European Commission

JRC TECHNICAL REPORT

EU start-up calculator: impact of COVID-19 on aggregate employment

Scenario analysis for Austria, Belgium, Germany, Hungary, Italy and Spain

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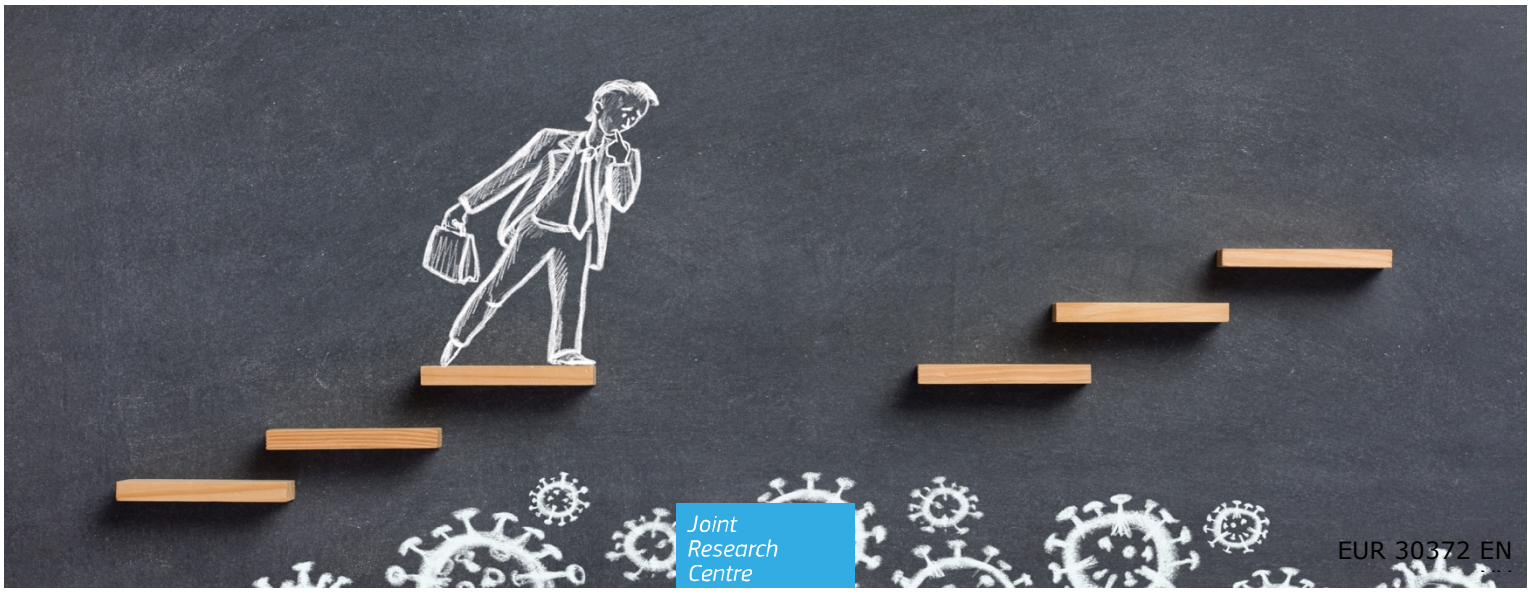
2020



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EU Science Hub
https://ec.europa.eu/jrc

JRC121715

EUR 30372 EN

PDF ISBN 978-92-76-21710-7 ISSN 1831-9424 doi:10.2760/049945

Luxembourg: Publications Office of the European Union, 2020

How to cite this report: Benedetti Fasil, C., P. Sedláček and V. Sterk, *EU start-up calculator: impact of COVID-19 on aggregate employment. Scenario analysis for Austria, Belgium, Germany, Hungary, Italy and Spain*, EUR 30372 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-21710-7, doi:10.2760/049945, JRC121715.

Contents

Foreword

This paper is the first of a series of publications that uses a newly developed EU start-up calculator. This is a simulator that allows to assess the disruptive impact of COVID-19 on start-up activity and ultimately aggregate employment in the European Union Member States. The paper introduces the tools and performs scenario analysis for Austria, Belgium, Germany, Hungary, Italy and Spain. Similar papers under preparation will analyse the remaining Member States.

The start-up calculator has been firstly developed by Sedláček and Sterk (2020) and applied to the US economy. It has subsequently been adapted to fit the employment profile of young firms in individual EU Member States.

Acknowledgements

We are grateful to colleagues in the JRC, especially James Gavigan, Zoltan Csefalvay, Clemens Domnick, Miguel Sanchez-Martinez and Giuseppina Testa that contributed with feedback on the work. We would also like to thank the Chief Economist teams of DG RTD and DG COMP for their useful comments on earlier stages of this work and the Federal Statistical Office of Germany which provided us with recent data on firm creation.

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Abstract

Early data show that the COVID-19 pandemic has affected particularly strongly start-up business activity. This may have dramatic and lasting effects on aggregate employment which persist as the cohort of new firms age. To assess such an impact, we developed the EU start-up calculator. This is an empirical tool that allows to conduct scenario analysis to compute the impact that the disruption of start-up activity has on aggregate employment on EU Member States and their economic sectors. In particular, we simulate the effects of a strong (i.e. of magnitude equivalent to the Great Recession of 2008 and 2009) but short-lived (i.e. lasting one-year) crisis in Austria, Belgium, Germany, Hungary, Italy and Spain. This shock generates important and persistent job losses in all the countries ranging between 0.7 (Belgium) and 2.2% (Austria) of the deviation from the employment trend in 2020 and results in a computed potential cumulative loss of jobs for the period 2020-2030 ranging from 82,000 (Belgium) to 1186,000 (Italy). The potential negative impact is particularly high in Austria, Hungary, Italy and Spain, as well as in the service sector, which are characterized by a high firm turnover and a reliance on start-ups and young firms for job creation. We also find that in most countries the deterioration of the survival rate of young firms plays an important role in driving employment, seconded by the number of new entrants. As a consequence, policies aimed at supporting young firms and incentivizing the creation of new ones may significantly mitigate the medium-term effect of the pandemic. In fact, when we simulate bounce-back scenarios where the number of firms entering the economy rapidly increases in 2021, in every country the outlook is significantly improved, the recovery is faster and the aggregate job loss is lower.

Key words: COVID-19, start-ups, employment

"Governments [are urged] to channel stimulus funds towards sectors that can create new jobs [..] rather than spending money to defend the status quo."

Mario Draghi, Former European Central Bank President[1]

[1] Bloomberg article, September 1, 2020 available at https://www.bloomberg.com/news/articles/2020-09-01/draghi-says-stimulus-must-create-new-jobs-not-save-old-ones .

1 Introduction

The EU start-up calculator is an empirical tool that allows researchers and policy analysts to compute an estimate of the medium-run impact, i.e. up to 2030, that COVID-19 may have on aggregate employment due to the disruption of start-ups and young firms. Different scenarios can be created with the possibilities to vary three margins: (i) the number of start-ups, (ii) the survival rate of young firms and (iii) the growth potential of start-ups (i.e. the post-entry growth of firms in terms of employment). The start-up calculator uses publicly available data from Eurostat allowing analysis of the whole economy, the industrial and service sectors in each Member State.

The focus is on the impact of COVID-19 on the employment-generating potential of start-ups and young firms.[2] This category of firms is particularly important for a dynamic and productive economy. Start-ups and young firms are job creators and account for a large share of employment in the EU Member States (Figure 1). At the EU 27 level, 35% of firms are less than 5 years old and account for 12% of total European employment, with start-ups accounting for 2.5%. Figure 1 shows that in Austria, Hungary, Italy and Spain, young firms are particularly relevant actors in terms of their contribution to aggregate employment when compared to the EU average. Even more striking is the disproportional contribution of start-ups and young firms to employment growth. In the EU 27, young firms accounted for 36% of employment growth in the period 2013-2017. This pattern is qualitatively present also in the other European countries analyzed which show a contribution of young firms to employment growth ranging between 20 to 40%. The exception is Belgium where young firms contribute less than 1% to employment growth, highlighting a less dynamic economy with respect to the EU 27 average where the reative contribution of young firms to employment growth is of almost 35%.

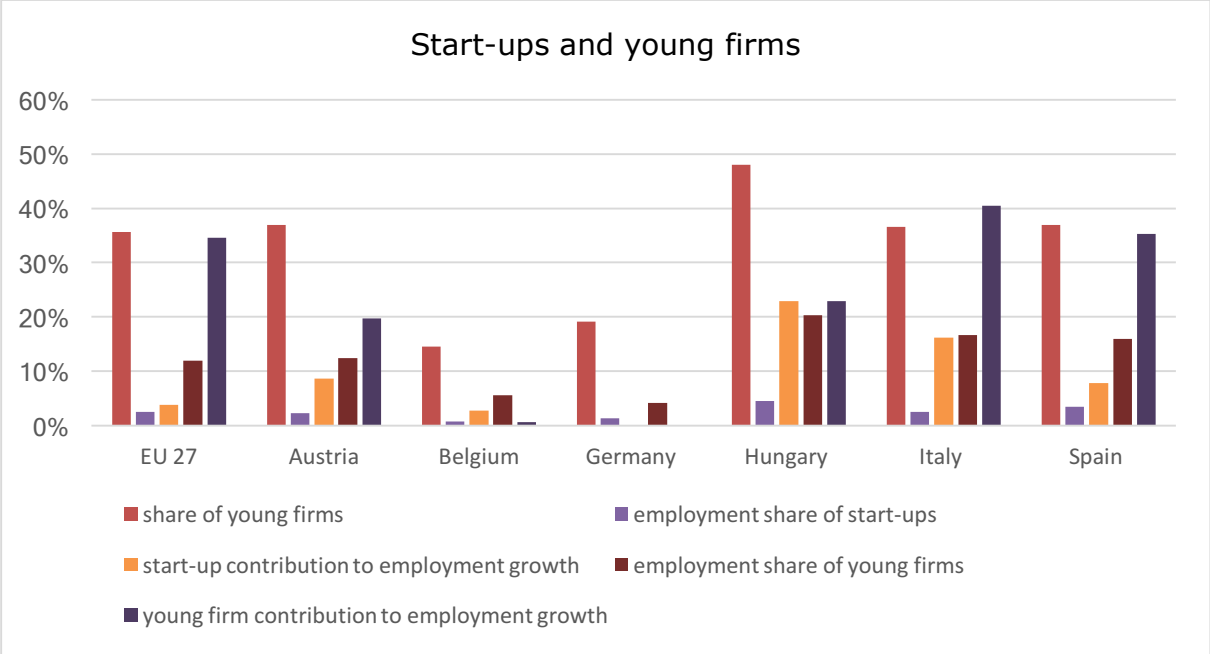


Figure 1. Importance of start-ups and young firms for aggregate employment

Source: JRC, Eurostat, Business Demography dataset EU27, 2020.
Note(1): The Business Demography dataset for Germany does not have enough data to compute the start-up and young firm contribution to growth. Hence, this is omitted in the Figure.

[2] For the porpuse of this paper, start-ups are firms aged zero or new entrants, while young firms are less than six years old from when they registered as new businesses.

Importantly, start-ups are also pivotal for the *creation* of new jobs. Figure 2 shows net job creation (i.e. creation minus destruction) by firm age, in the same set of countries. On average, the employment share of start-ups accounts for 0.8 to 4.6% of aggregate employment. Thus, a lack of start-up activity can lead to an important loss of aggregate employment. Figure 2 also shows that for firms beyond age 1, net job creation is negative in most countries. That is, these age groups on average destroy more jobs (either via exit or scaling back) than they create. Again, this highlights the importance of start-ups in sustaining aggregate employment. Finally, the figure suggests that there is substantial variation across countries in the importance of start-ups for job creation, although qualitatively the patterns are similar.

At the same time, start-ups (i.e. firms age 0 in Figure 2) and young firms find themselves in a fragile stage of their firm life-cycle being more susceptible to disruption of supply chains, a drop in demand for their products or services, limited access to funding and more stringent regulations. For this reason, the COVID-19 pandemic and its consequences in terms of containment measures adopted, changes in consumer preferences and related economic crisis is deemed to impact particularly strongly on start-ups and young firms. This is confirmed by recent data on the number of new business registrations in the first months of 2020 which show a sharp decline with respect to the same months of the previous year across several EU countries. Figure 3 shows how the number of new companies created declines in the first four months of 2020 with respect to the first four months of 2019, i.e. -8.5% in Belgium, -11.84% in Germany, -13.32% in Hungary, -28.09% in Italy and -21.13% in Spain. These data hide large monthly drops in the number of new start-ups registered during the lockdowns and the consequent freeze of administrative activities. For instance, at the height of the first wave in Spain the number of start-ups dropped by 73.4% in April 2020 compared to April 2019, and in Italy by about 79% in April 2020 compared to April 2019.[3] The resulting decline in job creation potential, due to the missing generation of start-ups, can have a dramatic and lasting effect on aggregate employment that persists as the cohorts of new firms mature (see Gourio et al. (2016) and Sedláček (2020)).

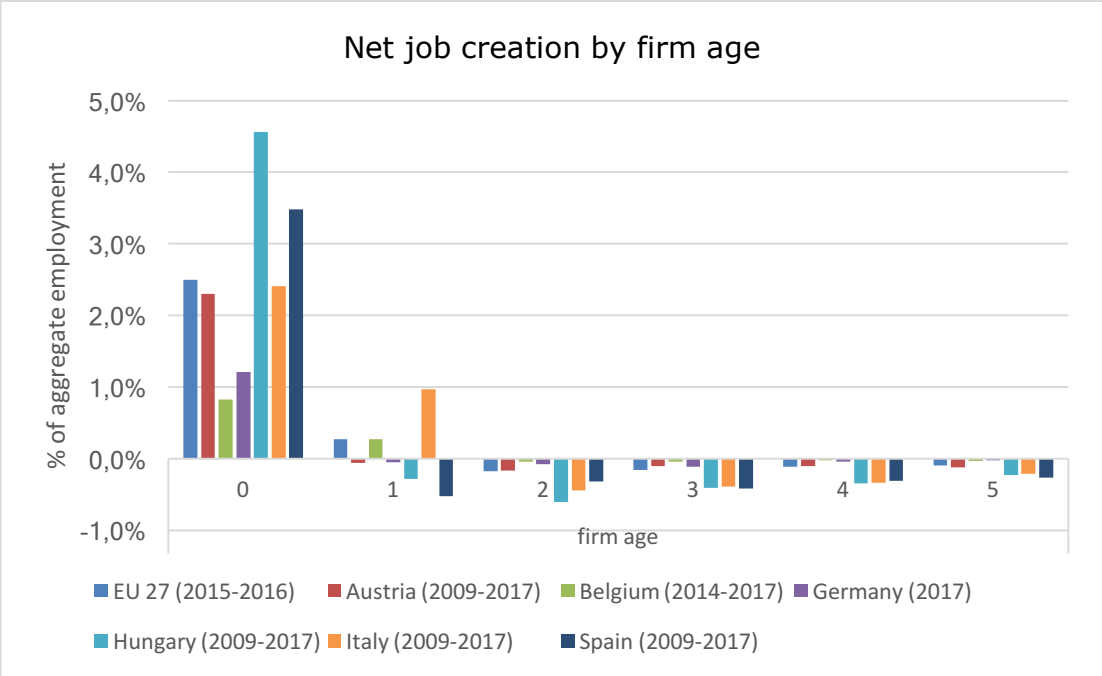


Figure 2. Importance of start-ups for job creation

Source: JRC, Eurostat, Business Demography dataset EU27, 2020.

