00%	3.60%	0.18%	0.16%	0.05%
	MN - Scientific and administrative	-0.15%	-0.43%	-0.75%	0.16%	-0.01%	0.40%
	OQ - Administration and health	0.00%	-5.42%	4.98%	-0.29%	-0.53%	0.01%
	R - Arts	-0.61%	0.48%	-4.35%	0.79%	-0.39%	0.01%
	S - Other services	0.55%	-1.77%	1.97%	0.69%	0.48%	0.03%
	All sectors	-0.89%	-1.20%	-2.49%	-1.36%	-0.35%	3.51%
	A - Agriculture	-0.98%	-4.12%	-2.22%	-1.24%	-0.63%	0.16%
	BDE - Mining, electricity, water	0.19%	5.73%	-0.95%	-1.33%	0.27%	0.01%
	C - Manufacturing	-1.08%	-0.69%	-3.55%	-1.19%	-0.70%	0.17%
	F - Construction	-0.99%	-1.12%	-1.99%	-1.67%	-0.48%	0.44%
	G - Trade	-0.88%	-2.20%	-2.88%	-1.30%	-0.36%	0.60%
Belgium	H - Transport	-0.96%	-3.07%	-3.22%	-1.40%	0.13%	0.08%
	I - Accomodation	-0.85%	-0.94%	-2.92%	-1.31%	-0.51%	0.22%
	J - Information	-0.47%	-0.22%	-1.31%	-1.57%	0.29%	0.17%
	L - Real estate	0.12%	0.69%	-1.86%	-0.75%	0.52%	0.14%
	MN - Scientific and administrative	-1.24%	-1.24%	-2.86%	-1.53%	-0.65%	0.75%
	OQ - Administration and health	-0.48%	-0.76%	-1.41%	-0.36%	-0.28%	0.34%
	R - Arts	-0.67%	-0.08%	-2.04%	-1.40%	-0.10%	0.17%
	S - Other services	-1.06%	-1.28%	-5.09%	-1.76%	-0.19%	0.25%

Country	Sector		Age				Cluster population (share of EU)
		All ages	**0 to 2 years old**	**2 to 5 years old**	**5 to 10 years old**	**10 years old and more**	
	All sectors	-0.07%	0.03%	0.06%	-0.10%	-0.11%	3.23%
	A - Agriculture	-0.12%	0.26%	0.89%	-0.20%	-0.26%	0.45%
	BDE - Mining, electricity, water	0.06%	0.38%	0.34%	0.01%	0.01%	0.01%
	C - Manufacturing	-0.14%	0.14%	-0.38%	-0.31%	-0.09%	0.16%
	F - Construction	0.09%	0.15%	0.40%	-0.12%	0.10%	0.12%
	G - Trade	-0.11%	-0.04%	0.02%	-0.15%	-0.13%	0.95%
Bulgaria	H - Transport	0.00%	0.08%	-0.20%	0.06%	0.00%	0.19%
	I - Accomodation	0.07%	0.06%	0.06%	-0.05%	0.11%	0.18%
	J - Information	-0.18%	0.31%	-0.62%	0.05%	-0.31%	0.07%
	L - Real estate	-0.13%	0.18%	-0.34%	-0.21%	-0.09%	0.34%
	MN - Scientific and administrative	-0.07%	-0.01%	0.38%	-0.14%	-0.15%	0.34%
	OQ - Administration and health	0.07%	0.29%	0.14%	0.24%	0.02%	0.14%
	R - Arts	0.09%	0.06%	0.25%	0.49%	-0.01%	0.09%
	S - Other services	0.02%	-0.31%	0.16%	0.31%	-0.04%	0.20%
	All sectors	-3.52%	-1.19%	-8.21%	-4.36%	-1.74%	0.76%
	A - Agriculture	-0.91%	1.81%	-7.22%	-0.90%	0.18%	0.02%
	BDE - Mining, electricity, water	-5.33%	-6.21%	-0.85%	-7.22%	-0.70%	0.01%
	C - Manufacturing	-5.00%	-0.31%	-9.48%	-4.26%	-1.69%	0.08%
	F - Construction	-3.08%	-0.31%	-8.78%	-4.31%	-1.70%	0.09%
	G - Trade	-5.06%	-3.97%	-14.89%	-5.65%	-2.64%	0.15%
Croatia	H - Transport	-1.52%	0.02%	1.09%	-4.63%	-1.50%	0.05%
	I - Accomodation	-3.85%	-1.06%	-10.61%	-4.23%	-1.20%	0.08%
	J - Information	-2.45%	0.45%	-6.56%	-2.59%	-1.44%	0.04%
	L - Real estate	-2.91%	-2.57%	-8.58%	-2.52%	-1.86%	0.02%
	MN - Scientific and administrative	-5.28%	-1.17%	-6.56%	-4.63%	-1.74%	0.14%
	OQ - Administration and health	-1.96%	-0.25%	-5.15%	-3.20%	-1.04%	0.02%
	R - Arts	-5.07%	-2.05%	-2.36%	-7.65%	-0.95%	0.01%
	S - Other services	-2.05%	-0.11%	-5.03%	-2.81%	-0.98%	0.05%
	All sectors	-1.91%	-1.25%	-3.24%	-2.08%	-1.78%	0.13%
	A - Agriculture	0.59%	0.00%	-4.04%	2.38%	0.45%	0.00%
	BDE - Mining, electricity, water	1.34%	0.00%	-3.14%	1.87%	2.62%	0.00%
	C - Manufacturing	-2.96%	0.00%	-10.56%	0.52%	-3.50%	0.01%
	F - Construction	-3.01%	-0.06%	-1.70%	-2.45%	-3.25%	0.01%
	G - Trade	-2.21%	-1.66%	-2.79%	-2.69%	-2.07%	0.05%
Cyprus	H - Transport	-0.26%	1.41%	-1.77%	1.41%	-0.89%	0.00%
	I - Accomodation	-0.34%	-0.22%	2.40%	-1.81%	-0.31%	0.01%
	J - Information	-4.37%	-0.09%	-4.93%	-11.84%	-2.49%	0.00%
	L - Real estate	-2.14%	-0.06%	-12.06%	0.02%	-1.88%	0.01%
	MN - Scientific and administrative	-1.43%	-1.81%	-3.08%	-0.91%	-1.29%	0.02%
	OQ - Administration and health	-0.36%	-0.22%	-6.20%	-4.64%	2.20%	0.00%
	R - Arts	-2.09%	-1.08%	-1.28%	-12.33%	2.10%	0.00%
	S - Other services	2.31%	-0.39%	-1.03%	4.21%	1.52%	0.00%
	All sectors	-0.09%	-0.13%	-0.35%	-0.10%	-0.02%	4.06%
	A - Agriculture	-0.01%	-0.24%	0.12%	-0.16%	0.04%	0.23%
	BDE - Mining, electricity, water	-0.29%	0.25%	-1.82%	-0.02%	-0.08%	0.06%
	C - Manufacturing	-0.07%	-0.39%	-0.24%	-0.01%	-0.01%	0.49%
	F - Construction	0.00%	0.24%	-0.39%	0.02%	0.03%	0.51%
	G - Trade	-0.11%	-0.18%	-0.31%	-0.12%	-0.04%	0.78%
Czechia	H - Transport	-0.10%	0.25%	-1.37%	-0.01%	0.02%	0.13%
	I - Accomodation	-0.05%	-0.15%	-0.11%	0.03%	-0.04%	0.23%
	J - Information	-0.03%	-0.01%	-0.18%	0.01%	0.00%	0.12%
	L - Real estate	-0.52%	0.01%	-0.75%	-0.64%	-0.15%	0.24%
	MN - Scientific and administrative	-0.11%	0.09%	-0.52%	-0.10%	-0.04%	0.73%
	OQ - Administration and health	-0.06%	-0.37%	-0.05%	-0.10%	0.01%	0.14%
	R - Arts	0.02%	-0.34%	0.09%	0.14%	0.03%	0.10%
	S - Other services	-0.10%	-0.76%	-0.16%	-0.11%	0.03%	0.31%