[3] See Section 3 for further data on each country analysed in this paper.

Acknowledging that challenging times may spark radical innovations (e.g. teleworking, contact-tracing applications) and the creation of new successful enterprises, the COVID-19 crisis is likely to affect negatively not only the start-up rate but also the survival rate of young firms and the growth potential of start-ups for which we do not have available data yet. In general, data show that start-ups and young firms have a much higher exit rate than older firms. In 2017, almost one in five start-ups in Europe exited the market within the first year of operation, about 58% of new companies survived for three years and only 44% survived for five years.[4] Furthermore, the literature suggests that the exit rates of young firms increase during downturns (e.g. Haltiwanger, Jarmin, and Miranda (2013)). Moreover, Sedláček and Sterk (2017) show that the growth potential of firms is linked to the business cycle and that firms born during recessions are in general smaller and tend to stay smaller during their life-cycle.

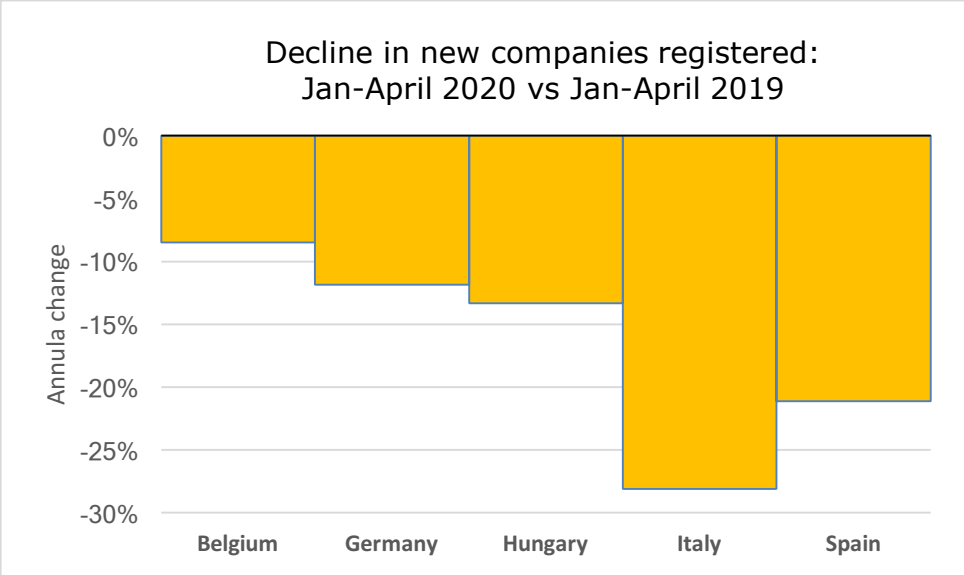


Figure 3. Annual change in the number of new companies registered in the period from January to April 2020 with respect to January to April 2019 (percentage)

Source: JRC, data from Statistics Belgium (STABEL), the Federal Statistical Office of Germany providing preliminary data (DESTATIS), the Hungarian Central Statistical Office (KSH), the Spanish National Statistical Institute (INE) and for Italy the quarterly data can be derived from an article by Formari S., F. Lotti, F. Manaresi and F. Scoccianti (2020), "Cosi il COVID ha contagiato l'imprenditorialità" published on lavoce.info

At this point of the COVID-19 pandemic it is not clear whether the current economic crisis will be short lived or sustained over a much longer period and if the implications for start-ups will be consistent with what has been documented during previous economic downturns. For this reason, our baseline scenario assumes a strong but brief contraction with start-up activities affected negatively by the crisis, i.e. the number of start-ups, their growth potential and the survival rate of young firms drop for only one year to a level corresponding to that experienced during the Great Recession of 2008 and 2009. This baseline scenario constitutes a plausible scenario and we postpone to further research the analysis of alternatives conjectures. According to the EU start-up calculator, this scenario would create substantial and persistent aggregate employment losses, especially in Austria, Hungary, Italy and Spain. A full recovery to realign employment to its pre-crisis trend may take about a decade, even if start-up activity recovers to its pre-

[4] The business survival rates are taken from statista.com. Some sectors, such as the IT sector seems to be particularly characterized by high exit rates. CBInsights.com reports that about 70% of tech start-ups fail within 20 months after obtaining financing, and about 97% of consumer hardware start-ups eventually fail.

crisis level in one year.[5] The outlook is considerably improved in every country if specific policies would be introduced in 2021 targeted at increasing the number of firms entering the economy. Likewise, policies aimed at increasing the survival rate of young firms would also be quite effective in mitigating the negative impact of the crisis.[6] These results suggest that policy makers have ample space of manoeuvre for policies specifically targeting an easily identifiable category of firms, i.e. start-ups and young firms. Finally, in all the countries analyzed, the service sector may be affected more than the industry and manufacturing sectors, as young firms are important job creators in this sector. This also in the case in which the three margins are shocked symmetrically across sectors as the calculator embeds the employment structure of each sector considered.

In what follows, Section 2 introduces the EU start-up calculator. Section 3 discusses the data used and the methodology adopted to create the simulator. Section 4 applies the calculator to simulate how the destruction of start-up activities affects aggregate employment in Austria, Belgium, Germany, Hungary, Italy and Spain. Business dynamism and scenario analysis is discussed separately for each country. A cross-country comparison is deferred to when the tool will be available for a larger set of Member States. Section 5 concludes.

[5] The persistence of our results is aligned to similar simulations based on the OECD DynEmp3 Database performed by Calvino et al. (2020). They evaluate the impact on aggregate employment over 3 to 14 years of a 20% decline in the number of entering firms in a year as average across 15 countries.

[6] For instance, Germany is initiating a start-up program aiming at supporting and expanding venture capital financing, France has created a 4 billion euros fund to support young firms liquidity, Italy has created the programme "Smart&Start Italia" which allocates 100 million euros to refinance innovative start-ups, as well as 200 million euros to support venture capital financing. This adds to further programs aiding start-ups and young firms with training and couching and the 34 billion euros more generally assigned to support liquidity needs of SMEs.

2 What is the start-up calculator?

The EU start-up calculator is an empirical tool which allows researchers and policy analysts to compute the medium-run impact, up to 2030, that COVID-19 has on aggregate employment due to the destruction of the activities of start-ups and young firms. In the context of this study, start-ups are defined as firms of age 0, i.e. newly registered firms, and young firms are those up to 5 years old. The calculator was firstly developed by Sedláček and Sterk (2020) for the US economy and then adapted to fit the employment profile of young firms in the EU Member States using publicly available Eurostat data.[7]

The EU start-up calculator will be made publically available as a web-based tool in the coming months. A user will be able to easily simulate the time path for aggregate employment for a given scenario of start-up activity. Different scenarios can be created varying the following three parameters or "margins"[8] (in economics parlance) related to entry, exit and growth of young firms which tend to worsen during a recession:

i) *the number of start-ups*, i.e. shift the number of start-ups (for incoming cohorts).
ii) *the survival rate of young firms*: i.e. shift the profile of firm survival rates by age (for all firms up to age fifteen).
iii) *the growth potential of start-ups*: i.e. shift the profile of average size by age (for incoming cohorts).

A decline in the number of start-ups directly translates into a decline in the number of new jobs created and hence employment. Furthermore, this lost generation of firms creates a persistent dent in aggregate employment as subsequent years will be characterized by a lower number of firms (see for instance Gourio, Messer, and Siemer (2016) and Sedláček (2020)). The survival rate of young firms is directly linked to their exit rate. In general, start-ups and young firms are more fragile than established incumbents. This fragility is exacerbated during recessions - see Haltiwanger, Jarmin, and Miranda (2013). An economic consequence of this pandemic is expected to be a higher exit rate of young firms, a lower firm survival rate and, thus, more job destruction. Finally, the growth potential of start-ups entering the economy in 2020 is expected to decline. Firms that are born during a recession start smaller and tend to stay smaller even when the economy has recovered as shown by Sedláček and Sterk (2017). Changing the growth potential margin will result in shifting downwards the entire growth of the employment profile of the cohort of companies entering the market in 2020.

When creating a scenario changing the three margins, the calculator computes the implied time-dependent changes in aggregate employment for the given country and sector from 2020 to 2030 and the cumulative job loss. The flexibility of the tool permits the user to analyse the overall employment effects or outcomes by country and sector resulting from different degrees of severity of the economic impact that COVID-19 has on start-ups and young firms. The scenarios can reflect V-, U-, W- or L- shaped recessions with the analysis being comparable across economic sectors and countries. The user should constrain the flexibility of the tool with knowledge of the possible impacts of COVID-19 on the three margins are likely to be in order to analyse plausible scenarios.

[7] The start-up calculator for US is available at the following website http://users.ox.ac.uk/~econ0506/Main/StartupCalculator.html

[8] where a marginal change is a relaxing or tightening of constraints or the response which this relaxation or tightening produces

3 Data and methodology

The EU start-up calculator is tailored to individual Member States. It allows scenarios to be analysed for the whole business economy, the industrial sector, the manufacturing sector and the service sector.[9] It uses data from Eurostat Business Demography Statistics on the number of firms, persons employed, average size and survival rate of cohorts of firms for the age bins 0, 1, 2, 3, 4, 5, and all covering the years from 2008 and 2017, except for Belgium and Germany where coverage if from 2012 to 2017. It considers data of only employer businesses, that is businesses that have at least one employee.

The data for 2018 and 2019 are extrapolated for each age group assuming that the survival rates, the firm sizes and the number of start-ups linearly converge to their 2008-2017 average.[10] Similarly, the age profile of firm size and survival rate between age 6 and 15 for the years 2008 to 2017 are interpolated to obtain values per age bin that reflect trends consistent with the aggregate average values per age bin and year. The age profile of the number of firms older than 5 years is then simply obtained using the information on the interpolated yearly survival rate per age bin 6 to 15. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. This implies that the simulations should be considered as lower boundaries given that they do not take into account the impact of the crisis on firms older than 15. Finally, the different scenarios are simulated from 2020. The calculator allows analysis of bounce-back scenarios to capture the case in which the three margin would recover strongly, i.e. above the 2012-2017 average, from 2021, for instance due to a policy intervention. See Appendix I for technicalities behind the interpolation extrapolation and creation of scenarios.

The start-up calculator allows also to adjust the simulations taking into consideration general equilibrium effects, i.e. potential employment reallocation towards surviving and older firms, which are driven by a lower wage rate caused by the decline in start-up employment. To this end the calculator is embedded in a standard heterogeneous firm model, which allows to connect the calculator with the literature on firm dynamics.[11] In models with firm heterogeneity, firms are distributed over different levels of productivity, unproductive firm exit the economy and are replaced by new entrants, while households consume and supply labour to firms. The interested reader can find in Appendix I the derivations formalizing the embedding of the calculator in a general equilibrium model with firm dynamics. When the COVID-19 pandemic hits the activity of start-ups and young firms, the general equilibrium reallocation mechanism dampens the effect. The disruption of start-up and young firm activities results in lower employment and a lower wage rate. Firms that remain in the market hire more labour partially absorbing the negative shock on employment. The magnitude of the equilibrium dampening effect depend on the labor supply and demand elasticities. In the EU start-up calculator, the elasticities are consistent with the literature and with the values adopted by the European Commission QUEST and RHOMOLO models. In particular, the labour supply elasticity is set at 0.25 and the labour demand elasticity at -0.1. These elasticities result in a dampening effect of 29% (see Appendix II).[12]

[9] The sectoral aggregation analysed reflects the classification available in Eurostat. That is, business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

[10] In the case of Belgium and Germany, Eurostat data for the survival rate start in 2013. The short time series does not allow us to have 5 years to construct the 1-5 survival rate. As a consequence, the minimum, maximum and average value of the survival rate are the same number.

[11] As a reference to the canonical model of firm heterogeneity see Hopenhayn (1993) and Hopenhayn and Rogerson (1995).

[12] The elasticities chosen result in a conservative dampening effect. When setting the elasticities at values more commonly used in the macroeconomic literature, such that for the labour supply elasticity and –0.246 for the labour demand elasticity (Lichter et al. (2015)), the dampening effect reduces to 20%. In light of the large range of elasticities discussed in the literature the calculator features easily changeable elasticities enabling for robustness checks.

4 Country analysis

4.1 EU start-up calculator: Austria

4.1.1 Summary

- The COVID-19 crisis is likely to heavily affect young firms, leading to a decline in the start-up rate, higher exit of young firms, and lower growth of start-ups.
- According to the EU start-up calculator, these developments are likely to create substantial aggregate employment losses, of up to 2.2% of negative deviation from the employment trend in 2020. The cumulative employment loss for the period 2020-2030 could be up to 344,000.
- Effects are very persistent: full recovery may take more than a decade, even if start-up activity recovers to its pre-crisis level in one year.
- More than two thirds of the aggregate employment loss is accounted for by the reduction of the survival rate. Policies targeted to support young firm survival would seem to be the most effective. The outlook is improved if in 2021 there is a rapid increase in the number of firms entering the economy. i.e. the cumulative aggregate employment loss is reduced to 312,000.
- The Austrian service sector may be affected particularly strongly, as young firms are particularly important job creators in this sector. In all three sectors about two third of the job loss is due to a decline in the survival rate of young firms.

4.1.2 Business dynamism in Austria

Before presenting the scenario analysis, we consider a number of statistics on the dynamism of Austrian firms, see Table I.

Table I. Descriptive statistics on the economy and sector dynamics of young firms - Austria

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	8.9%	4.8%	4.7%	9.5%
survival rate	92%	91%	94%	94%	91%
share of young firms	36%	37%	23%	23%	38%
employment share of start-ups	2.5%	2.3%	0.8%	0.6%	2.8%
employment share of young firms	12%	12.4%	4.1%	4.1%	14.9%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

The statistics show that, when it comes to business turnover, the Austrian economy is aligned with the EU average. A seemingly important share of job creation is attributed to start-ups and young firms. Over the sample, about 8% of firms exit within a given year, whereas the start-up rate is about 9%. Start-ups (firms of age zero) account for about 2.3% of aggregate employment whereas firms up to age 5 together account for more

than 12%, again in line with the EU average.[13] The service sector contributes to most of the business dynamic of the overall Austrian economy.

4.1.3 Scenario analysis

We consider a deterioration of the three margins described above. Specifically, we assume that the number of start-ups, the survival rate, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), see Table II.[14] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. The scenario is the one of a strong but short-lived crisis expecting that once the containment measures are lifted, the economic activity of start-ups and young firms will resume. This expectation seems to be consistent with the recent economic trend.

Table II. Scenario assumptions - Austria

	All	Industry	Manufacturing	Services
# Start-ups	-6%	-11%	-11%	-5%
Growth potential	-8%	-9%	-20%	-8%
Survival rate	-10%	-10%	-10%	-10%

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Figure 4 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by just over 2.2%. The recovery is very slow: by 2027, aggregate employment is still more than 0.75% below the level it would have attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 344,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 246,000. The decline in the survival rate accounts for 77% of the effects. The number of start-ups accounts for about 10% and the growth potential for roughly 13%. These findings provide an important input for the policy discussion. The three different margins can be influenced by targeted policies. Potential employment benefits of policies targeted towards firm survival suggest to be highest. However, the cost of different policy options needs to be taken into account.

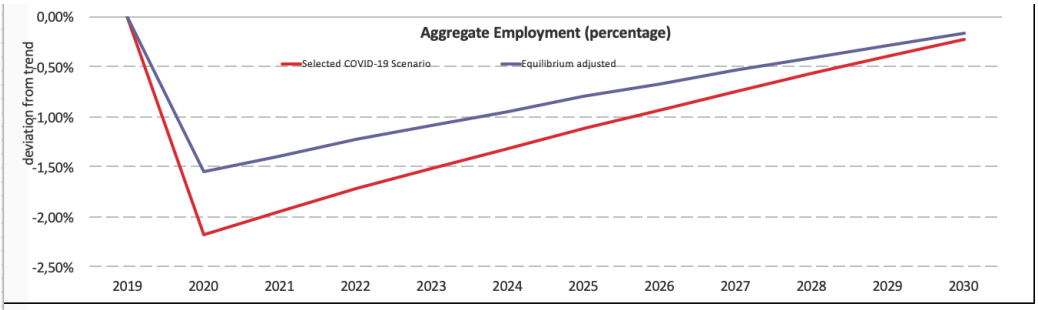
Moreover, we consider how sectors may be affected differently. Table II shows that, compared to manufacturing and overall industry, firms in the service sector are relatively dynamic. This sector has much higher start-up and exit rate, and a much higher employment share of start-ups and other young firms.

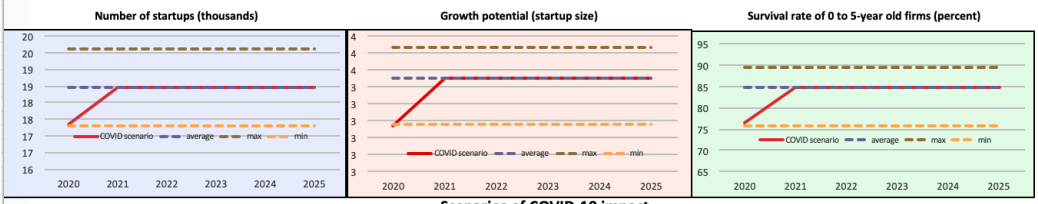
Figure 5 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins

[13] Table I also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

[14] Note that in Table II Industry, Manufacturing and Serving sector are set to their sample minima which happens to be the same for the number of start-ups. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.

assumed is actually somewhat smaller, especially if compared to the manufacturing sector. This result is driven by the fact that the service sector is more dynamic in terms of entry and exit and therefore reliant on young firms to provide employment.





Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	6%	1	0%	1
Growth Potential	8%	1	0%	1
Survival rate	10%	1	0%	1

Figure 4. Scenario analysis for employment and the three margins of start-up activity - Austria

Source: EU start-up calculator, Austria, 2020.

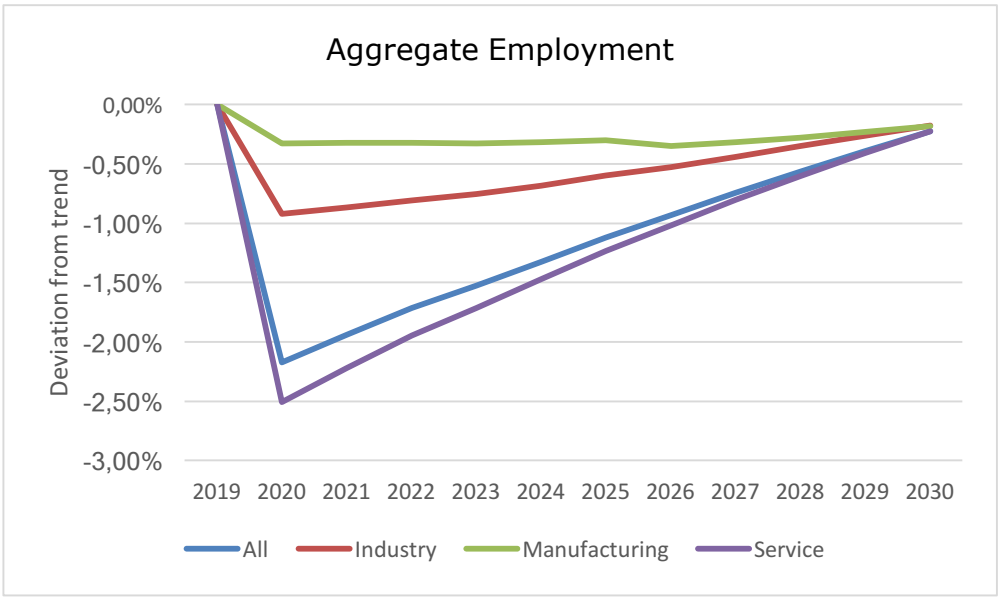


Figure 5. Sectors employment (not equilibrium adjusted) - Austria

Source: JRC, EU start-up calculator, Austria, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

Table III. Share of aggregate employment loss accounted for by the margins - Austria

	All	Industry	Manufacturing	Services
Cumulative employment loss	344 k	40 k	19 k	252 k
# Start-ups	10%	14%	10%	8%
Growth potential	13%	11%	18%	21%
Survival rate	77%	75%	72%	78%

Source: JRC, EU start-up calculator, Austria, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Hence, a disruption to start-ups and other young firms affects the service sector relatively strongly causing a loss of aggregate employment of more than 252,000 jobs (Table III). In all the three sectors approximately two third of the job loss is attributed to the decline in the survival rate of young firms. This is indicative that policy targeted to support firms to tackle survival challenges could have a significant effect in mitigating the impact that the COVID-19 pandemic will have on aggregate employment.

Figure 6. Bounce-back scenario in the number of firms, results for aggregate employment - Austria

Source: EU start-up calculator, Austria, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of the duration of one year. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021 especially if supported by specific policies targeted to start-ups that could reduce the entry barriers, promote innovation and relax financial constraints. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 6 where, after the initial negative shock, the number of start-ups is increased in 2021 to the maximum level registered in the time series, which in this case mirrors the 2020 loss of start-up entry. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes an improvement of the employment trend and a lower cumulative job loss totalling to about 312,000. Despite the better outlook aggregate employment still does not reach its pre COVID-19 level by 2030. This is due to the fact that the number of start-ups account for a small part, i.e. about 10%, of the total effect on employment (see Table III).

4.2 EU start-up calculator: Belgium

4.2.1 Summary

- The COVID-19 crisis is likely to negatively affect young firms, leading to a decline in the start-up rate, a higher exit of young firms, and lower growth of start-ups.
- According to the EU start-up calculator, these developments are likely to create aggregate employment losses, of up to 0.7% deviation from employment trend in 2020. The cumulative employment loss for the period 2020-2030 could be up to 82,000.
- Effects are somewhat persistent: full recovery may take about a decade, even if start-up activity recovers to its pre-crisis level in one year.
- About 60% of the aggregate employment loss is accounted for by the reduction of the survival rate and about 30% by the reduction in the number of start-ups. Policies targeted to reduce exit of young firms and incentivise entry would seem to be the most effective. The outlook is significantly improved if in 2021 there is a rapid increase in the number of firms entering the economy. i.e. the cumulative aggregate employment loss is reduced to 59,000.
- The Belgian service sector may be affected stronger than the industry and manufacturing sectors, as young firms are important job creators in this sector. This also in the case of symmetric shocks across sectors.

4.2.2 Business dynamism in Belgium

Before presenting the scenario analysis, we consider a number of statistics on the dynamism of Belgian firms, see Table IV. The statistics show that the Belgian economy has a low firms' entry and exit compared to the average EU one, especially in the industry sector and seems to rely mostly on established firms for job creation rather than on start-ups. Over the sample only 3% of firms exit within a given year, whereas the start-up rate reaches only 3.5%.[15] These values are well below the EU average of 9.2% and 8% for entry and exit rate, respectively, collocating Belgium among the countries with the lowest start-up rate in the EU 27. Also the employment share of Belgian start-ups and young firms is considerably below the EU average. Start-ups (firms of age zero) account for less than 1% of aggregate employment whereas firms up to age 5 together account for about 5.6%.[16] Moreover, Bijnens and Konings (2017) show that in Belgium there is an overall decline of high-growth firms. However, while the propensity for large, older firms to become high-growth firms seems to increase, the propensity for small and

[15] In 2017 data shows that Belgium had the lowest employment start-up rate among the EU 27 (Source: Eurostat).

[16] Table IV also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

young firms to become high-growth seems to decline since 2000. This indicates that in Belgium the depositaries of employment growth are older and larger firms.

Nevertheless, the creation of new companies has been affected by the crisis showing an overall contraction in the first months of 2020 with respect to the same period in 2019. In particular, the decline in the entry rates becomes evident once the lockdown measures have been introduced in mid-March.[17] Figure 7 shows how the number of new companies created initially increases in January and February and then declines in March by 2.9%, drops in April by 38.5% and in May by 25.5%, in each case compared to the corresponding month of 2019. Hence, also Belgium has suffered from an important disruption of start-up activity due to the COVID-19 pandemic. Despite the lower then EU average dynamism of the Belgian start-up ecosystem (see Table IV), the "unborn" start-ups may cause important repercussions for aggregate employment, especially if the number of start-ups recovers slowly and may be further affected by a second wave of the epidemic.

Table IV. Descriptive statistics on the economy and sector dynamics of young firms - Belgium

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	3.5%	1.7%	1.7%	3.9%
survival rate	92%	97%	97%	97%	97%
share of young firms	36%	14.5%	8.1%	8.1%	15.8%
employment share of start-ups	2.5%	0.8%	0.3%	0.4%	0.9%
employment share of young firms	12%	5.6%	2.7%	2.6%	6.6%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

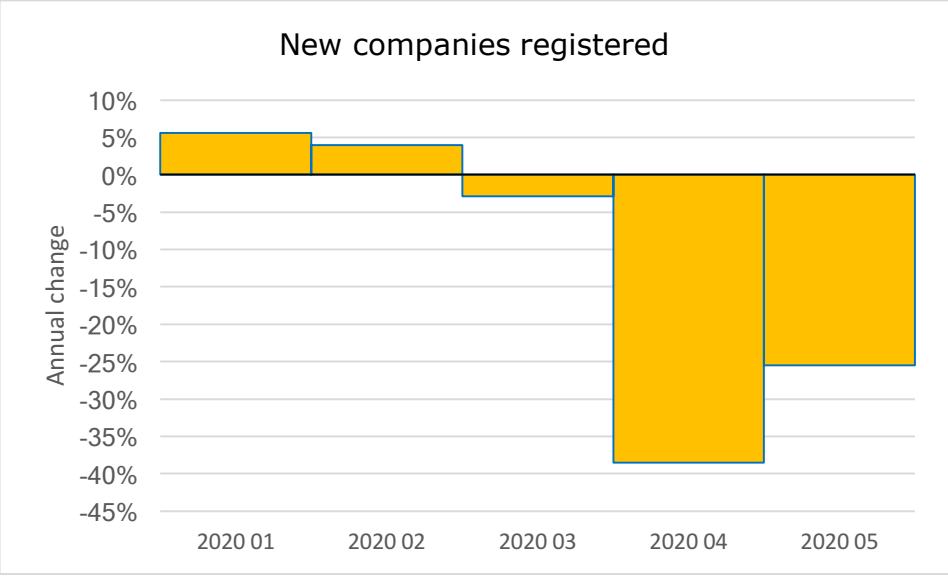


Figure 7. Annual change in the number of new companies registered (percentage) - Belgium

Source: JRC, data from Statistics Belgium at the following website: https://statbel.fgov.be.

[17] The World Health Organization has announced on March 12 that COVID-19 constitutes a pandemic. As a result Belgium has adopted a partial lockdown on March 13 transformed into a full lock-down on March 18.

4.2.3 Scenario analysis

We consider a deterioration of the three margins described above which. Specifically, we assume that the number of start-ups, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), while the survival rate is arbitrarily assumed to drop considerably[18], see

Table V. Scenario assumptions - Belgium

	All	Industry	Manufacturing	Services
# Start-ups	-15%	-15%	-15%	-15%
Growth potential	-8%	-20%	-20%	-7%
Survival rate	-10%	-10%	-10%	-10%

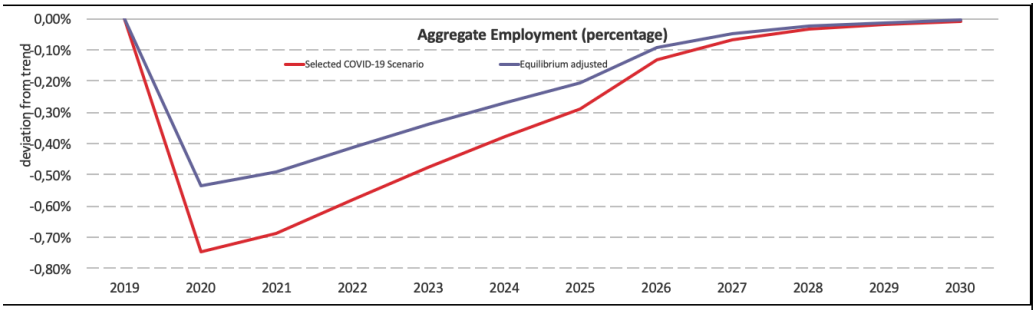
Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

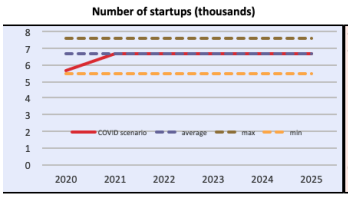
Table V.[19] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. As for Austria, the scenario is the one of a strong but short-lived crisis expecting that once the containment measures are lifted, the economic activity of start-ups and young firms will resume.

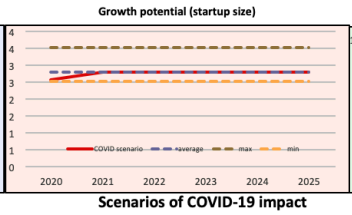
Figure 8 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by just over 0.7%. The recovery is slow: only by 2030 aggregate employment is at the level it would have attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 82,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 58,000. The decline in the survival rate accounts for almost 60% of the effects. The number of start-ups accounts for almost 30% and the growth potential for roughly 15% each.