Country	Sector		Age			10 years old and more	Cluster population (share of EU)
		All ages	0 to 2 years old	2 to 5 years old	5 to 10 years old		
	All sectors	0.94%	1.57%	3.03%	2.27%	0.06%	7.58%
	A - Agriculture	0.61%	2.28%	2.58%	1.21%	-0.01%	0.08%
	BDE - Mining, electricity, water	0.74%	1.72%	2.40%	0.83%	0.05%	0.13%
	C - Manufacturing	0.66%	1.68%	3.28%	2.18%	-0.02%	0.58%
	F - Construction	1.23%	2.00%	3.87%	2.85%	0.32%	0.96%
	G - Trade	0.91%	1.96%	3.47%	2.26%	0.03%	1.49%
Denmark	**H - Transport**	1.36%	3.00%	3.17%	2.97%	0.21%	0.29%
	I - Accomodation	1.43%	2.30%	3.24%	2.24%	0.11%	0.37%
	J - Information	1.36%	1.57%	3.21%	3.11%	0.16%	0.32%
	L - Real estate	0.55%	0.80%	1.78%	1.73%	-0.11%	0.53%
	MN - Scientific and administrative	0.90%	1.05%	3.00%	2.48%	-0.02%	1.82%
	OQ - Administration and health	0.95%	1.55%	2.35%	2.15%	0.22%	0.23%
	R - Arts	0.78%	1.97%	2.56%	2.09%	0.13%	0.19%
	S - Other services	0.62%	0.73%	2.13%	1.30%	-0.03%	0.59%
	All sectors	-1.38%	-3.60%	-3.48%	-0.54%	-0.13%	1.89%
	A - Agriculture	0.04%	1.15%	1.59%	-1.08%	-0.06%	0.15%
	BDE - Mining, electricity, water	-0.78%	-6.21%	-0.97%	0.79%	-0.42%	0.02%
	C - Manufacturing	0.31%	0.83%	0.74%	0.34%	-0.02%	0.07%
	F - Construction	0.02%	-4.25%	2.10%	0.26%	0.32%	0.14%
	G - Trade	-0.46%	-2.34%	-2.17%	0.28%	0.29%	0.24%
Estonia	**H - Transport**	-1.62%	-2.67%	-5.52%	1.79%	-0.48%	0.05%
	I - Accomodation	-1.55%	-2.38%	-4.21%	1.17%	-1.67%	0.06%
	J - Information	-0.79%	-1.28%	-2.85%	-0.42%	0.27%	0.12%
	L - Real estate	0.06%	-0.46%	-0.93%	0.39%	0.21%	0.18%
	MN - Scientific and administrative	-1.55%	-4.46%	-3.35%	-0.33%	-0.16%	0.33%
	OQ - Administration and health	-0.55%	-2.07%	-1.49%	0.73%	-0.30%	0.16%
	R - Arts	-1.06%	0.81%	-4.73%	-0.31%	-0.24%	0.05%
	S - Other services	-4.85%	-7.21%	-8.32%	-3.44%	-0.98%	0.31%
	All sectors	0.11%	0.28%	0.54%	0.08%	-0.07%	0.64%
	A - Agriculture	-0.24%	0.20%	-0.16%	-0.60%	-0.19%	0.05%
	BDE - Mining, electricity, water	-0.04%	-0.18%	0.19%	0.00%	-0.32%	0.00%
	C - Manufacturing	-0.15%	-1.01%	0.37%	-0.12%	-0.13%	0.03%
	F - Construction	-0.08%	0.27%	-0.50%	-0.02%	-0.16%	0.06%
	G - Trade	0.02%	0.71%	0.42%	0.05%	-0.49%	0.10%
Finland	**H - Transport**	-0.10%	-0.43%	0.58%	-0.28%	-0.17%	0.03%
	I - Accomodation	0.16%	0.16%	0.43%	0.45%	-0.20%	0.02%
	J - Information	0.53%	0.82%	0.90%	0.32%	-0.18%	0.05%
	L - Real estate	0.24%	-0.05%	0.41%	0.13%	0.31%	0.05%
	MN - Scientific and administrative	0.24%	0.38%	0.61%	0.09%	0.02%	0.13%
	OQ - Administration and health	0.55%	0.38%	0.20%	0.54%	0.30%	0.03%
	R - Arts	0.22%	0.37%	0.09%	0.34%	0.16%	0.04%
	S - Other services	0.08%	-0.24%	-0.14%	0.23%	0.21%	0.06%
	All sectors	0.92%	0.26%	1.40%	5.76%	-0.73%	1.57%
	A - Agriculture	0.22%	0.33%	-0.06%	1.38%	-0.05%	0.07%
	BDE - Mining, electricity, water	1.18%	0.91%	5.77%	9.02%	-1.43%	0.01%
	C - Manufacturing	0.54%	-1.60%	1.40%	4.58%	-0.60%	0.10%
	F - Construction	0.98%	-0.03%	0.87%	6.98%	-1.08%	0.20%
	G - Trade	1.26%	0.07%	1.76%	9.07%	-0.93%	0.23%
France	**H - Transport**	0.75%	0.80%	1.68%	5.22%	-0.45%	0.08%
	I - Accomodation	1.76%	1.14%	1.10%	9.92%	-1.33%	0.06%
	J - Information	1.96%	-0.39%	2.90%	8.87%	-0.84%	0.07%
	L - Real estate	0.97%	3.57%	4.18%	4.80%	-0.45%	0.11%
	MN - Scientific and administrative	0.99%	0.17%	1.58%	5.93%	-0.88%	0.32%
	OQ - Administration and health	0.69%	0.27%	0.72%	2.54%	-0.14%	0.13%
	R - Arts	0.09%	-0.59%	0.16%	1.91%	-0.74%	0.06%
	S - Other services	0.50%	0.23%	0.60%	1.63%	-0.32%	0.11%

Country	Sector	Age					Cluster population (share of EU)
		All ages	0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	
Germany	All sectors	-1.46%	-4.13%	-4.20%	-0.53%	-0.51%	28.13%
	A - Agriculture	-0.26%	-0.28%	-0.89%	-0.44%	-0.17%	0.68%
	BDE - Mining, electricity, water	-0.45%	-1.64%	-0.47%	-0.03%	-0.48%	0.17%
	C - Manufacturing	-1.63%	-2.95%	-5.44%	-0.65%	-0.92%	0.91%
	F - Construction	-1.84%	-3.32%	-6.08%	-0.60%	-1.03%	2.49%
	G - Trade	-2.09%	-5.32%	-5.73%	-0.73%	-0.88%	3.69%
	H - Transport	-6.30%	-11.54%	-8.99%	-1.26%	-1.07%	0.76%
	I - Accomodation	-2.24%	-3.51%	-7.23%	-0.98%	-1.11%	1.19%
	J - Information	-1.75%	-3.77%	-4.41%	-0.72%	-0.65%	0.76%
	L - Real estate	-0.53%	-0.72%	-1.30%	-0.16%	-0.11%	6.86%
	MN - Scientific and administrative	-1.92%	-4.61%	-4.84%	-0.66%	-0.77%	3.73%
	OQ - Administration and health	-0.77%	-3.54%	-1.76%	-0.16%	-0.23%	2.64%
	R - Arts	-0.82%	-3.26%	-2.91%	-0.49%	-0.15%	1.73%
	S - Other services	-0.74%	-2.62%	-2.58%	-0.26%	-0.21%	2.52%
Greece	All sectors	0.13%	0.06%	0.55%	0.02%	0.03%	0.09%
	A - Agriculture	0.10%	0.00%	1.08%	0.00%	-0.25%	0.00%
	BDE - Mining, electricity, water	0.06%	0.00%	0.54%	0.00%	0.00%	0.00%
	C - Manufacturing	0.10%	-0.04%	0.18%	-0.03%	0.14%	0.01%
	F - Construction	0.17%	-0.07%	1.16%	0.00%	0.00%	0.01%
	G - Trade	0.11%	0.22%	0.50%	0.04%	-0.05%	0.03%
	H - Transport	0.20%	0.00%	0.11%	-0.07%	0.42%	0.00%
	I - Accomodation	0.17%	0.22%	0.21%	0.23%	-0.05%	0.01%
	J - Information	0.10%	-0.11%	0.93%	-0.12%	-0.07%	0.01%
	L - Real estate	0.17%	0.00%	0.27%	0.00%	0.28%	0.00%
	MN - Scientific and administrative	0.11%	-0.08%	0.62%	0.03%	-0.02%	0.01%
	OQ - Administration and health	0.25%	-0.10%	1.39%	0.00%	-0.04%	0.00%
	R - Arts	0.33%	0.60%	0.00%	0.00%	0.00%	0.00%
	S - Other services	0.39%	0.00%	1.70%	0.00%	-0.36%	0.00%
Hungary	All sectors	-1.24%	0.12%	-3.13%	-0.61%	-1.31%	2.56%
	A - Agriculture	-1.47%	-1.14%	-2.71%	-1.50%	-1.06%	0.09%
	BDE - Mining, electricity, water	-2.17%	-4.04%	-3.89%	-0.64%	-1.60%	0.02%
	C - Manufacturing	-0.46%	0.28%	0.29%	0.10%	-0.85%	0.18%
	F - Construction	-1.25%	0.62%	-3.52%	-0.58%	-1.48%	0.28%
	G - Trade	-1.54%	0.18%	-5.06%	-0.31%	-1.47%	0.50%
	H - Transport	-1.62%	-0.01%	-5.98%	-0.52%	-1.33%	0.10%
	I - Accomodation	-1.74%	-1.08%	-3.12%	-1.32%	-1.68%	0.11%
	J - Information	-0.97%	0.58%	-2.53%	0.42%	-1.57%	0.14%
	L - Real estate	-0.69%	-1.23%	-1.26%	-0.34%	-0.63%	0.15%
	MN - Scientific and administrative	-1.15%	0.55%	-3.15%	-0.60%	-1.34%	0.54%
	OQ - Administration and health	-0.47%	-0.60%	-0.59%	-0.27%	-0.46%	0.19%
	R - Arts	-1.19%	0.46%	-2.41%	-1.08%	-1.51%	0.09%
	S - Other services	-1.84%	-0.25%	-2.76%	-2.36%	-1.85%	0.18%
Ireland	All sectors	-0.04%	-0.04%	0.03%	0.13%	-0.14%	0.35%
	A - Agriculture	-0.17%	-0.02%	-0.02%	-0.80%	0.27%	0.01%
	BDE - Mining, electricity, water	-0.94%	-0.15%	-0.22%	-0.12%	-1.59%	0.00%
	C - Manufacturing	-0.60%	-0.05%	-4.56%	0.38%	0.02%	0.02%
	F - Construction	0.20%	-0.06%	-0.04%	0.28%	0.29%	0.04%
	G - Trade	-0.41%	0.22%	0.18%	-0.56%	-0.69%	0.05%
	H - Transport	-0.24%	-0.03%	-0.17%	0.02%	-0.41%	0.01%
	I - Accomodation	0.21%	-0.25%	0.36%	0.35%	0.24%	0.02%
	J - Information	-0.17%	-0.07%	-0.66%	0.34%	-0.24%	0.02%
	L - Real estate	-0.17%	-0.07%	0.05%	0.48%	-0.41%	0.04%
	MN - Scientific and administrative	0.24%	-0.04%	0.92%	0.34%	-0.02%	0.09%
	OQ - Administration and health	0.13%	-0.06%	0.20%	0.07%	0.22%	0.02%
	R - Arts	0.12%	0.00%	0.47%	-0.03%	0.09%	0.01%
	S - Other services	-0.11%	-0.11%	-0.16%	0.16%	-0.21%	0.02%

Country	Sector	All ages	0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	Cluster population (share of EU)
	All sectors	-0.51%	-0.59%	-1.56%	-0.96%	-0.13%	15.48%
	A - Agriculture	-0.05%	-0.30%	-0.09%	-0.12%	-0.01%	1.80%
	BDE - Mining, electricity, water	-1.08%	-0.97%	-2.54%	-1.78%	-0.12%	0.09%
	C - Manufacturing	-0.61%	-0.55%	-2.05%	-1.22%	-0.27%	1.28%
	F - Construction	-0.36%	-0.54%	-0.90%	-0.68%	-0.14%	1.98%
	G - Trade	-0.46%	-0.55%	-1.57%	-0.79%	-0.10%	3.57%
Italy	H - Transport	-0.40%	-0.77%	-0.68%	-0.91%	-0.16%	0.40%
	I - Accomodation	-0.64%	-0.92%	-1.68%	-0.82%	-0.11%	1.16%
	J - Information	-1.40%	-0.65%	-4.46%	-2.15%	-0.40%	0.35%
	L - Real estate	-0.54%	-1.10%	-1.91%	-1.07%	-0.23%	0.78%
	MN - Scientific and administrative	-0.99%	-0.36%	-2.42%	-2.02%	-0.17%	1.07%
	OQ - Administration and health	-0.79%	-1.88%	-1.87%	-1.36%	-0.05%	0.20%
	R - Arts	-0.67%	-0.80%	-1.90%	-1.08%	-0.05%	0.21%
	S - Other services	-0.33%	-0.34%	-1.06%	-0.68%	-0.02%	0.60%
	All sectors	-1.06%	-1.01%	-2.03%	-1.64%	-0.64%	0.46%
	A - Agriculture	-0.82%	-0.57%	2.76%	0.24%	-2.26%	0.01%
	BDE - Mining, electricity, water	-2.54%	-11.13%	-2.92%	0.13%	-5.25%	0.01%
	C - Manufacturing	-2.24%	1.19%	-4.82%	-1.96%	-2.27%	0.03%
	F - Construction	-0.44%	-1.89%	-3.55%	-2.93%	1.67%	0.04%
	G - Trade	-0.78%	-1.38%	-1.95%	-2.37%	0.11%	0.11%
Latvia	H - Transport	-0.98%	-0.99%	-2.53%	-0.21%	-0.93%	0.03%
	I - Accomodation	-0.62%	0.67%	-2.47%	-3.29%	0.43%	0.02%
	J - Information	0.03%	0.08%	0.54%	-0.14%	-0.07%	0.02%
	L - Real estate	0.05%	-7.34%	-1.28%	-2.77%	2.25%	0.02%
	MN - Scientific and administrative	-0.27%	-0.60%	-1.69%	-1.39%	0.82%	0.06%
	OQ - Administration and health	-3.33%	-1.48%	-1.34%	-3.58%	-3.93%	0.02%
	R - Arts	-1.29%	0.29%	-2.53%	-0.26%	-1.69%	0.02%
	S - Other services	-2.01%	0.31%	-1.29%	-0.25%	-2.55%	0.07%
	All sectors	1.11%	-1.84%	1.20%	1.98%	1.60%	0.17%
	A - Agriculture	2.51%	0.19%	5.18%	2.93%	2.12%	0.00%
	BDE - Mining, electricity, water	0.85%	0.00%	4.87%	-0.05%	-0.05%	0.00%
	C - Manufacturing	3.18%	-0.32%	4.92%	2.51%	3.38%	0.00%
	F - Construction	0.44%	-2.55%	-4.37%	2.52%	1.65%	0.02%
	G - Trade	2.11%	-0.12%	2.78%	4.73%	1.58%	0.03%
Lithuania	H - Transport	1.41%	0.85%	7.98%	2.86%	0.00%	0.01%
	I - Accomodation	1.11%	-6.59%	-0.98%	-1.81%	4.12%	0.01%
	J - Information	0.91%	-10.66%	0.94%	4.49%	2.79%	0.01%
	L - Real estate	-0.70%	1.21%	0.92%	-1.93%	-1.12%	0.02%
	MN - Scientific and administrative	1.56%	-2.20%	1.71%	2.45%	2.93%	0.04%
	OQ - Administration and health	2.95%	0.41%	4.65%	3.59%	2.73%	0.00%
	R - Arts	1.32%	0.01%	2.19%	1.01%	1.50%	0.01%
	S - Other services	-0.01%	-1.02%	0.94%	2.27%	-1.14%	0.01%
	All sectors	1.93%	1.89%	8.68%	1.31%	0.02%	0.62%
	A - Agriculture	1.53%	-0.22%	8.11%	1.32%	-0.19%	0.02%
	BDE - Mining, electricity, water	-0.38%	1.63%	-4.13%	1.75%	-0.60%	0.01%
	C - Manufacturing	1.97%	0.78%	8.37%	1.75%	0.36%	0.05%
	F - Construction	3.20%	2.38%	13.85%	1.24%	0.62%	0.06%
	G - Trade	2.33%	1.14%	13.87%	1.20%	-0.04%	0.16%
Luxembourg	H - Transport	1.18%	1.56%	4.58%	1.69%	-0.18%	0.04%
	I - Accomodation	1.23%	2.66%	4.09%	1.83%	0.08%	0.02%
	J - Information	1.66%	2.43%	5.97%	0.64%	0.05%	0.03%
	L - Real estate	0.72%	1.49%	2.97%	0.88%	-0.05%	0.05%
	MN - Scientific and administrative	2.10%	3.23%	7.08%	1.47%	-0.20%	0.10%
	OQ - Administration and health	0.54%	-0.24%	1.59%	1.27%	0.01%	0.02%
	R - Arts	1.36%	3.38%	3.92%	0.66%	0.22%	0.03%
	S - Other services	1.87%	2.08%	7.41%	1.52%	-0.16%	0.05%