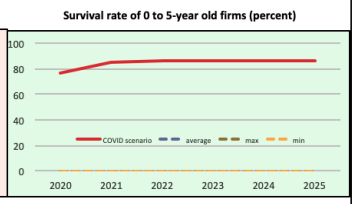
[18] In the case of Belgium, Eurostat data for the survival rate start in 2013. The short time series does not allow us to have 5 years to construct the 1-5 survival rate. As a consequence, the minimum, maximum and average value of the survival rate are the same number.

[19] Note that in Table V Industry, Manufacturing and Serving sector are set to their sample minima which happens to be the same for the number of start-ups. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.









Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	15%	1	0%	1
Growth Potential	8%	1	0%	1
Survival rate	10%	1	0%	1

Figure 8. Scenario analysis for employment and the three margins of start-up activity - Belgium

Source: EU start-up calculator, Belgium, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

These findings provide an important input for the policy discussion. The three different margins can be influenced by targeted policies. Potential employment benefits of policies targeted towards firm survival suggest to be highest. At the same time policies to reduce entry barriers could support a faster recovery. However, the cost of different policy options needs to be taken into account.

Moreover, we consider how sectors may be affected differently. Table V shows that, compared to manufacturing and overall industry, firms in the service sector are relatively dynamic: This sector has much higher start-up and exit rate, and a much higher employment share of start-ups and other young firms.

Figure 9 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins assumed is actually somewhat smaller than in manufacturing and industry. This result is driven by the fact that the service sector has a higher turnover rate and is more reliant on young firms to provide employment. Hence, a disruption to start-ups and other young firms affects the service sector stronger than the other sectors causing a loss of aggregate employment of more than 65,000 jobs (Table VI). In all the three sectors the decline in the survival rate accounts for about half of the employment loss.[20] This is indicative that policy targeted to incentivize firm entry and reduce exit could have a significant effect in mitigating the impact that the COVID-19 pandemic will have on aggregate employment.

[20] The combination of a relative high contribution of the survival rate in explaining the medium-run impact of the COVID-19 shock combined with an overall low number of firms in the economy is causing the wiggles that are visible in Figure 10.

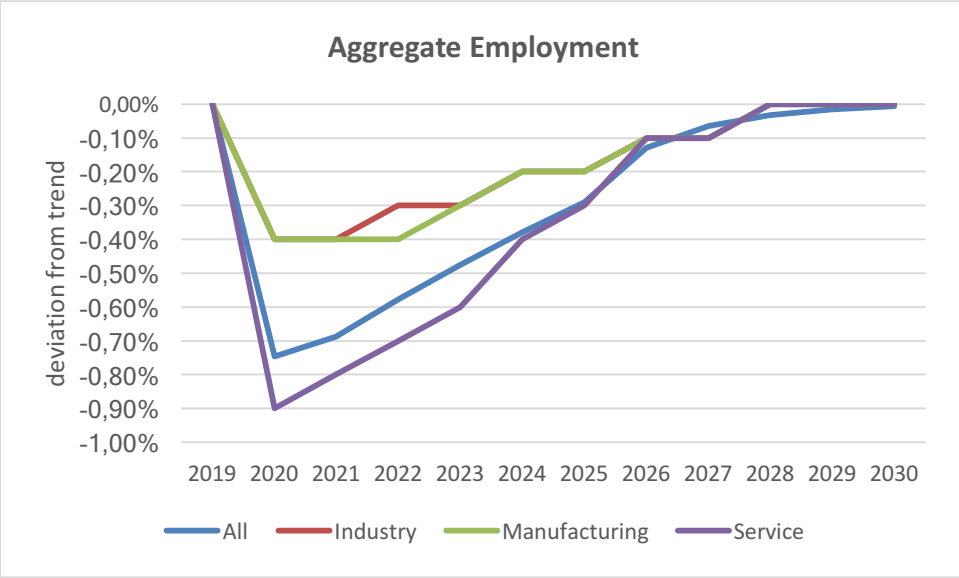


Figure 9. Sectors employment (not equilibrium adjusted) - Belgium

Source: EU start-up calculator, Belgium, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

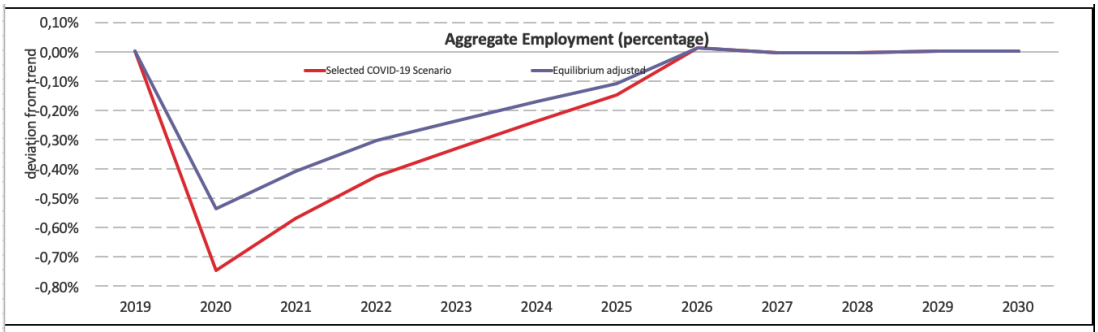
Table VI. Share of aggregate employment loss accounted for by the margins - Belgium

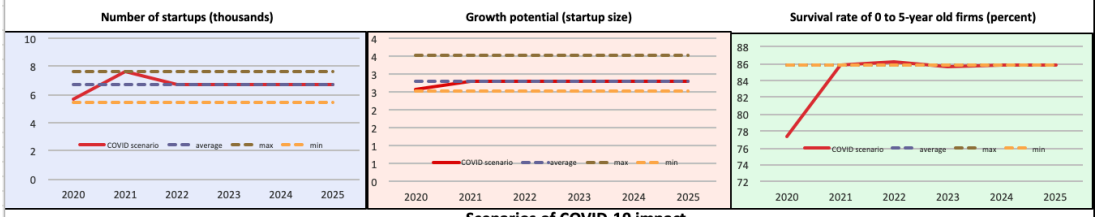
	All	Industry	Manufacturing	Services
Cumulative employment loss	82 k	11 k	10 k	65 k
# Start-ups	28%	22%	21%	28%
Growth potential	15%	30%	29%	14%
Survival rate	58%	51%	48%	58%

Source: JRC, EU start-up calculator, Belgium, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021 and it should be supported by policies promoting and facilitating firm entry. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 10 where, after the initial negative shock, the number of start-ups is increased in 2021 to the maximum level registered in the time series. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes a speedy recovery of aggregate employment and a lower cumulative job loss totalling to about 59,000s. Thanks to this enhanced firm entry aggregate employment reaches its pre COVID-19 level by 2026.





Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	15%	1	15%	1
Growth Potential	8%	1	0%	1
Survival rate	10%	1	0%	1

Figure 10. Bounce-back scenario in the number of firms, results for aggregate employment - Belgium

Source: EU start-up calculator, Belgium, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and last one year. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

4.3 EU start-up calculator: Germany

4.3.1 Summary

- The COVID-19 crisis is likely to heavily affect young firms, leading to a decline in the start-up rate, a higher exit of young firms, and lower growth of start-ups.
- According to the EU start-up calculator, these developments are likely to create substantial aggregate employment losses, of up to 0.6% deviation from employment trend in 2020. The cumulative employment loss for the period 2020-2030 could be up to 764,000.
- Effects are somewhat persistent: full recovery may take about a decade, even if start-up activity recovers to its pre-crisis level in one year.
- The decline in the survival rate and in the number of start-ups account each for about 40% of the aggregate employment loss. Policies targeted to reduce exit of young firms and incentivise entry would seem to be the most effective in Germany. The outlook is significantly improved if in 2021 there is a rapid increase in the number of firms entering the economy, i.e. the cumulative aggregate employment loss is reduced by 37% and by 2026 the employment would reach the level that it would have attained without the COVID-19 crisis.
- The German service sector may be affected stronger than the industry and manufacturing sectors, as young firms are important job creators in this sector. This also in the case of symmetric shocks across sectors.

4.3.2 Business dynamism in Germany

As before, we consider a number of statistics on the dynamism of German firms, see Table VII. The statistics show that in terms of firms' entry and exit the German economy is somewhat dynamic despite the employment share due to young firms is considerably lower than the EU average. Over the sample about 6% of firms exit within a given year, whereas the start-up rate reaches more than 7%. Start-ups (firms of age zero) account for more than 1% of aggregate employment whereas firms up to age 5 together account for about 4.2%.[21] However, young firms represent only 19% of the population of active firms compared to 36% of the EU average.

Similarly, to other European countries, also the business dynamism of the German economy has been affected by the crisis. The overall contraction in the creation of new companies in the first quarter of 2020 with respect to the same quarter in 2019 amounts to about 11.8%. Figure 11 shows how the number of new companies created starts to decline in February by 2.7%, to then drop in March by 24.7% and in April by 28.5%, in each case compared to the corresponding month of 2019.[22] Hence, also Germany has suffered from a significant disruption of start-up activity due to the COVID-19 pandemic. The persistence in the slow-down of start-up activities may cause important repercussions for aggregate employment, especially if the number of start-ups does not recover after the lift of the lockdown.

Table VII. Descriptive statistics on the economy and sector dynamics of young firms - Germany

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	7.4%	3.7%	3.4%	8.1%
survival rate	92%	94%	96%	96%	94%
share of young firms	36%	19.1%	10%	9.3%	21.1%
employment share of start-ups	2.5%	1.3%	0.3%	0.3%	1.7%
employment share of young firms	12%	4.2%	1%	0.9%	5.3%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

[21] Table VII also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

[22] The data are preliminary and provided by the Federal Statistical Office of Germany, Crafts, Business Notifications, Insolvencies Unit. The series used considers also new establishments but not change of addresses of existing firms. Moreover, a press release of the Federal Statistical Office adjusts the decline of new companies registered in the first quarter of 2020 with respect to 2019 at 7.7%.

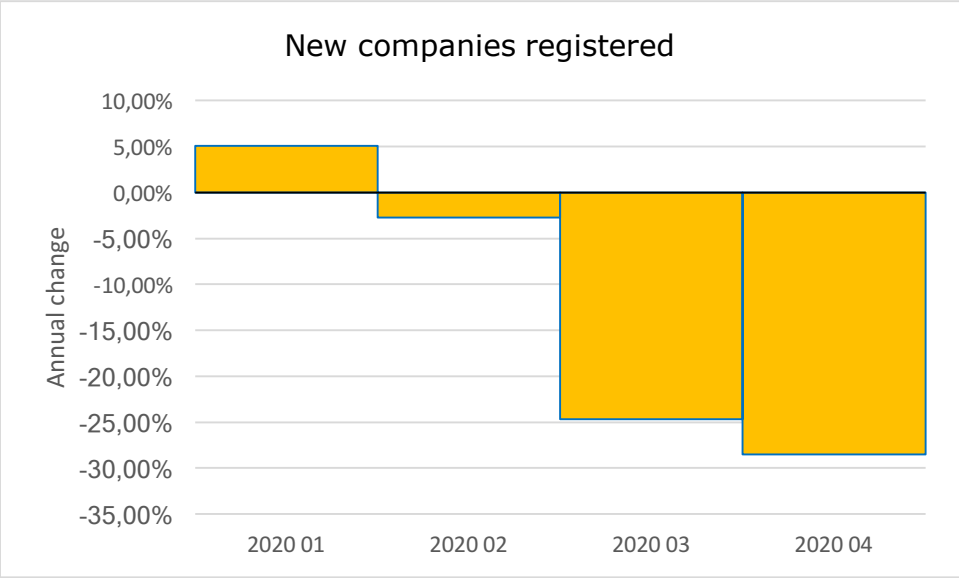


Figure 11. Annual change in the number of new companies registered (percentage) - Germany

Source: JRC, data provided by the Federal Statistical Office of Germany, Crafts, Business Notifications, Insolvencies Unit. The series used considers also new establishments but not change of addresses of existing firms, 2020.

4.3.3 Scenario analysis

We consider a deterioration of the three margins described above. Specifically, we assume that the number of start-ups, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), while the survival rate is arbitrarily assumed to drop considerably[23], see Table VIII.[24] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. As for the previous countries, our benchmark scenario assumes a one-off and short-lived negative effect of the Corona-crisis on start-up activities expecting that once the containment measures are lifted, the economic activity of start-ups and young firms will resume.

Table VIII. Scenario assumptions - Germany

	All	Industry	Manufacturing	Services
# Start-ups	-13%	-14%	-14%	-15%
Growth potential	-10%	-7%	-7%	-12%
Survival rate	-4%	-4%	-4%	-4%

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

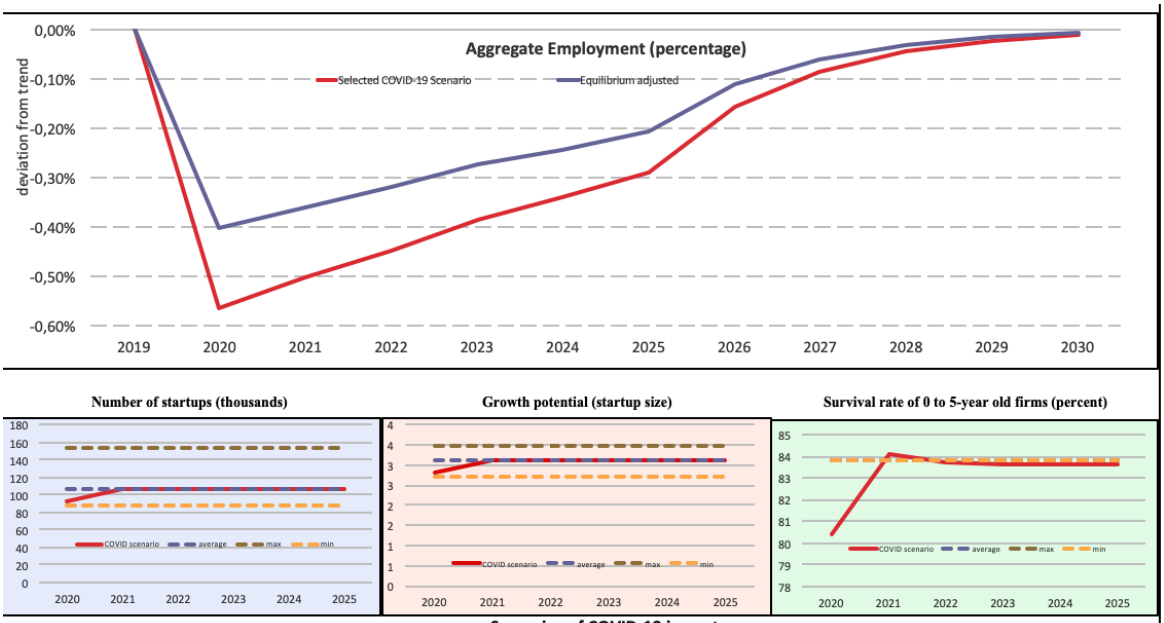
[23] In the case of Germany, Eurostat data for the survival rate start in 2013. The short time series does not allow us to have 5 years to construct the 1-5 survival rate. As a consequence, the minimum, maximum and average value of the survival rate are the same number.