Country	Sector	All ages	Age				Cluster population (share of EU)
			0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	
Malta	**All sectors**	-1.34%	0.15%	-1.32%	-0.71%	-1.92%	0.01%
	A - Agriculture	-1.00%	0.00%	0.00%	0.00%	-1.67%	0.00%
	C - Manufacturing	NA	NA	NA	NA	NA	0.00%
	F - Construction	-1.21%	-0.40%	2.07%	-0.49%	-1.77%	0.00%
	G - Trade	-1.27%	0.00%	0.00%	-0.56%	-1.79%	0.00%
	H - Transport	-0.85%	4.07%	2.61%	0.10%	-2.53%	0.00%
	I - Accomodation	1.45%	2.43%	9.29%	-1.36%	0.15%	0.00%
	J - Information	-14.28%	0.00%	0.00%	-1.66%	-19.77%	0.00%
	MN - Scientific and administrative	-0.06%	-0.16%	-0.50%	0.78%	-0.38%	0.00%
	OQ - Administration and health	NA	NA	NA	NA	NA	0.00%
	R - Arts	-1.69%	-0.79%	-2.62%	-5.06%	-0.74%	0.00%
	S - Other services	0.72%	0.00%	0.00%	4.32%	-0.36%	0.00%
Netherlands	**All sectors**	-4.96%	-3.97%	-13.48%	-0.45%	-2.83%	0.00%
	A - Agriculture	-0.96%	0.00%	0.00%	-1.04%	-1.47%	0.00%
	BDE - Mining, electricity, water	-0.04%	-0.49%	-1.20%	1.54%	-0.25%	6.84%
	C - Manufacturing	-0.44%	-0.42%	-0.14%	-5.03%	0.00%	0.22%
	F - Construction	5.11%	3.02%	4.85%	4.73%	1.60%	0.02%
	G - Trade	-0.62%	-0.04%	-1.09%	1.48%	-1.17%	0.21%
	H - Transport	-0.52%	-1.44%	-1.49%	1.08%	-0.64%	0.58%
	I - Accomodation	0.51%	-1.13%	-1.51%	3.68%	0.14%	0.80%
	J - Information	-0.89%	-4.26%	-0.74%	1.22%	-0.93%	0.16%
	L - Real estate	-2.42%	-1.57%	-3.10%	-2.56%	-2.39%	0.20%
	MN - Scientific and administrative	1.60%	-0.11%	-0.22%	3.21%	1.76%	0.52%
	OQ - Administration and health	-0.40%	-4.86%	0.73%	1.60%	-0.52%	0.16%
	R - Arts	0.68%	0.36%	-0.13%	3.37%	-0.15%	1.61%
	S - Other services	-0.63%	-0.18%	-1.90%	-0.85%	-0.15%	0.95%
Poland	**All sectors**	-0.27%	1.29%	-1.25%	-0.34%	-0.29%	0.56%
	A - Agriculture	-0.72%	-0.22%	-3.35%	-0.34%	-0.47%	1.05%
	BDE - Mining, electricity, water	-2.50%	0.19%	-1.07%	-6.90%	-0.48%	5.91%
	C - Manufacturing	-2.46%	0.48%	-2.47%	-8.72%	-0.43%	0.10%
	F - Construction	-7.18%	0.25%	-3.70%	-22.59%	-0.72%	0.06%
	G - Trade	-1.47%	0.20%	-0.76%	-6.00%	-0.05%	0.66%
	H - Transport	-0.97%	0.18%	0.65%	-4.30%	-0.06%	0.97%
	I - Accomodation	-2.98%	0.22%	-1.39%	-9.78%	-0.25%	1.46%
	J - Information	-1.48%	0.06%	-0.57%	-4.74%	-0.16%	0.35%
	L - Real estate	-2.52%	0.40%	-0.87%	-6.62%	-0.52%	0.18%
	MN - Scientific and administrative	-3.95%	0.08%	-2.23%	-10.40%	-0.57%	0.30%
	OQ - Administration and health	-5.59%	0.30%	-3.24%	-10.96%	-0.12%	0.15%
	R - Arts	-2.60%	0.15%	-2.19%	-6.14%	-0.43%	0.90%
	S - Other services	-1.22%	0.44%	-1.26%	-2.80%	-0.31%	0.41%
Portugal	**All sectors**	-2.56%	-0.87%	-0.22%	-5.26%	-2.63%	0.08%
	A - Agriculture	-3.36%	0.12%	0.64%	-6.47%	-4.50%	0.29%
	BDE - Mining, electricity, water	6.12%	0.94%	5.27%	9.03%	6.48%	1.53%
	C - Manufacturing	2.88%	2.53%	3.31%	-0.14%	4.44%	0.06%
	F - Construction	4.61%	4.37%	0.25%	10.42%	3.91%	0.01%
	G - Trade	5.76%	-0.14%	4.82%	6.79%	6.29%	0.12%
	H - Transport	7.87%	0.40%	4.70%	10.08%	9.18%	0.15%
	I - Accomodation	7.18%	0.37%	5.19%	9.84%	7.71%	0.52%
	J - Information	5.76%	0.70%	4.14%	9.66%	7.35%	0.07%
	L - Real estate	8.01%	1.75%	6.87%	15.43%	8.00%	0.14%
	MN - Scientific and administrative	6.90%	-0.56%	8.41%	11.05%	6.84%	0.04%
	OQ - Administration and health	4.97%	0.65%	5.89%	8.50%	4.86%	0.12%
	R - Arts	7.62%	1.86%	6.65%	12.54%	7.47%	0.19%
	S - Other services	3.94%	1.68%	6.37%	5.93%	3.21%	0.11%

Country	Sector	All ages	Age				Cluster population (share of EU)
			0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	
Romania	All sectors	1.99%	0.39%	0.76%	4.48%	1.92%	0.07%
	A - Agriculture	1.82%	0.72%	2.46%	3.73%	1.30%	0.13%
	BDE - Mining, electricity, water	-0.28%	-0.09%	-0.46%	-0.43%	-0.17%	4.06%
	C - Manufacturing	-0.33%	-0.16%	-0.39%	-0.67%	-0.06%	0.35%
	F - Construction	-0.21%	-0.77%	0.99%	-1.23%	0.02%	0.03%
	G - Trade	-0.37%	-0.15%	-0.79%	-0.52%	-0.17%	0.32%
	H - Transport	-0.28%	-0.08%	-0.52%	-0.22%	-0.27%	0.41%
	I - Accomodation	-0.21%	-0.09%	-0.41%	-0.22%	-0.17%	1.17%
	J - Information	-0.25%	-0.02%	0.18%	-0.72%	-0.31%	0.32%
	L - Real estate	-0.32%	-0.54%	-0.32%	-0.53%	-0.11%	0.20%
	MN - Scientific and administrative	-0.76%	0.03%	-1.94%	-0.80%	-0.25%	0.18%
	OQ - Administration and health	-0.18%	-0.20%	-0.38%	-0.46%	0.02%	0.10%
	R - Arts	-0.15%	-0.04%	-0.31%	-0.26%	-0.05%	0.57%
	S - Other services	-0.35%	-0.30%	-0.69%	-0.06%	-0.32%	0.15%
Slovakia	All sectors	-0.35%	0.30%	-0.37%	-0.69%	-0.55%	0.10%
	A - Agriculture	-0.35%	0.19%	-0.29%	-0.68%	-0.46%	0.17%
	BDE - Mining, electricity, water	-0.35%	0.02%	-0.30%	-0.44%	-0.41%	3.63%
	C - Manufacturing	-0.46%	-0.26%	0.00%	-0.67%	-0.50%	0.52%
	F - Construction	-0.42%	-1.78%	-1.39%	0.11%	-0.21%	0.02%
	G - Trade	-0.39%	0.57%	-1.07%	-0.34%	-0.39%	0.15%
	H - Transport	-0.34%	-0.10%	-0.13%	-0.34%	-0.44%	0.32%
	I - Accomodation	-0.52%	0.50%	-0.21%	-0.51%	-0.46%	0.38%
	J - Information	-0.28%	-0.20%	0.17%	-0.05%	-0.49%	0.09%
	L - Real estate	-0.31%	-1.04%	-0.39%	-0.59%	0.10%	0.11%
	MN - Scientific and administrative	-0.74%	-0.35%	-0.78%	-0.55%	-0.94%	0.20%
	OQ - Administration and health	0.03%	0.62%	-0.36%	0.52%	-0.18%	0.22%
	R - Arts	-0.39%	0.20%	-0.36%	-0.64%	-0.41%	0.72%
	S - Other services	-0.42%	0.02%	-0.22%	-0.46%	-0.57%	0.22%
Slovenia	All sectors	-0.21%	0.06%	0.03%	-0.38%	-0.25%	0.28%
	A - Agriculture	-0.29%	-0.26%	-0.44%	-0.44%	-0.21%	0.41%
	BDE - Mining, electricity, water	4.94%	17.05%	7.47%	4.22%	1.43%	0.70%
	C - Manufacturing	2.59%	8.55%	4.34%	3.14%	0.95%	0.01%
	F - Construction	0.63%	1.52%	-0.90%	0.99%	1.03%	0.01%
	G - Trade	3.06%	10.57%	5.90%	3.39%	1.25%	0.07%
	H - Transport	2.61%	7.25%	4.50%	3.03%	1.35%	0.08%
	I - Accomodation	3.41%	11.63%	6.20%	3.75%	1.25%	0.10%
	J - Information	3.23%	7.42%	6.02%	4.20%	1.66%	0.03%
	L - Real estate	11.81%	58.30%	11.71%	5.01%	1.52%	0.04%
	MN - Scientific and administrative	4.18%	9.19%	5.28%	3.80%	1.82%	0.03%
	OQ - Administration and health	3.15%	5.57%	3.30%	4.04%	1.89%	0.01%
	R - Arts	5.40%	14.55%	7.63%	4.86%	1.45%	0.14%
	S - Other services	7.15%	21.39%	9.53%	4.89%	1.54%	0.05%
Spain	All sectors	7.28%	25.82%	10.31%	6.69%	1.65%	0.05%
	A - Agriculture	5.52%	12.50%	6.31%	3.60%	1.44%	0.07%
	BDE - Mining, electricity, water	-0.17%	0.24%	0.19%	-0.27%	-0.33%	1.60%
	C - Manufacturing	-0.07%	0.07%	0.09%	-0.16%	-0.11%	0.06%
	F - Construction	-0.04%	-0.37%	-0.12%	0.69%	-0.34%	0.01%
	G - Trade	-0.09%	0.34%	0.10%	-0.16%	-0.23%	0.19%
	H - Transport	-0.15%	0.14%	0.04%	-0.24%	-0.25%	0.23%
	I - Accomodation	-0.27%	0.10%	0.35%	-0.44%	-0.38%	0.32%
	J - Information	-0.45%	0.36%	0.19%	-0.23%	-1.00%	0.06%
	L - Real estate	-0.29%	0.40%	0.33%	-0.65%	-0.45%	0.06%
	MN - Scientific and administrative	-0.13%	0.21%	0.25%	-0.21%	-0.35%	0.07%
	OQ - Administration and health	-0.08%	0.57%	0.27%	-0.18%	-0.23%	0.05%
	R - Arts	-0.09%	0.42%	0.28%	-0.30%	-0.24%	0.34%
	S - Other services	-0.49%	-0.04%	0.34%	0.03%	-0.85%	0.07%

Country	Sector	All ages	Age				Cluster population (share of EU)
			0 to 2 years old	2 to 5 years old	5 to 10 years old	10 years old and more	
	All sectors	-0.06%	0.24%	-0.09%	-0.31%	0.01%	0.03%
	A - Agriculture	-0.06%	0.07%	0.01%	-0.13%	-0.08%	0.11%
	BDE - Mining, electricity, water	-0.51%	0.02%	-0.12%	-0.46%	-0.68%	5.53%
	C - Manufacturing	-0.42%	0.01%	-0.55%	-0.18%	-0.52%	0.15%
	F - Construction	-1.75%	0.11%	0.39%	-2.26%	-2.04%	0.10%
	G - Trade	-0.53%	0.12%	-0.46%	-0.76%	-0.55%	0.42%
Sweden	H - Transport	-0.58%	-0.07%	-0.01%	-0.01%	-0.56%	0.97%
	I - Accomodation	-0.43%	0.00%	-0.09%	-0.48%	-0.55%	1.20%
	J - Information	-0.22%	-0.23%	-0.38%	-1.21%	0.14%	0.16%
	L - Real estate	-0.54%	-0.04%	-0.11%	-0.50%	-0.82%	0.48%
	MN - Scientific and administrative	-0.20%	0.15%	0.37%	0.12%	-0.59%	0.19%
	OQ - Administration and health	-0.77%	0.00%	-0.83%	-0.63%	-0.91%	0.44%
	R - Arts	-0.42%	0.07%	0.25%	-0.38%	-0.66%	0.86%
	S - Other services	-0.70%	0.24%	-0.58%	-0.21%	-1.11%	0.28%

Source: Orbis and author's calculus (see text for detail

Annex 2: More information about Orbis' corporate demography

One must keep in mind that Orbis suffers from a certain time lag. As of January 2023, using data from July 2022, demographic data could be extracted with sufficient reliability only up to March 2021 The project allows to produce descriptive statistics of the demography of European non-financial firms since 2015 (Figure 18). Orbis encompasses information on the statuses of each firm, such as "active", "inactive", being created, and various harmonized stages of bankruptcies. As a first step, we aggregate those bankruptcy stages into one single category. We exclude financial firms and extraterritorial entities. This data is a useful tool in itself in order to follow the mutations of the European economy. It allows decompositions per countries, sectors, and firms' ages, as well as combinations of any of the three.

Orbis data presents a certain number of challenges. A first issue is the concentration in time of firms' creations and bankruptcies (Figure 19). For firms' creations, small peaks are observed at monthly intervals, and much bigger ones at year-ends. This is due to constraints in data collection from Orbis. The decrease over time of the size of these yearly peaks points to a gradual improvement of Orbis' data collection process. Extreme bankruptcy peaks also appear at the beginning, middle, and end of the year. As a consequence, we deal with volatility following those steps :

- In a first step, various bankruptcy stages are aggregated into a single category. Financial firms and extraterritorial entities are excluded.
- In a second step, we smooth bankruptcy and establishment rates series. For each week, we calculate the standard deviation of bankruptcy and firm creation rates in the past 12 months.
- We then winsorize[1] the standard deviation at the first percentile over a one-year rolling window.
- We then consider the difference between weekly rates and this smoothed standard deviation. If the difference between the two is above ten times the smoothed standard deviation, we flag this weekly rate.
- We then replace this weekly rate, along with the previous and next two weeks, by a weighted moving average of the past quarter.

A second issue is the coverage of the database. Orbis has a good coverage for certain countries like France, Italy, Spain, Portugal, or Hungary. However, it is not the case for other countries, where it suffers from a lack of representativity, notably in terms of the weight of different sectors. Re-weighting methods have been tested, notably by the OECD, but so far without satisfying results. Bearing those caveats in mind, Orbis provides the advantages of providing streamlined harmonized European data and having a good coverage of several European countries. Alternate data sources and their advantages and drawbacks are detailed in Annex 4.

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[1] Winsorization is the transformation of statistics by limiting extreme values to reduce the effect of possibly spurious outliers. We set outliers at the 99th percentile.