[24] Note that in Table VIII Industry, Manufacturing and Serving sector are set to relatively similar values. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.

Figure 12 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by only about 0.6%. The recovery is slow, it may take up to a decade to recover the level of aggregate employment that could have been attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 764,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 545,000.

The decline in the survival rate and in the number of start-ups accounts for about 36% of the negative employment effect each. These findings provide an important input for the policy discussion. The three different margins can be influenced by targeted policies. Potential employment benefits of policies targeted towards firm survival and ease entry suggest to be highest. At the same time policies to reduce entry barriers could support a faster recovery (see also Figure 14 which simulates a bounce-back scenario). However, the cost of different policy options needs to be taken into account.

Moreover, we consider how sectors may be affected differently. Table VII shows that, compared to manufacturing and overall industry, firms in the service sector are more dynamic. This sector has much higher start-up rate, and a much higher employment share of start-ups and other young firms.



Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	13%	1	0%	1
Growth Potential	10%	1	0%	1
Survival rate	4%	1	0%	1

Figure 12. Scenario analysis for employment and the three margins of start-up activity - Germany

Source: EU start-up calculator, Germany, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

Figure 13 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins assumed is actually somewhat symmetric across all sectors. This result is driven by the fact that the service sector is more dynamic and therefore reliant on young firms to provide employment. Hence, a disruption to start-ups and other young firms affects the service sector relatively strongly causing a loss of aggregate employment of more than 665,000 jobs (Table IX). The decline in all the three margins account for more than 30% of the employment loss each. This is indicative that policy targeted to incentivize firm entry, scalability and reduce exit could have a significant effect in mitigating the impact that the COVID-19 pandemic will have on aggregate employment in Germany.

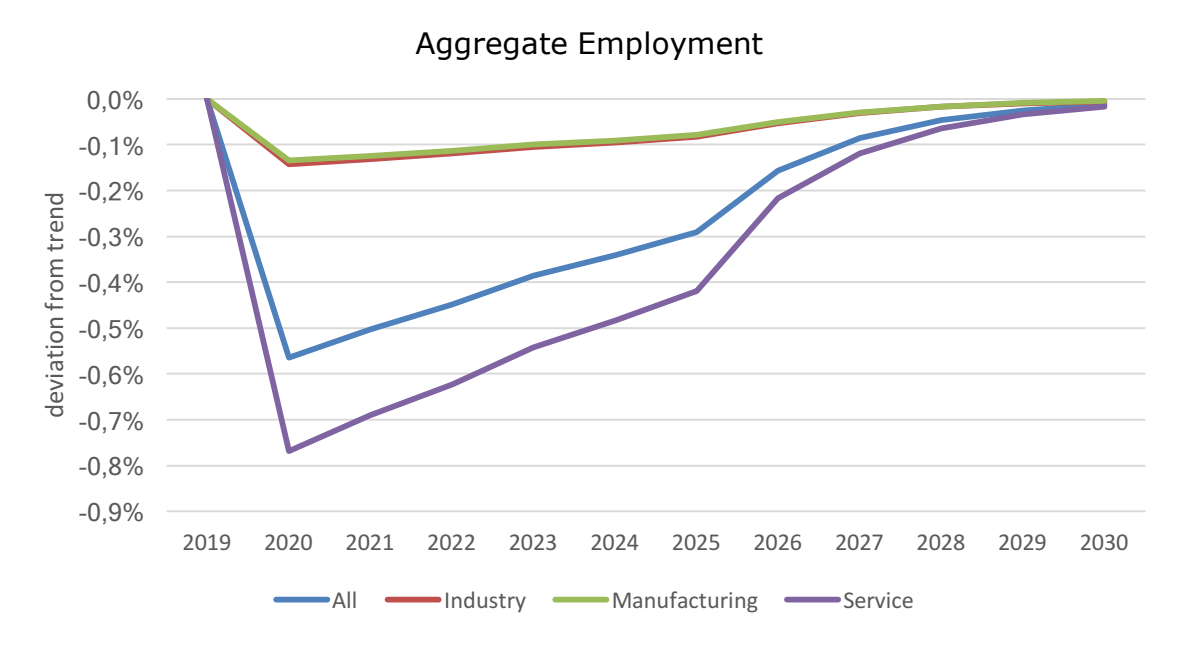


Figure 13. Sectors employment (not equilibrium adjusted) - Germany

Source: JRC, EU start-up calculator, Germany, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

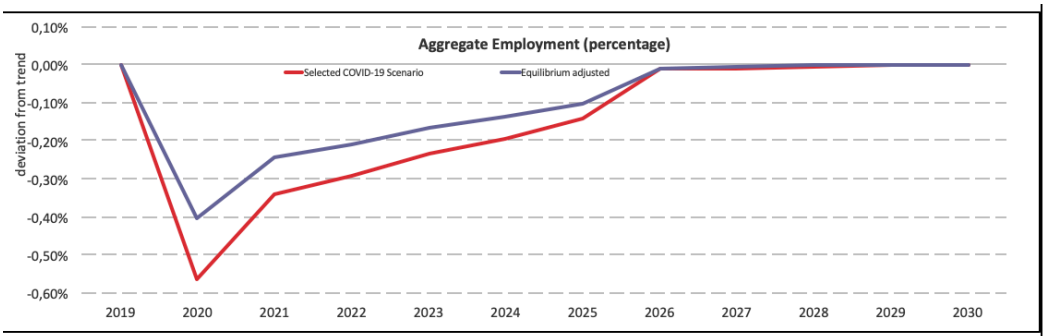
Table IX. Share of aggregate employment loss accounted for by the margins - Germany

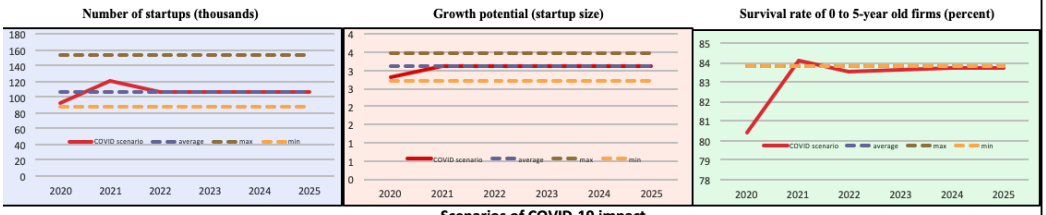
	All	Industry	Manufacturing	Services
Cumulative employment loss	764 k	61 k	54 k	665 k
# Start-ups	36%	39%	39%	37%
Growth potential	27%	19%	19%	31%
Survival rate	36%	41%	42%	32%

Source: JRC, EU start-up calculator, Belgium, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021 especially if stimulated by policies targeted to support the creation of new firms and innovative ideas. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 14 where, after the initial negative shock, the number of start-ups is increased in 2021 to match the loss happened in 2020. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes a speedy recovery of aggregate employment and a lower cumulative job loss during the period 2020-2030 totalling to about 480,000, i.e. 37% lower than the scenario without increased entry. Thanks to this enhanced firm entry aggregate employment reaches its pre COVID-19 trend by 2026.





Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	13%	1	13%	1
Growth Potential	10%	1	0%	1
Survival rate	4%	1	0%	1

Figure 14. Bounce-back scenario in the number of firms, results for aggregate employment - Germany

Source: EU start-up calculator, Germany, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and last one year. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

4.4 EU start-up calculator: Hungary

4.4.1 Summary

- The COVID-19 crisis is likely to heavily affect young firms, leading to a decline in the start-up rate, a higher exit of young firms, and lower growth of start-ups.
- According to the EU Start-up Calculator, these developments are likely to create substantial aggregate employment losses, of up to 1.8% deviation from the

employment trend in 2020. The cumulative employment loss for the period 2020-2030 could be up to 309,000.

- Effects are very persistent: full recovery may take more than a decade, even if start-up activity recovers to its pre-crisis level in one year.
- The decline in the number of start-ups accounts for almost half of the employment loss, while the decline in the survival rate for almost 40%. Policies targeted to reduce exit of young firms and incentivise entry would seem to be the most effective in Hungary. The outlook is significantly improved if in 2021 there is a rapid increase in the number of firms entering the economy, i.e. the cumulative aggregate employment loss is reduced to 171,000.
- The Hungarian service sector may be affected particularly strongly, as young firms are particularly important job creators in this sector.

4.4.2 Business dynamism in Hungary

Before presenting the scenario analysis, we consider a number of statistics on the dynamism of Hungarian firms, see Table X. The statistics show that, when it comes to firms' entry and exit, Hungary is very dynamic and relies heavily on start-ups for job creation. Over the sample, more than 13% of firms exit within a given year, whereas the start-up rate is about 15 %. Both values are considerably higher than the EU average. Start-ups (firms of age zero) account for about 4.5% of aggregate employment (almost double than the EU average) whereas firms up to age 5 together account for more than 20%, which is considerably higher with respect to the EU average of 12%. The importance of start-ups and young firms is particularly evident in the service sector where young firms account for about 50% of the total number of active firms and for more than 25% of total employment.[25] As a consequence, we expect that effect of the disruption of start-up activity due to COVID-19 will be particularly high in this sector.

Table X. Descriptive statistics on the economy and sector dynamics of young firms - Hungary

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	15%	10.1%	10%	15.6%
survival rate	92%	86%	89%	90%	86%
share of young firms	36%	48%	36%	35%	50%
employment share of start-ups	2.5%	4.5%	1.3%	1.3%	5.8%
employment share of young firms	12%	20.3%	8.5%	8.8%	25.3%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat –i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Moreover, recent data from the Hungarian Central Statistical Office shows an increasing contraction in the number of new businesses created since the beginning of the COVID-19 pandemic with respect to the same period in 2019. In particular, 22.1% less businesses were created in March, 46.8% less in April, and 31.2% less in May, in each

[25] Table X also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

case compared to the corresponding month of 2019 (see Figure 15).[26] Interestingly, in June 2016 the number of start-ups shows a bounce back increasing by 26% with respect June 2019. If this trend persists the Hungarian start-up scene may recover relatively quickly from the negative impact of the COVID-19 pandemic. This is despite concluding the first semester of 2020 with 12,858 new companies showing a decline in the start-ups rate of 11.3% with respect 2019. However, under a long-term perspective, the drop in the start-up rate needs to be discounted by the fact that 2019 was a year with a high number of new start-ups entering the market totalling to 14,495 during the first semester, when compared to the average number of start-ups during the first semester of the period 2015-2018, i.e. 12,937. Nevertheless, during the first semester of the period 2015-2019 the number of start-ups grew on average by 3.8% annually, while in the first semester of 2020 the corresponding growth rate is – 11.3%. Acknowledging the possibility of a rapid recovery in the number of start-ups during the second half of the year, these statistics show an important disruption of start-up activity due to the COVID-19 pandemic. This can have important repercussions for aggregate employment, especially if the number of start-ups does not keep increasing also in the second semester.

Figure 15. Annual change in the number of new companies registered (percentage) - Hungary

Source: JRC, data from the Hungarian Central Statistical Office, 2020.

4.4.3 Scenario analysis

We consider a deterioration of the three margins described above, which mirrors the scenario analysis done for the previous countries. Specifically, we assume that the number of start-ups, the survival rate, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), see Table XI.[27] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. The scenario is the one of a strong but short-lived crisis expecting that once

[26] The data from the Hungarian Central Statistical Office refers to new enterprsies with legal entity and are available at the following webpage https://www.ksh.hu/docs/eng/xstadat/xstadat_infra/e_qvd023a.html .

[27] Note that in Table XI Industry, Manufacturing and Serving sector are set to their sample minima which happens to be the same for the number of start-ups. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.

the containment measures are lifted, the economic activity of start-ups and young firms will resume.

Table XI. Scenario assumptions - Hungary

	All	Industry	Manufacturing	Services
# Start-ups	-18%	-19%	-19%	-18%
Growth potential	-6%	-8%	-18%	-6%
Survival rate	-4%	-3%	-3%	-4%

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Figure 16 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by just over 1.8%. The recovery is very slow: by 2030, aggregate employment is still more than 0.4% below the level it would have attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 309,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 220,000.

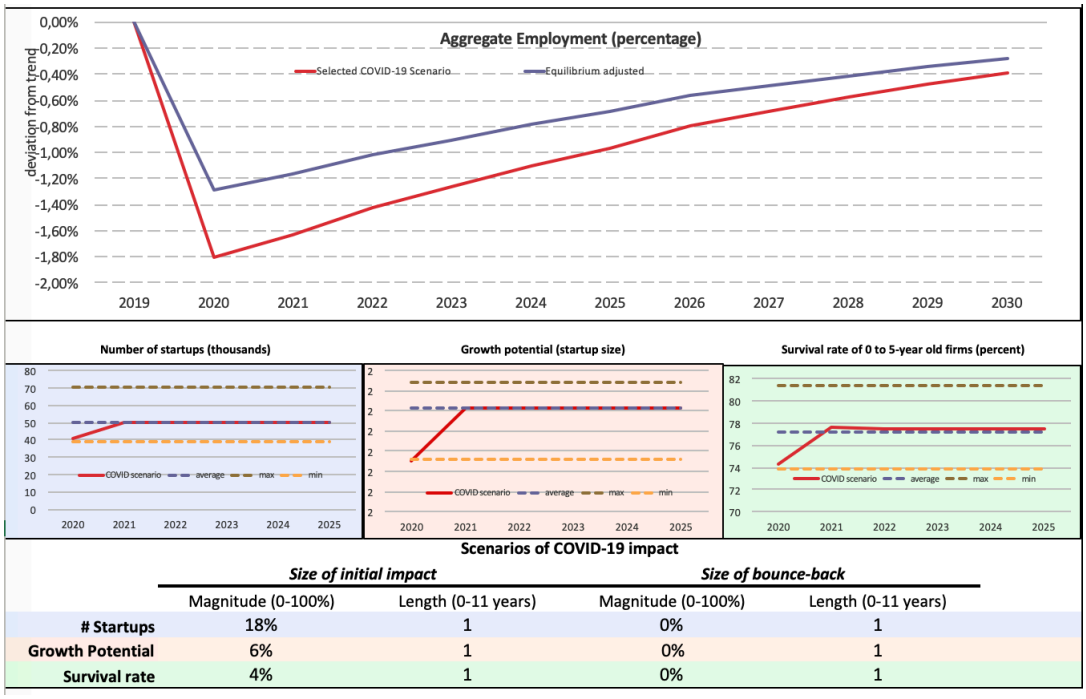


Figure 16. Scenario analysis for employment and the three margins of start-up activity - Hungary

Source: EU start-up calculator, Hungary, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of the one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

The decline in the number of start-ups accounts for almost half of the effects. The number survival rate accounts for about 40% and the growth potential for roughly 15% each. These findings provide an important input for the policy discussion. The three different margins can be influenced by targeted policies. Potential employment benefits of policies targeted towards incentivizing the entrants of new enterprises and to support their survival suggest to be highest. However, the cost of different policy options needs to be taken into account.

Moreover, we consider how sectors may be affected differently. Table X shows that, compared to manufacturing and overall industry, firms in the service sector are more dynamic: This sector has much higher start-up and exit rate, and a much higher employment share of start-ups and other young firms (Table X).