Figure 18: Yearly firm creation and bankruptcy rates in the European Union and the UK from 2015 to the first semester of 2020 (non-financial firms)
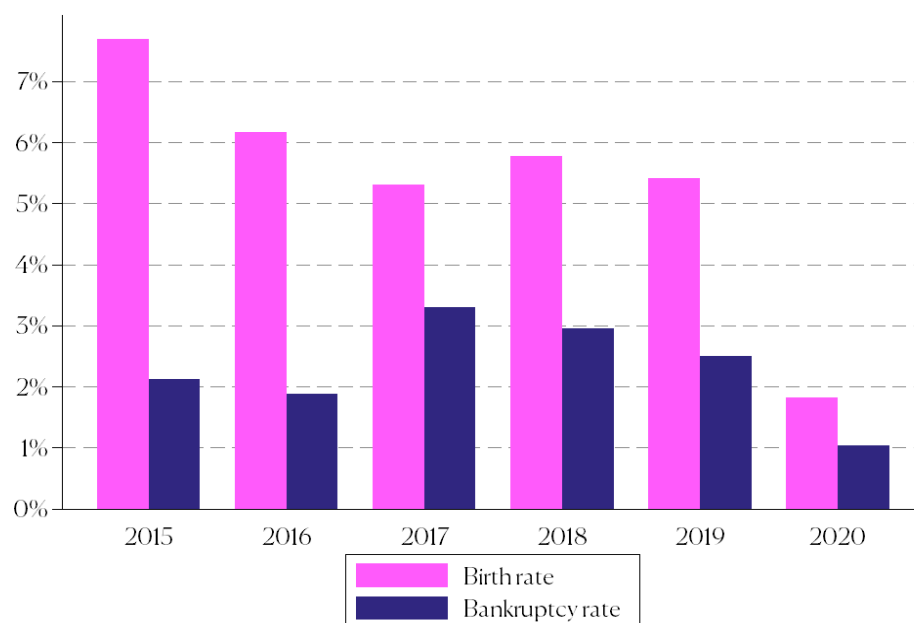
Source: Orbis and author's calculus (see text for details)

Figure 19: Weekly firm creations and bankruptcies in the European Union and the UK from 2015 to the first semester of 2020 (non-financial firms)
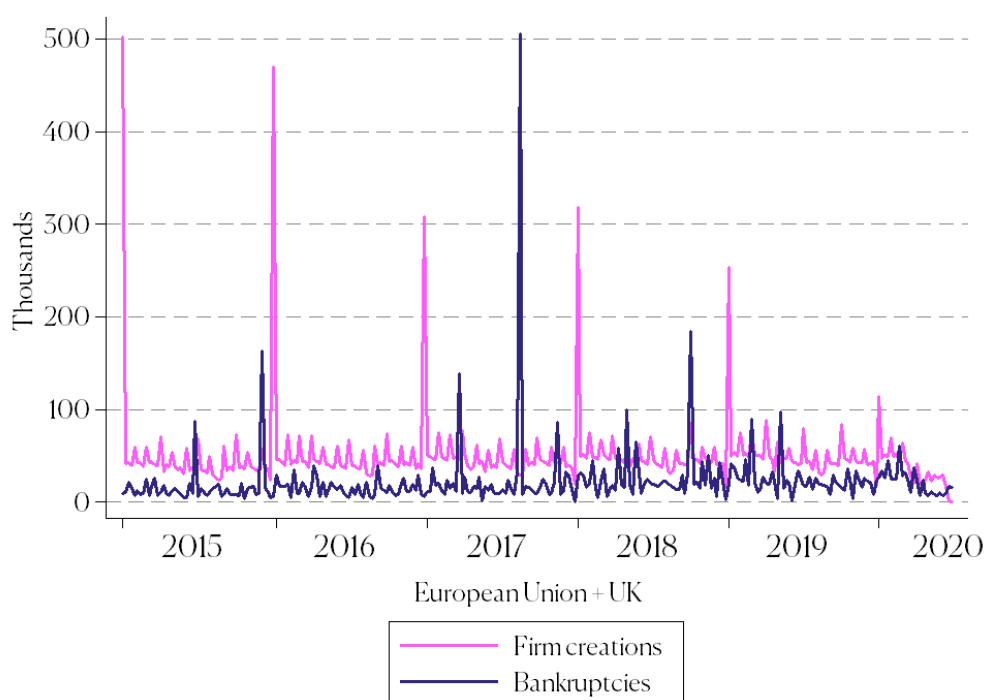
Source: Orbis and author's calculus (see text for details)

Annex 3: Standardizing ISO weeks into treatment periods

Estimating the impact of a shock over time means choosing a time period for the analysis. In our case, this time period is weeks. However, years don't all begin on a Monday, which means that the first and last weeks of the year would not be full weeks. As a consequence were invented "ISO weeks" ("isoweeks" henceforth), which attempt at standardizing full weeks over time. We choose isoweeks as our basic time unit, following similar work by Nielsen et al. (2021). The last isoweek of a year, which can be isoweek 52 or 53, extends into the following year. The first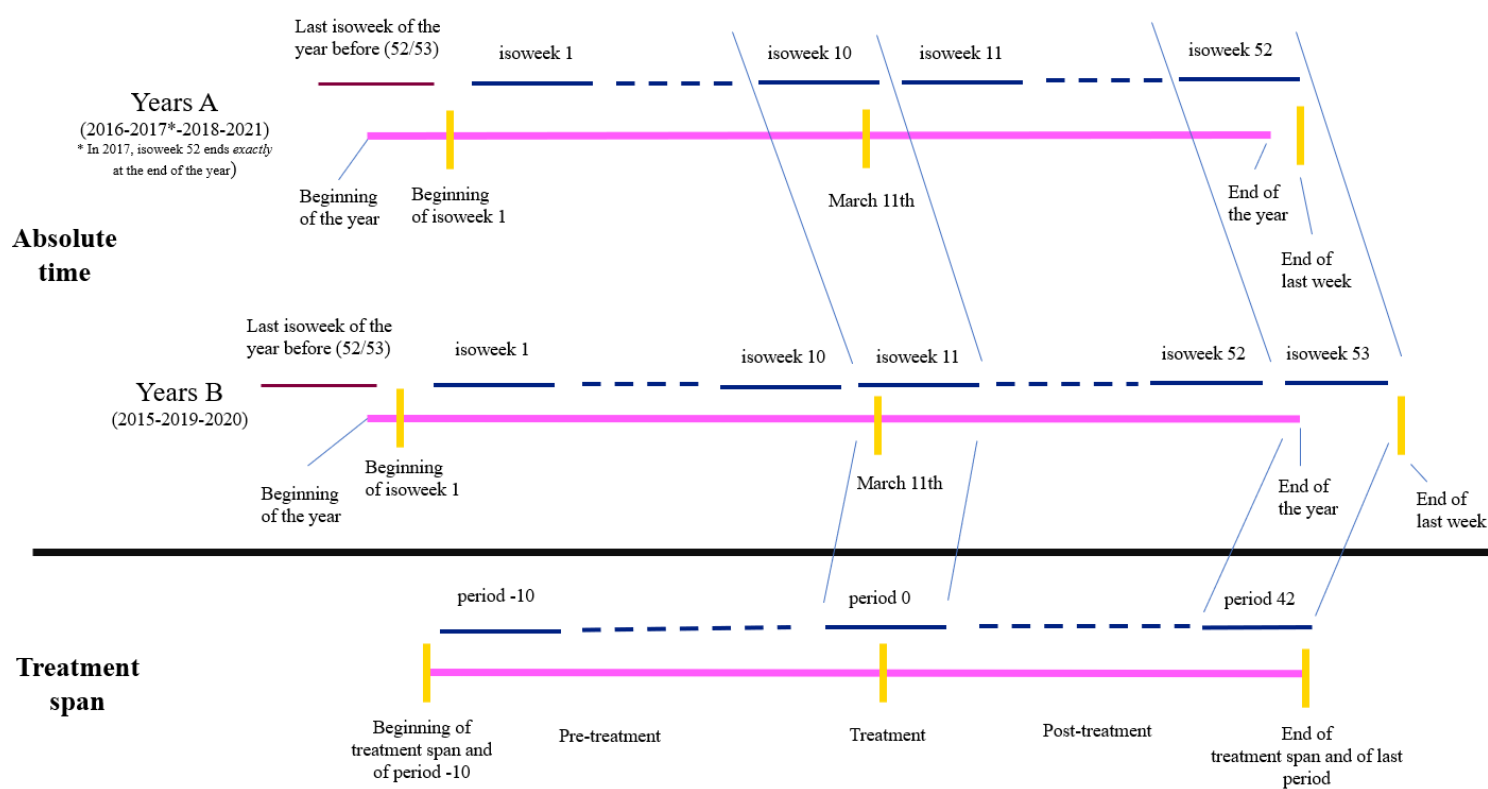 isoweek of the new year hence begins a few days after the new year begins. This number of days will not always be the same. This means that, over the year, days will not always correspond to the same isoweek. As a consequence, we standardize isoweeks into treatment periods according to Figure 20.