Figure 17 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins assumed is actually somewhat smaller than in manufacturing and industry. This result is driven by the fact that the service sector has a high business dynamism and therefore reliant on start-ups and young firms to provide employment. Hence, a disruption to start-ups and other young firms affects the service sector relatively strongly causing a loss of aggregate employment of more than 223,000 jobs (Table XII). The decline in the number of start-ups accounts for almost half of the employment loss, while the decline in the survival rate for almost 40%. This is indicative that policy targeted to incentivize firm entry and reduce exit could have a significant effect in mitigating the impact that the COVID-19 pandemic will have on aggregate employment, especially in the service sector.

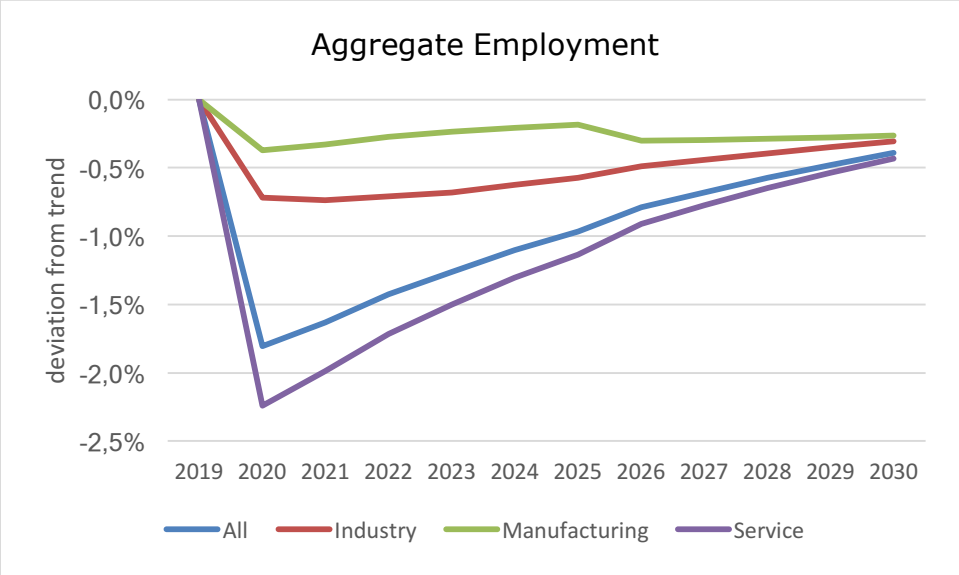


Figure 17. Sectors employment (not equilibrium adjusted) - Hungary

Source: JRC, EU start-up calculator, Hungary, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

Table XII. Share of aggregate employment loss accounted for by the margins - Hungary

	All	Industry	Manufacturing	Services
Cumulative employment loss	309 k	47 k	22 k	223 k
# Start-ups	47%	48%	38%	47%
Growth potential	15%	20%	36%	15%
Survival rate	39%	35%	31%	39%

Source: JRC, EU start-up calculator, Hungary, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021, which could be stimulated by policies supporting entrants and the creation of new business ideas that could lead to radical innovations. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 18 where, after the initial negative shock, the number of start-ups is increased in 2021 to a level corresponding to the 2020 drop level registered in the time series. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes a sharp improvement of the employment trend and a lower cumulative job loss totalling to about 171,000. Despite the better outlook aggregate employment still does not reach its pre COVID-19 level by 2030.

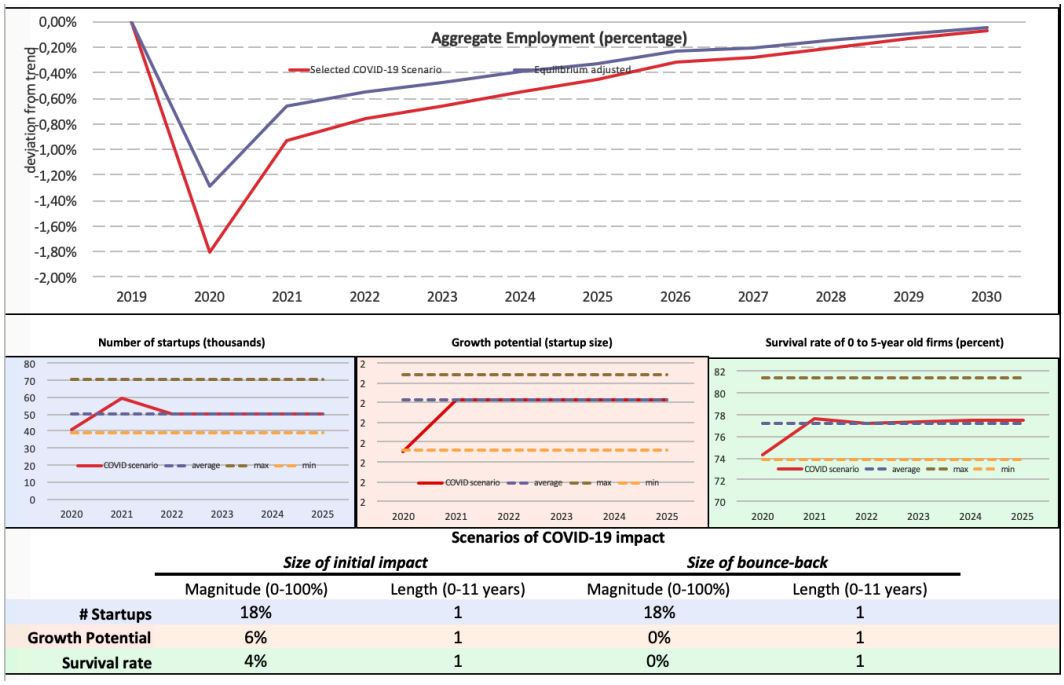


Figure 18. Bounce-back scenario in the number of firms, results for aggregate employment - Hungary

Source: EU start-up calculator, Hungary, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and last one year. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

4.5 EU start-up calculator: Italy

4.5.1 Summary

- The COVID-19 crisis is likely to heavily affect young firms, leading to a decline in the start-up rate, a higher exit of young firms, and lower growth of start-ups.
- According to the EU Start-up Calculator, these developments are likely to create substantial aggregate employment losses, of up to 1.4% in 2020 and 1.5% as deviation from the employment trend. The cumulative employment loss for the period 2020-2030 could be up to 1186,000.
- Effects are very persistent: full recovery may take more than a decade; by 2027, aggregate employment is still more than 0.5% below the level it would have attained without the disruption of start-up activity.
- The decline in the number of start-ups accounts for about 28% of the employment loss, the decline in the survival rate for almost 43% and the decline of the growth potential of start-ups for about 33%. A holistic approach to policies targeted to reduce exit of young firms and incentivise entry and productivity of new firms would seem to be the most effective in Italy. The outlook is significantly improved if in 2021 there is a rapid increase in the number of firms entering the economy, i.e. the cumulative aggregate employment loss is reduced to 729,000.
- The Italian service sector may be affected particularly strongly, as young firms are particularly important job creators in this sector.

4.5.2 Business dynamism in Italy

Before presenting the scenario analysis, we consider a number of statistics on the dynamism of Italian firms, see Table XIII. The statistics show that, when it comes to firms' entry and exit, the Italian economy is in line with the EU average, and relies heavily on start-ups for job creation. Over the sample, more than 10 % of firms exit within a given year, whereas the start-up rate is about 9.3%. Start-ups (firms of age zero) account for about 2.5% of aggregate employment considerably contributing to the average annual employment growth rate of about 1%. Firms up to age 5 together account for 16.7% of aggregate employment.

Table XIII. Descriptive statistics on the economy and sector dynamics of young firms - Italy

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	9.3%	5.9%	5.8%	9.9%
survival rate	92%	90%	92%	92%	91%
share of young firms	36%	36.6%	26.4%	26.4%	38%
employment share of start-ups	2.5%	2.5%	1.1%	1.2%	2.9%
employment share of young firms	12%	16.7%	8.6%	8.8%	19.4%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

The importance of start-ups and young firms is particularly evident in the service sector where young firms account for about 38% of the total number of active firms and for more than 19% of total employment (Figure XIII).[28] Hence, it has to be expected that this sector will be most strongly hit by a disruption of start-up activities also when shocks across sectors are symmetric.

The COVID-19 pandemic has hit hard the start-ups in Italy. Since the beginning of the pandemic there are about 20,000 less new businesses created with respect to the same period in 2019. Based on data computed from Formai at al. (2020) about 7.7% less businesses were created in January, 4.6% less in February, 37.1% less in March, 75.8% less in April, and 39.2% less in May, in each case compared to the corresponding month of 2019.[29] Figure 19 shows the weekly registration of new businesses in 2019 and 2020.[30] The difference between the two years can be interpreted as the missing start-ups due to the COVID-19 pandemic and consequent containment and lockdown measures adopted in Italy. Not surprisingly, the trend in the number of new businesses starts to decline as the first containment measures were adopted in Northern Italy and drops as the lockdown was imposed. These statistics show an important and persistent disruption of start-up activity due to the COVID-19 pandemic which can have important repercussions for aggregate employment, especially if the number of start-ups does not recover quickly.

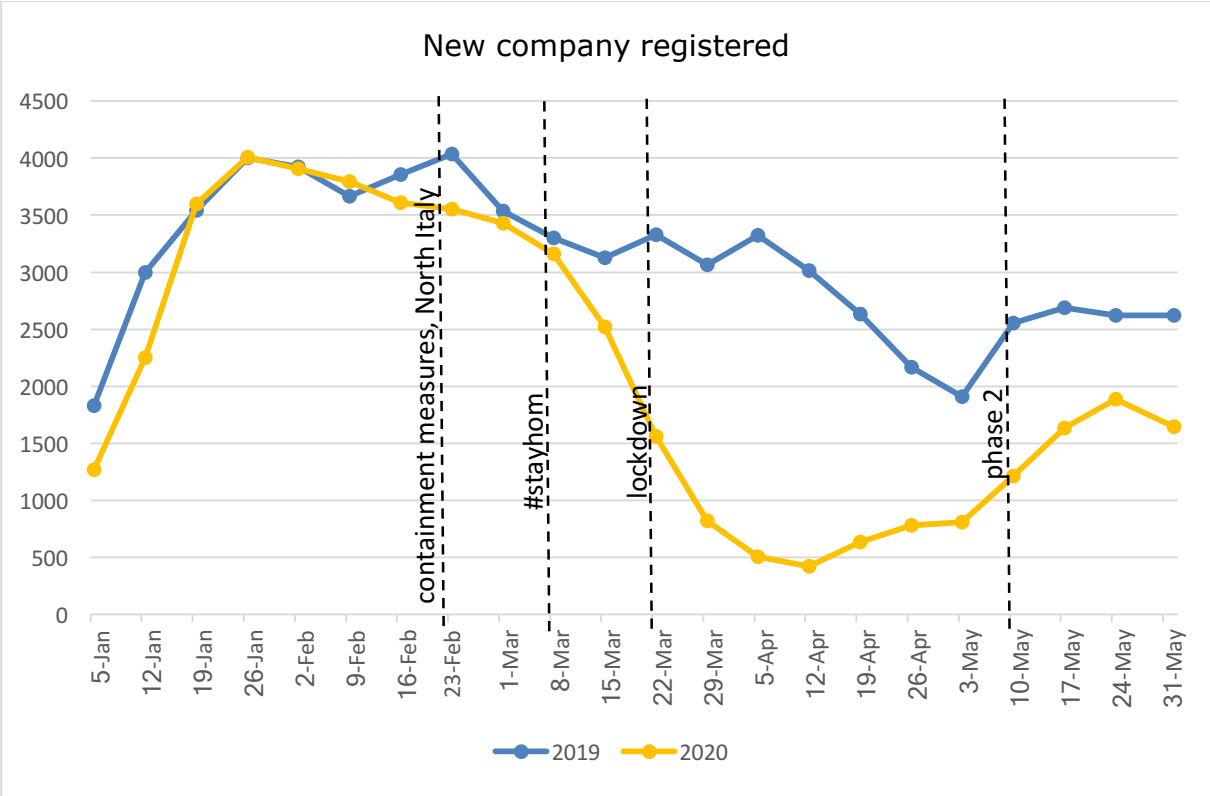


Figure 19. Weekly registration of new businesses in 2019 (blue) and 2020 (yellow) - Italy

Source: JRC reproduction of Fornari et al., 2020.

[28] Table XIII also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

[29] The data can be computed from the article by Formari S., F. Lotti, F. Manaresi and F. Scoccianti (2020), "Cosi il COVID ha contagiato l'imprenditorialità" published on lavoce.info and available at https://www.lavoce.info/archives/68205/cosi-il-coronavirus-ha-contagiato-limprenditorialita/ .

[30] Source Formari et al. (2020).

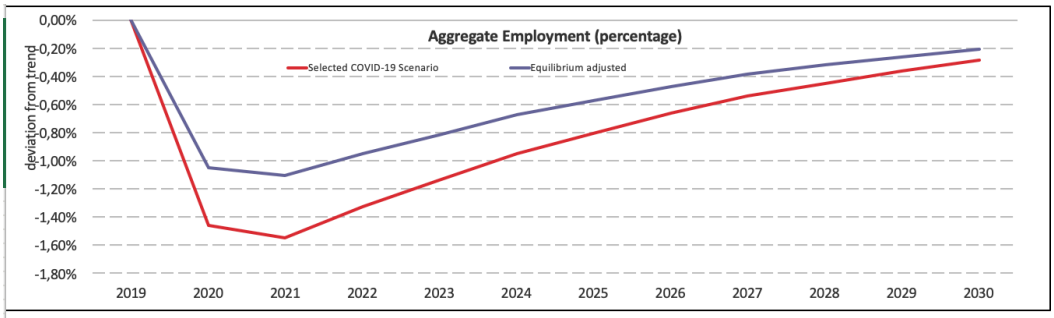
4.5.3 Scenario analysis

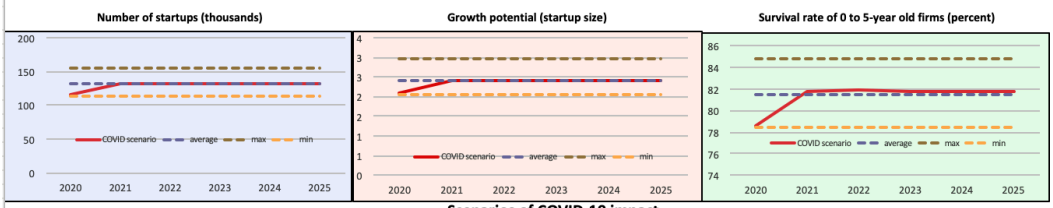
As for the previous countries analysed, we consider a deterioration of the three margins described above. Specifically, we assume that the number of start-ups, the survival rate, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), see Table XIV.[31] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. The scenario is the one of a strong but short-lived crisis expecting that once the containment measures are lifted, the economic activity of start-ups and young firms will resume.

Table XIV. Scenario assumptions - Italy

	All	Industry	Manufacturing	Services
# Start-ups	-11%	-11%	-11%	-11%
Growth potential	-13%	-10%	-10%	-13%
Survival rate	-4%	-3%	-3%	-4%

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.





Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	11%	1	0%	1
Growth Potential	13%	1	0%	1
Survival rate	4%	1	0%	1

Figure 20. Scenario analysis for employment and the three margins of start-up activity - Italy

Source: EU start-up calculator, Italy, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

[31] Note that in Table XIII Industry, Manufacturing and Serving sector are set to their sample minima which happens to be the same for the number of start-ups. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.

Figure 20 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by just over 1.4%. The negative trend persists during 2021 during which the reduction in aggregate employment exceed 1.5%. The recovery is very slow: by 2027, aggregate employment is still more than 0.5% below the level it would have attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 1186,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 847,000. The decline in the survival rate accounts for about 43% of the effects. The number of start-ups accounts for about 28% and the growth potential for roughly 33% each. These findings provide an important input for the policy discussion pointing to the need of a holistic policy approach. The three different margins can be influenced by a mix of targeted policies. While, potential employment benefits of policies targeted towards firm survival suggest to be highest, promoting firm entry and the growth potential of entrants plays an essential role. However, the cost of different policy options needs to be taken into account.

Moreover, we consider how sectors may be affected differently. Table XIII shows that, compared to manufacturing and overall industry, firms in the service sector are relatively dynamic. This sector has much higher start-up rate, and a much higher employment share of start-ups and other young firms.

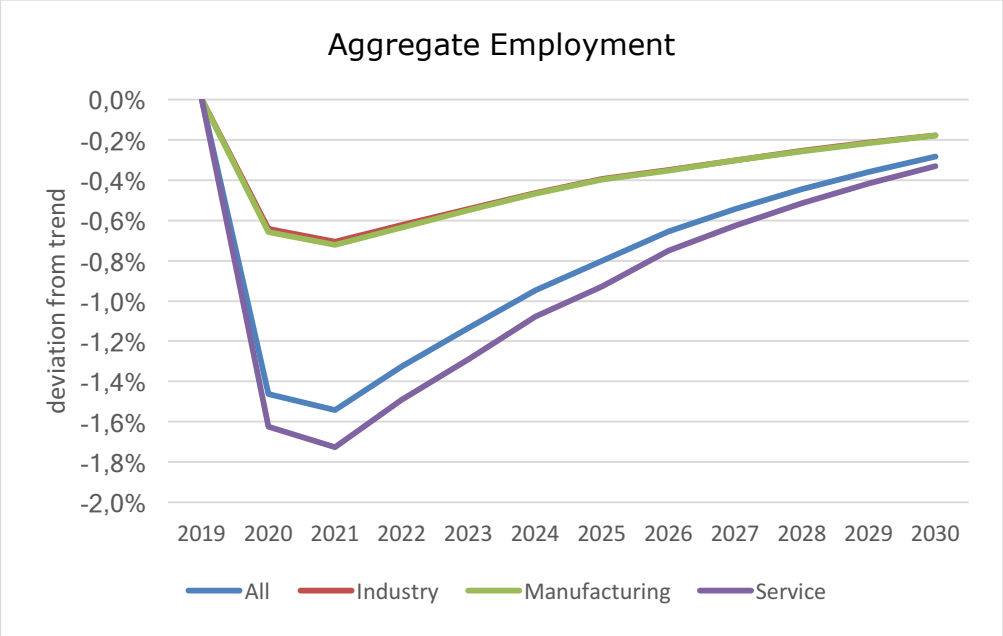


Figure 21. Sectors employment (not equilibrium adjusted) -Italy

Source: JRC, EU start-up calculator, Italy, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

Table XV. Share of aggregate employment loss accounted for by the margins Italy

	All	Industry	Manufacturing	Services
Cumulative employment loss	1186 k	173 k	161 k	837 k
# Start-ups	28%	31%	32%	28%
Growth potential	33%	29%	30%	33%
Survival rate	43%	41%	41%	42%

Source: JRC, EU start-up calculator, Italy, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Figure 21 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins assumed is actually somewhat similar to the one in manufacturing and industry. This result is driven by the fact that the service sector is relatively dynamic (in terms of turnover rate) and therefore reliant on young firms to provide employment. Hence, a disruption to start-ups and other young firms affects the service sector relatively strongly. Finally, in all the three sectors the decline in the survival rate accounts for more than 40% of the effect. The decline of the number of start-ups seems to be somewhat stronger in the industry and manufacturing, while the decline in the growth potential seems slightly stronger in the service sector. These considerations summarized in Table XV can be of relevance for the policy discussion.

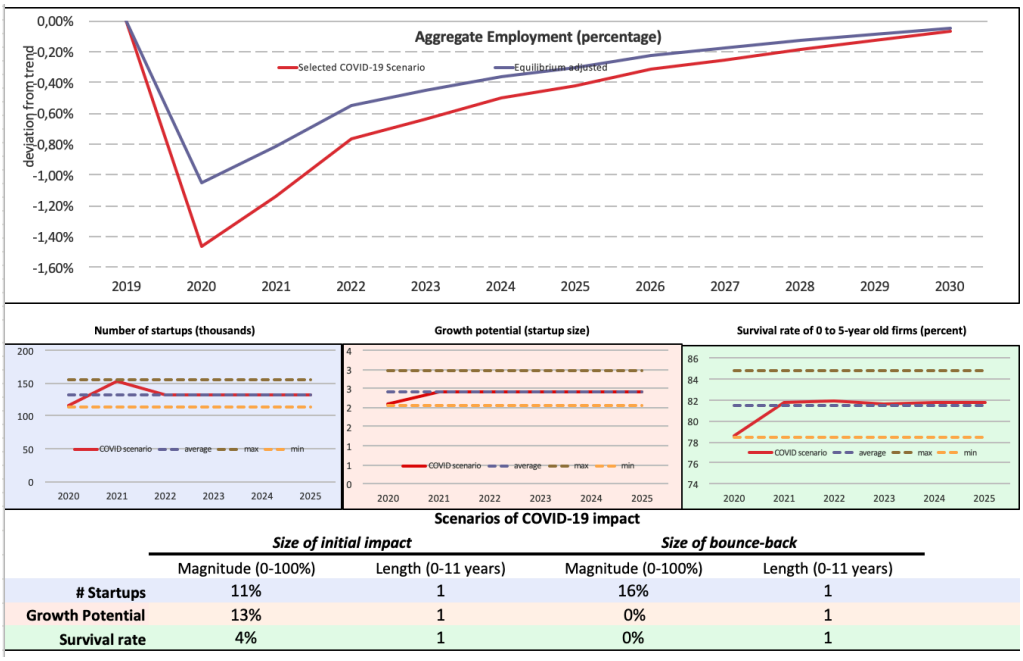


Figure 22. Bounce-back scenario in the number of firms, results for aggregate employment - Italy

Source: EU start-up calculator, Italy, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and last one year. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021. Following the discussion above, policies aimed at facilitating the entry of new firms in the market can be quite effective. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 22 where, after the initial negative shock, the number of start-ups is increased in 2021 to the maximum level registered in the time series. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes a significant improvement of the employment trend and a lower cumulative job loss totalling to about 729,000. Despite the better outlook the recovery is still sluggish and aggregate employment still does not reach its pre COVID-19 level by 2030.

4.6 EU start-up calculator: Spain

4.6.1 Summary

- The COVID-19 crisis is likely to heavily affect young firms, leading to a decline in the start-up rate, a higher exit of young firms, and lower growth of start-ups.
- According to the EU start-up calculator, these developments are likely to create substantial aggregate employment losses, of up to 1.5% deviation from the employment trend in 2020. The cumulative employment loss for the period 2020-2030 could be up to 844,000.
- Effects are very persistent: full recovery may take more than a decade, even if start-up activity recovers to its pre-crisis level in one year. By 2027, aggregate employment is still more than 0.5% below the level it would have attained without the disruption of start-up activity
- The decline in the survival rate accounts for almost half of the employment loss, while the decline in the number of start-ups for about 30%. Policies targeted to reduce exit of young firms and incentivise entry would seem to be the most effective in Spain. The outlook is significantly improved if in 2021 there is a rapid increase in the number of firms entering the economy, i.e. the cumulative aggregate employment loss is reduced to 575,000.
- The Spanish service sector may be affected particularly strongly, as young firms are particularly important job creators in this sector.

4.6.2 Business dynamism in Spain

Before presenting the scenario analysis, we consider a number of statistics on the dynamism of Spanish firms, see Table XVI. The statistics show that, when it comes to firm entry and exit, the Spanish economy is a dynamic one, relying heavily on start-ups for job creation. Over the sample, more than 11% of firms exit within a given year, whereas the start-up rate is about 10%. This results in a higher churn rate than the EU average, which shows an entry rate of 9.2% and a exit rate of 8%. Start-ups (firms of age zero) account for about 3.5% of aggregate employment whereas firms up to age 5 together account for almost 16% implying a higher contribution from young firms as job creators in Spain relative to the EU average. [32]

[32] Table XVI also indicates that industry and manufacturing are very similar to each other as the latter is a large component of the former.

Table XVI. Descriptive statistics on the economy and sector dynamics of young firms - Spain

	EU 27 All	All	Industry	Manufacturing	Services
start-up rate	9.2%	10%	5%	5%	11%
survival rate	92%	88%	92%	92%	89%
share of young firms	36%	37%	24%	27%	39%
employment share of start-ups	2.5%	3.5%	1.2%	1.3%	3.9%
employment share of young firms	12%	16%	7%	7%	17%

Source: JRC, Eurostat, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Moreover, recent data from the Spanish National Statistical Institute shows an increasing contraction in the number of new businesses created since the beginning of the year with respect to the same period in 2019. While the negative trend is present since the beginning of the year, it has sharply deteriorated since the start of the COVID-19 pandemic and the ensuing hibernation of most of the economic activities. In particular, 28.3% less businesses were created in March, (when the COVID-19 pandemic started), 73.4% less in April (when strict lockdown measures have been implemented), 55.9% less in May and 9.4% less in June, in each case compared to the corresponding month of 2019 (see Figure 23).[33] These statistics show an important and persistent disruption of start-up activity due to the COVID-19 pandemic which can have important repercussions for aggregate employment, especially if the number of start-ups does not recover quickly as Figure 23 seems to suggest.

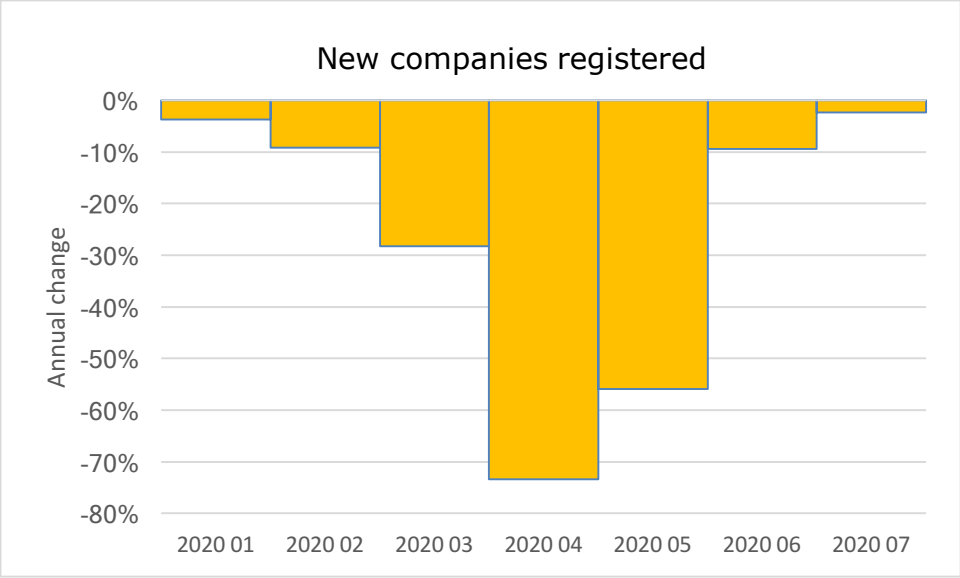


Figure 23. Annual change in the number of new companies registered (percentage) - Spain

[33] The data from the Spanish National Statistical Institute (Instituto Nacional de Estadistica) are available at the following website: https://www.ine.es/en/index.htm .

Source: JRC, data from Spanish National Statistical Institute, 2020.

4.6.3 Scenario analysis

We consider a deterioration of the three margins described above. Specifically, we assume that the number of start-ups, the survival rate, and the growth potential all fall from the sample *averages* to the sample *minima* (which were reached in the years following the financial crisis of 2008), see Table XVII.[34] Moreover, we assume that this decline lasts for one year only. From 2021 onwards, the three margins are assumed to be back at their sample averages. The scenario is the one of a strong but short-lived crisis expecting that once the containment measures are lifted, the economic activity of start-ups and young firms will resume (in line with the latest forecasts at the aggregate level which predict a "V-shaped" type of recovery).

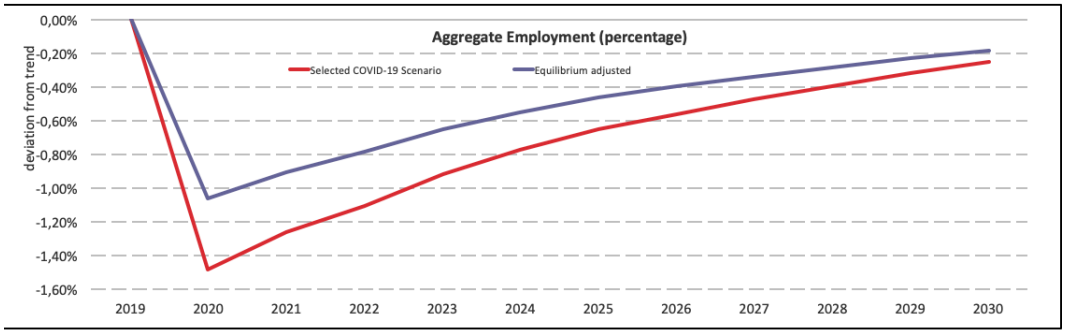
Table XVII. Scenario assumptions - Spain

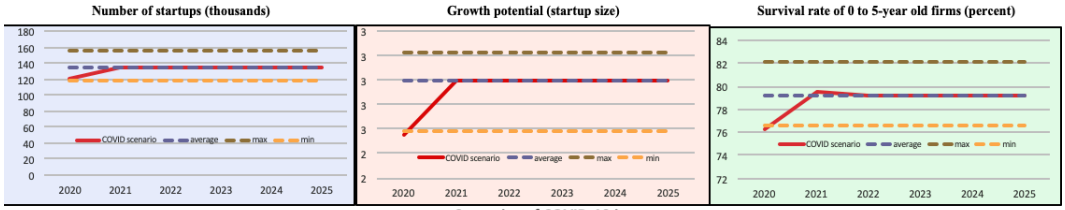
	All	Industry	Manufacturing	Services
# Start-ups	-11%	-14%	-14%	-14%
Growth potential	-8%	-10%	-10%	-7%
Survival rate	-4%	-3%	-4%	-3%

Note(1): The sector aggregate reflects the classifications available in Eurostat, i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Figure 24 shows the scenario assumptions on the three margins, as well as the implications for aggregate employment produced by the calculator. For 2020, the calculator shows that the three margins together reduce aggregate employment by just over 1.5%. The recovery is very slow: by 2027, aggregate employment is still more than 0.5% below the level it would have attained without the disruption of start-up activity. The employment loss, cumulated up to 2030 is 844,000. Accounting for equilibrium adjustments, aggregate effects are dampened by 29%, leaving a cumulative employment loss of about 603,000. The decline in the survival rate accounts for about half of the effects. The number of start-ups accounts for about 30% and the growth potential for roughly 22% each. These findings provide an important input for the policy discussion. The three different margins can be influenced by targeted policies. Potential employment benefits of policies targeted towards firm survival suggest to be highest. However, the cost of different policy options needs to be taken into account.