Figure 20: Translating ISO weeks into treatment periods

Source: author

- **Years A**: isoweeks begin later:
  - March 11th is at isoweek 10, because the last isoweek of the previous year extended for a lot of days in year A. Hence the isoweek 1 of year A began quite late, hence isoweek 10 started later.
  - December 31st is at isoweek 52, because, since all the isoweeks begin later, isoweek 52 arrived also late, and there was no time left for isoweek 53 to happen.
- **Years B**: isoweeks begin earlier:

- March 11th is at isoweek 11, because the last isoweek of the previous year extended by a few days in year B, hence the isoweek 1 of year B began quite early, hence isoweek 11 started earlier as well.
- December 31st is at isoweek 53, because since all the weeks begin earlier, isoweek 52 arrived earlier too and there was time for isoweek 53 to happen.

These differences occur because the beginning of the first isoweek occurs more or less further in time compared to January 1st. The beginnings of all other weeks will be shifted by the same number of days. This means that the March 11th isoweek will not be the same depending on the year. However, this is not an issue, as the analysis is not comparing weeks, but treatment periods. Those periods are numbered depending on their position relative to March 11th, which is period 0. In this case, it would mean this translation:

- **Years A**:
  - March 11th is at isoweek 10 > it becomes treatment period 0
  - December 31st is at isoweek 52 > it becomes treatment period 42
- **Years B**:
  - March 11th is at isoweek 11 > it becomes treatment period 0
  - December 31st is at isoweek 53 > it becomes treatment period 42

Hence, the isoweek 52 of years A and the isoweek 53 of years B will both become period 42. This is correct because those last isoweeks of the year should in both cases contain the end-of-year corporate registration peak. Still, the beginnings and ends of weeks are not the same over years. However, it is likely that data would be inputted on a weekly basis from Orbis and/or national providers, for instance on Friday, which means it wouldn't make a difference. For past years (2015-2019), the possibly induced differences would average out over time. However, not all problems are solved by our methodology. If the last isoweek "leaps" over December 31st and January 1st *or not* depending on the year still changes things. Over the 2015-2021 period, the last isoweek of the year always leaps into the next year, with a single exception, 2017, which ends on a Sunday. For 2017, January 1st would be attributed to isoweek 1 of the next year (or "period" 43), whereas for all other years, it would be attributed to isoweek 52/53 (or "period" 42). The fact that only one year is an exception limits the potential problematic effects on our results.

Annex 4: Other data sources on corporate demography

This appendix provides a list of statistical sources on European corporate demography, along with a brief description:

- *Surveys* only reflect market sentiments, as in:
    - the *Future of Business Survey*, co-led by the OECD, World Bank, and Facebook (OECD, 2020), and:
    - the EIB Investment Survey (EIB, 2020).
- *Forecasts* try to predict default probabilities (e.g.):
    - *Moody's* computes default probabilities for large firms, through its CreditEdge statistics.
    - The *IMF* computes default probabilities for SMEs post-COVID-19 (Gourinchas et al., 2020 and 2021).
    - The *OECD* forecast liquidity shortfalls and potential bankruptcies (Demmou et al., 2022).
- Web trackers:
    - The *OECD Weekly Tracker* (Woloszko, 2020) relies on Google searches of words like "bankruptcy" and "investment", but only aims at nowcasting aggregate GDP.
- Statistics:
    - *National statistical providers* such as the German Federal Statistical Office, the UK Insolvency Service and Companies House, and the French INSEE, provide timely data on corporate demography. However, different legal frameworks lead to different decompositions of bankruptcy stages, which are difficult to harmonize across Europe.
    - The *European Central Bank (ECB)* aggregates some of this data, but only for the seven biggest eurozone economies, and does not provide fine decompositions per sectors or firm characteristics (Gardo et al., 2020).
    - The *OECD* has provided for some time sector-level corporate statistics (OECD, 2017). It also provided several discontinued online tools in 2020[1]. General OECD statistics include quarterly corporate demography data only by country[2].
    - *Eurostat*:
        - Eurostat provides *yearly statistics* with a two-years lag on corporate demography at the country-level. The coverage is different from Orbis. Eurostat data excludes holdings but encompasses financial firms. Orbis data encompasses holdings, but we exclude financial firms. Eurostat encompasses 27m firms, against 40m non financial firms in Orbis. Average Eurostat bankruptcy rates hover around 7%, against 2% in our sample of Orbis. Eurostat data can be decomposed by country, sector, firm size and

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[1] See notably: *https://www.oecd.org/coronavirus/en/data-insights/bankruptcy-rates-fall-during-covid-19* and *https://www.oecd.org/coronavirus/en/recovery-dashboard* .

[2] *https://stats.oecd.org/* .

firm age, but multiple combinations of these categories are impossible. Sectors only encompass four sectors.

- o Eurostat also provides *quarterly statistics* with a four-months lag on provisional bankruptcies and business registrations. However, business registrations are not directly comparable to real firm creations, and provisional bankruptcies do not mean final bankruptcies. The data is only country-level and cannot be decomposed along stages of bankruptcies or by sectors, firm age, size or legal form. Not all European countries are encompassed, some data being forecasted rather than collected[1].

- *Orbis:* more information about Orbis can be found in the text and in Annex 2.
- In *North America*:
  - o In the US, the American Bankruptcy Institute provides monthly statistics on bankruptcies coming from the US Court System.
  - o In Canada, such statistics are provided by the Office of the Superintendent of Bankruptcy.

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[1] Further technical information on Eurostat business demography data may be found here: *https://ec.europa.eu/eurostat/statistics-explained/index.php* .

Annex 5: Information on the ESRB COVID policy database

The ESRB COVID policy database focuses on discretionary actions and might not fully reflect the policies taken by countries in response to COVID-19, such as automatic insurance mechanisms and existing social safety nets which differ across countries in their breadth and scope. The information included is not meant for comparison across members as responses vary depending on the nature of the shock and country-specific circumstances. Adding up the different measures—tax and spending, loans and guarantees, monetary instruments, and foreign exchange operations—might not provide an accurate estimate of the aggregate policy support. The tracker includes information that is publicly available or provided by the authorities to the ESRB. The collected policies are pledges and may not have been effectively spent. The collected policies are fiscal. They exclude monetary policies but include loans and guarantees outside of those given by central banks. Tax delays are not really final expenses, since they are just postponed revenues. Credit guarantees and loans are also not strictly speaking expenses. EU coverage is problematic. Sources do not consistently report if funds come from EU institutions. Our collection procedure does not report national expenditures if they come from the EU, instead encompassing them as coming from EU institutions. However, because of this inconsistency in reporting, some EU-funded national expenditures are still reported. This could lead to double reporting.

In terms of classification of types of policies, all EU contributions are classified as 'Support to institutions' and could hence be deducted from the global picture. Only exceptional measures related to the COVID crisis are recorded. Normal, ongoing policies are not. Fiscal measures encompassed here are only expenses. New revenues are not reported. Deferred revenues are collected in the case of tax delays. We only report expenses when the amount is indicated. Expenses of less than EUR 10 m. are not reported. ESRB data is re-classified according to our classification. Wage compensation and furlough schemes are classified as Subsidies / Subsidies to employees / Unemployment insurance. So are subsidies to firms conditioned to the retainment of workers. 'Various (unspecified' means that either the policy was not described, or that the policy combined two or more broader categories (e.g. Credit guarantees and investments), or it was impossible to understand what exactly the policy was from the available description (e.g. 'Sports' or 'Housing policy (loans, VAT cuts)'). When a sub-category is indicated as '… (various)', it means there was no possible or satisfying way to further decompose the classification of the policy. When national governments are charged to disburse EU funds, we do not count it as a national expense, but as disbursed by the EU. If ESRB data included two policies within the same month and same categorization, we merged the two.

Figure 21: COVID-19 pledged policies as share of EU GDP per country and policy type*

Country	Investments	Loans and guarantees	Subsidies	Support to institutions	Tax relief	Various (unspecified)	Total
Austria		0.03%	0.04%		0.03%		0.1%
Belgium		0.1%	0.01%				0.2%
Bulgaria	0.001%	0.001%	0.002%		0.0003%		0.005%
Croatia		0.01%	0.003%		0.004%		0.01%
Cyprus		0.002%	0.003%		0.001%		0.01%
Czechia		0.1%	0.02%		0.01%		0.1%
Denmark		0.03%	0.02%		0.1%		0.1%
Estonia		0.004%	0.002%	0.00004%	0.0002%		0.01%
Finland		0.0003%	0.01%		0.02%		0.03%
France		2.2%	0.2%	0.01%			2.4%
Germany	0.3%	0.5%	0.4%	0.003%	0.1%	1.1%	1.3%
Greece		0.01%	0.04%		0.01%		0.1%
Hungary		0.05%	0.01%		0.003%		0.1%
Ireland		0.01%	0.03%	0.01%	0.01%		0.05%
Italy		1.2%	0.2%	0.03%	0.1%		1.5%
Latvia	0.0003%	0.002%	0.004%		0.001%		0.01%
Lithuania		0.003%	0.002%		0.002%		0.01%
Luxembourg		0.01%	0.004%				0.01%
Malta		0.001%	0.002%		0.001%		0.004%
Netherlands		0.02%	0.1%		0.03%		0.1%
Poland		0.1%			0.001%		0.1%
Portugal		0.05%	0.02%		0.002%		0.1%
Romania		0.02%	0.003%		0.01%		0.05%
Slovakia		0.01%			0.001%		0.01%
Slovenia		0.01%	0.002%		0.003%		0.01%
Spain	0.05%	0.4%	0.1%		0.1%	0.003%	0.6%
Sweden		0.04%	0.1%		0.1%		0.2%
EU average	0.01%	0.2%	0.05%	0.002%	0.02%	0.04%	

Source: ESRB (2023) and author's calculus (see text for details)

* Deeper reds indicate a higher share of EU GDP.

In terms of categories, 'VAT' includes tourist tax. 'Social firms' include childcare facilities and retirement / care homes. Travel vouchers are classified as a subsidies to touristic firms. 'Export guarantees' include public insurance. Public funding of delays in loan repayments is encompassed in the 'Direct loans' category. 'Credit guarantees to firms' include trade credit, insurances of guarantees and 'liquidities for firms'. 'Retail taxes' and 'taxes on market places' are assimilated to VAT. Forgivable loans for the purpose of paying furloughed employees are considered as "Subsidies to employees / Unemployment insurance". Loan subsidies are considered as part of 'Direct loans'. Restaurants are encompassed in the broader hospitality sector. If the date of implementation is not given, the policy is not reported.

This tree details the categories and sub-categories chosen for the labelling of COVID support measures. Health measures are excluded from statistics displayed in this paper. Labour market policies are merged with "Various" as they represent very small amounts.

- Health:
  - Expansion of health capacity (Testing)

- Health insurance (Testing reimbursements)
- Medical equipment (Medical equipment and infrastructure / Medical equipment for the administration / Medicines)
- Medical research (Vaccine and drug development)
- Support to health system (Support to medical staff)
- Support to hospitals (Medical equipment for hospitals / Subsidies to hospitals / Support to vaccine acquisitions / Support to local health authorities / Support to regional health authorities)

- **Investments:**
  - Investments by local authorities
  - Investments in digitization (Investments in digitization for tourism)
  - Investments in equity (Investments in equity in banks / Investments in equity in joint-stock firms / Investments in equity in large firms / Investments in equity in mid-caps / Investments in equity in mid-caps and large firms / Investments in equity in SMEs / Investments in equity in start-ups / Investments in equity in state-owned firms / Investments in equity in strategic firms / Investments in venture capital)
  - Investments in health (Investments in the production of products to fight the virus)
  - Investments in infrastructure
  - Investments in research and development
  - Investments in rural areas
  - Investments to protect the environment
  - Investments to support exports
  - Investments to support jobs

- **Labour market:**
  - Active labour market policies

- **Loans and guarantees:**
  - Credit guarantees (Credit guarantees to firms / Credit guarantees to firms and households)
  - Export guarantees
  - Loans (Convertible loans / Health-related loans / Loans to agricultural firms / Loans to banks / Loans to exporting firms / Loans to firms / Loans to firms affected by COVID / Loans to households / Loans to midcaps and big companies / Loans to SMEs / Loans to SMEs and mid-caps / Loans to states / Loans to support renters and owners)
  - Loans and guarantees to firms (Loans and guarantees to SMEs / Loans and guarantees to SMEs and agricultural firms / Loans and guarantees to SMEs that retain workers)

- **Subsidies:**
  - Labour and business policy
  - Structural reforms
  - Subsidies to charities

- Subsidies to employees (Health insurance / Sick pay / Social benefits / Subsidies to artists / Subsidies to scientists / Subsidies to self-employed / Subsidies to self-employed and vocational training / Subsidies to frontline workers / Unemployment insurance (including furlough schemes, help to return to work, short-time schemes) / Unemployment insurance and social benefits)
- Subsidies to employees and firms (Employment fund / Subsidies to self-employed and SMEs)
- Subsidies to employees and households (Unemployment insurance and social benefits)
- Subsidies to firms (Capital advances / Compensation for cancelled events / Subsidies to support digitalization / Subsidies to cover fixed costs / Subsidies to cover lost revenues / Subsidies to exporting firms / Subsidies to firms affected by COVID / Subsidies to firms affected by social distancing / Subsidies to firms helping fight the virus / Subsidies to innovative firms /Subsidies to mid-caps and large firms / Subsidies to rents of businesses / Subsidies to SMEs / Subsidies to SMEs and self-employed / Subsidies to vulnerable firms
- Subsidies to firms and households
- Subsidies to households (Minimum income scheme / Parental support / Subsidies for food / Subsidies to car renewal / Subsidies to frontline workers / Subsidies to home buyers / Subsidies to households affected by the pandemic / Subsidies to households to support specific sectors / Subsidies to pensioners / Subsidies to renters / Subsidies to vulnerable households / Unemployment insurance
- Subsidies to specific sectors (Subsidies to agricultural producers / Subsidies to air transport / Subsidies to cultural firms / Subsidies to hospitality sectors / Subsidies to insurers / Subsidies to retail firms / Subsidies to social firms / Subsidies to sports firms / Subsidies to touristic firms)
- Support to resumption of activity after the crisis

- **Support to institutions:**
    - International aid
    - Public insurance
    - Support to education system
    - Support to international institutions (Support to EIB / Support to IMF / Support to WTO)
    - Support to local governments (Meals for children after school closures / Support to local promotional institutes / Support to municipalities
    - Support to national administrations (Support to health and education)
    - Support to national governments (Loans to national governments)
    - Support to NGOs

- **Tax relief:**
    - Tax credits (Advance payment of tax credits / Advance refund of VAT / Delays to the payment of tax debts)
    - Tax cuts (Cuts to corporate tax / Cuts to fees and tariffs / Cuts to late payment penalties / Cuts to pensions contributions / Cuts to real estate tax / Cuts to road taxes / Cuts to social contributions / Cuts to taxes of firms / Cuts to taxes of

households / Cuts to taxes on medical equipment / Cuts to taxes of real estate owners / Cuts to taxes to facilitate rent payments / Cuts to VAT / Cuts to VAT and corporate tax / Cuts to VAT and customs fees / Cuts to VAT and income tax / Cuts to VAT and tariffs / Tax incentives for skipped rent payments)

- Tax delays (Delays to alcohol and fuel duties / Delays to corporate and income tax / Delays to corporate tax / Delays to income tax / Delays to social contributions, VAT and payroll taxes / Delays to social security contributions / Delays to social security contributions and corporate tax / Delays to tax and pension payments / Delays to taxes of firms / Delays to taxes of firms affected by social distancing / Delays to taxes of firms and self-entrepreneurs / Delays to taxes of real estate owners / Delays to taxes of self-entrepreneurs / Delays to taxes of SMEs and self-employed / Delays to VAT / Delays to VAT and corporate tax)

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The European Investment Fund (EIF) is Europe's leading risk finance provider for small and medium sized enterprises (SMEs) and mid-caps, with a central mission to facilitate their access to finance. As part of the European Investment Bank (EIB) Group, EIF designs, promotes and implements equity and debt financial instruments which specifically target the needs of these market segments.

In this role, EIF fosters EU objectives in support of innovation, research and development, entrepreneurship, growth, and employment. EIF manages resources on behalf of the EIB, the European Commission, national and regional authorities and other third parties. EIF support to enterprises is provided through a wide range of selected financial intermediaries across Europe. EIF is a public-private partnership whose tripartite shareholding structure includes the EIB, the European Union represented by the European Commission and various public and private financial institutions from European Union Member States, the United Kingdom and Turkey. For further information, please visit *www.eif.org*.

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2010/008	*Impact of Legislation on Credit Risk – How different are the U.K. and Germany?*
2010/007	*SME Loan Securitisation – an important tool to support European SME lending.*