[34] Note that in Table XVII Industry, Manufacturing and Serving sector are set to their sample minima which happens to be the same for the number of start-ups. However, the COVID-19 crisis seems to have impacted particularly strongly the service sector imposing strict lockdown measures to sectors such as transport, tourism, and hospitality. Alternative scenarios that take into account this asymmetry can easily be computed as soon as sectoral data become available.





Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	11%	1	0%	1
Growth Potential	8%	1	0%	1
Survival rate	4%	1	0%	1

Figure 24. Scenario analysis for employment and the three margins of start-up activity - Spain

Source: EU start-up calculator, Spain, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

Moreover, we consider how sectors may be affected differently. Table XVI shows that, compared to manufacturing and overall industry, firms in the service sector are relatively dynamic. This sector has much higher start-up and exit rate, and a much higher employment share of start-ups and other young firms.

Figure 25 shows the results of the calculator for the three industries. The service sector shows a much larger employment loss, even though the decline in the three margins assumed is actually somewhat smaller than in manufacturing and industry. This result is driven by the fact that the service sector is relatively dynamic and therefore reliant on young firms to provide employment. Hence, a disruption to start-ups and other young firms affects the service sector relatively strongly causing a loss of aggregate employment of more than 600,000 jobs (Table XVIII). Both the decline in the survival rate and in the number of start-ups account for more than 40% of the employment loss. This is indicative that policy targeted to incentivize firm entry and reduce exit could have a significant effect in mitigating the impact that the COVID-19 pandemic will have on aggregate employment.

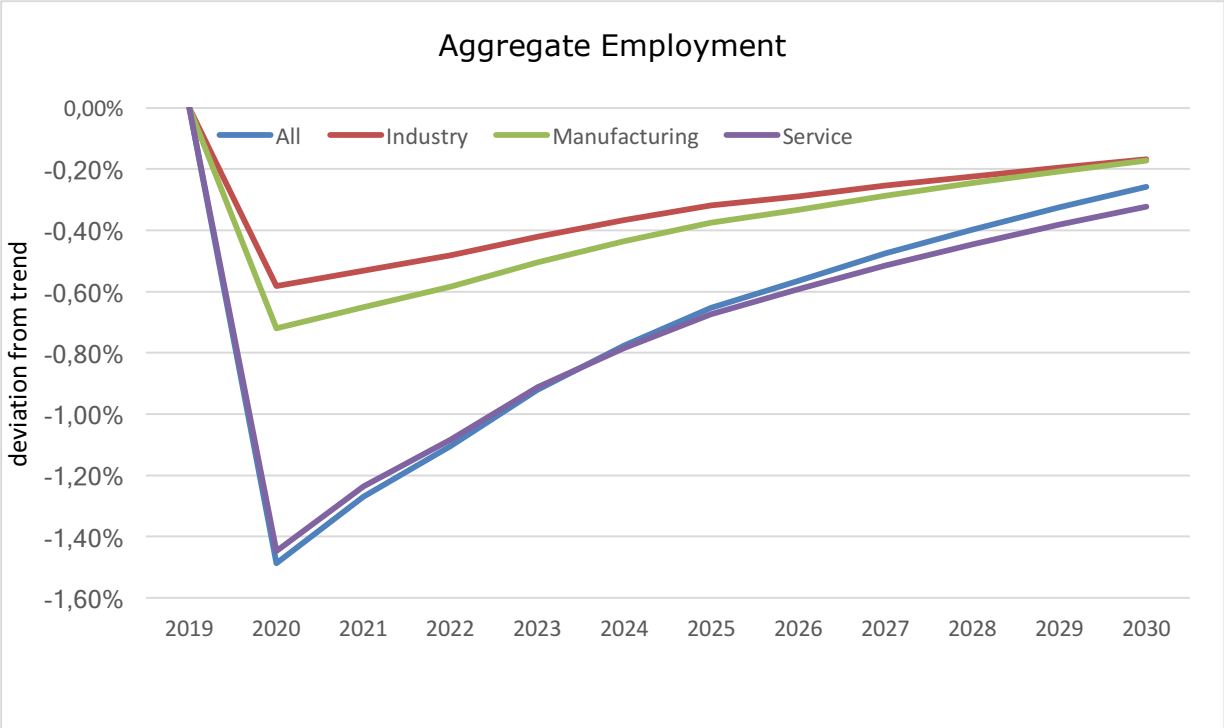


Figure 25. Sectors employment (not equilibrium adjusted) - Spain

Source: JRC, EU start-up calculator, Spain, 2020.

Note(1): The sector aggregate reflects the classifications available in Eurostat - i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

Note(2): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* in the respective sectors and of one year duration. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The employment path does not take into account general equilibrium effects.

Table XVIII. Share of aggregate employment loss accounted for by the three margins - Spain

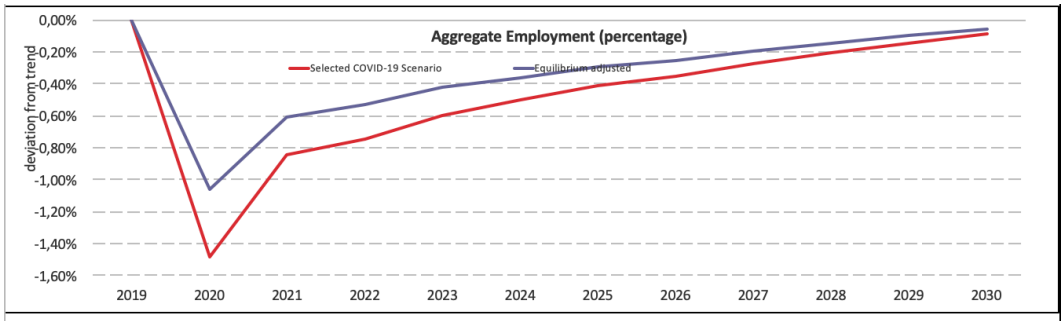
	All	Industry	Manufacturing	Services
Cumulative employment loss	844 k	78 k	82 k	612 k
# Start-ups	30%	38%	34%	43%
Growth potential	22%	27%	24%	21%
Survival rate	48%	39%	46%	45%

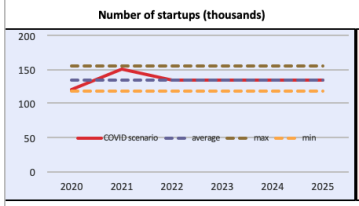
Source: JRC, EU start-up calculator, Spain, 2020.

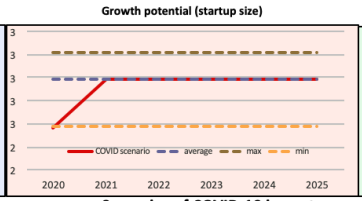
Note(1): The sector aggregate reflects the classifications available in Eurostat – i.e. all business economy except the activities of holding companies, the industrial sector except construction, and the service sector of the business economy except activities of holding companies.

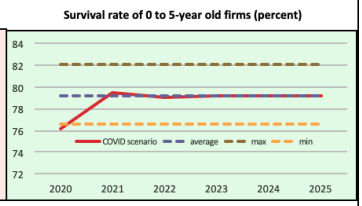
The subdued firm entry in 2020 due to the COVID-19 crisis may be the result of a pent-up with more firm entry in 2021, especially when targeted policies to promote firm entry are put in place. The optimistic outlook for a bounce-back in the number of start-ups is simulated in Figure 26 where, after the initial negative shock, the number of start-ups is

increased in 2021 to the maximum level registered in the time series. After an initial sharp decline in aggregate employment, the increased number of start-ups entering in 2021 causes an improvement of the employment trend and a lower cumulative job loss totalling to about 575,000. Despite the better outlook aggregate employment still does not reach its pre COVID-19 level by 2030.









Scenarios of COVID-19 impact

	Size of initial impact		*Size of bounce-back*	
	Magnitude (0-100%)	Length (0-11 years)	Magnitude (0-100%)	Length (0-11 years)
# Startups	11%	1	12%	1
Growth Potential	8%	1	0%	1
Survival rate	4%	1	0%	1

Figure 26. Bounce-back scenario in the number of firms, results for aggregate employment - Spain

Source: EU start-up calculator, Spain, 2020.

Note(1): The simulation on aggregate employment considers a shock on the three margins equal to their sample *minima* and of one year duration. The bounce-back in the number of start-ups is assumed to take place in 2021, to be equal to the sample *maxima* and last one year. Firms older than 15 are unaffected by the three margins and their time-path does not quantitatively affect the analysis. The blue line represents the impact on aggregate employment taking into account general equilibrium effects.

5 Conclusions

The COVID-19 crisis is likely to heavily affect start-ups and young firms and ultimately affect aggregate employment. To understand the impact, we developed the EU start-up calculator. This is an empirical tool which allows to assess the medium-term impact that the COVID-19 pandemic has on aggregate employment via the destruction of start-up activities varying three margins: (i) the number of start-ups, (ii) the growth potential and (iii) the survival rate. Different scenarios have been analysed for the business economy, the industry, manufacturing and service sector of Austria, Belgium, Germany, Hungary, Italy and Spain.

A strong but short lived-crisis may result in important and persist job losses in all the countries that range between 0.7 (Belgium) to 2.2% (Austria) in 2020 and adds to a cumulative employment loss for the period 2020-2030 that ranges between 82,000 (Belgium) to 1186,000 (Italy). These losses seem to be particularly high in countries and sectors characterized by a high firm turnover and that rely on start-ups and young firms for job creation, e.g. Austria, Hungary, Italy and Spain, as well as the service sector rather than the industry and manufacturing sector. As for the margins considered, in most countries the deterioration of the survival rate of young firms seems to play an important role in driving employment, seconded by the number of new entrants. The exceptions are Germany, where each margin accounts for about 40% of the aggregate employment loss, and Hungary, where the decline in the number of start-ups accounts for almost half of the employment loss while the decline in the survival rate accounts for about 40%.

Notwithstanding the significant economic disruption caused by the COVID-19 pandemic, the medium-term effects on aggregate employment may be significantly mitigated by policies aimed at supporting young firms and incentivizing the creation of new ones. This represents a positive factor as this group of firms, i.e. start-ups and young firms, is easily identifiable by policy makers and hence represents an easy target for policy interventions. With this in mind we explored the potential impact that policies may have on aggregate employment. In particular, we simulated bounce-back scenarios where the number of firms entering the economy rapidly increases in 2021. In every country, the outlook is significantly improved, the recovery is faster and the aggregate job loss is lower. Hence, policy makers may have amble margin of manoeuvre to alleviate the crisis with a mix of policies that while being targeted may also be efficient.

Along these lines, the European Union has launched a series of guidelines and instruments, such as InvestEu, the European Innovation Council and, as a result of the COVID-19 pandemic, the Recovery Resilience Facility. One of the goals of these instruments is to support the creation of a vibrant and more resilient entrepreneurial ecosystem with particular attention to promote start-ups and young firms. The interventions include access to liquidity and funding to start-ups and young firms in the forms of grants, equity or zero-interest loans especially targeted to scale-ups, to promising innovators and R&D investments, and to support young enterprises' needs. Also the use of in-kind support, such as training programs, creation of network opportunities with peer-entrepreneurs, customers and suppliers to rebuild the value chain, and the promotion of knowledge transfer from applied research to the entrepreneurial ecosystem are considered as priorities. Focus is also put on the creation of new opportunities via the promotion of digitalization and of the green transition. Finally, there is the indication to reduce and simplify the red-tape costs upon entry and the general administrative burden that firms face. If policy makers will be able to design and target these instruments to promote start-ups and young firms, then the recovery from the COVID-19 disruption will be considerably faster and the outlook much more positive. We postpone to further research the assessment on how these interventions may affect the three margins that govern the scenario creation of the start-up calculator and ultimately the impact that they will have on aggregate employment.

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Appendix

Appendix I. Interpolation, extrapolation and creation of scenarios

In Eurostat for firms of age $a = \{0,1,2,3,4,5\}$ in year $t \in [2008\text{-}2017]$ is directly observable the number of firms $n_{a,t}$, firm size $s_{a,t}$ and the survival rate $1\text{-}x_{a,t}$. However, firms older than 5 are grouped together in Eurostat. Hence, it is necessary to interpolate information for each of the individual age categories. Two inputs to the calculator are the profiles of average size and the survival rates by age in the baseline scenario (i.e. without shock), for firms up to age 15. For firms up to age 5, we measure directly in the data as averages over the sample period. For older firms, we assume a functional form for both profiles and fit these to the available data. Specifically, for the exit rate we assume the following functional form:

$$x_a = \beta_0 + \beta_1 \left(\frac{\exp \beta_2}{1+\exp \beta_2}\right)^{\alpha-1}.$$

This implies a smooth profile, gradually decaying from an initial point $x_{a=1} = \beta_0 + \beta_1$ to a limit point $x_{a\to\infty} = \beta_0$. The parameter β_2 controls the speed of decay.

Regarding the average size profile we assume a simple linear form:

$$n_a = \gamma_0 + \gamma_1 a.$$

The functional forms for these two profiles capture well patterns documented using data sets for which exit rates can be computed for all age groups (such as the US Longitudinal Business Database, see e.g. Pugsley, Sedláček and Sterk (2017).

To estimate the parameters of these profiles we use a minimum distance estimator, targeting the following outcomes which we can observe in the data: (i) the average exit rate by age, for firms up to age 5, (ii) average size of firms by age, for firms up to age 5, (iii) the average exit rate among all firms, and (iv) average size among all firms. Note that given a profile for the exit rate by age, one can compute the firm age distribution, and then the average exit rate by weighting the exit rates by age with the firm shares in each age bin. Then, given the age distribution and the average size profile by age, one can compute average size across all firms. The estimation is implemented in MatLab.

In order to extrapolate the necessary data between 2017 and 2019, we assume that firm size by age and exit rates by age (up to age 15), and the number of start-ups, all linearly converge to their 2008-2017averages:

$$x_{a,2017+\tau} = x_{a,2017} + \frac{\tau}{2}\left(\bar{x}_a - x_{a,2017}\right),$$

$$s_{a,2017+\tau} = s_{a,2017} + \frac{\tau}{2}\left(\bar{s}_a - s_{a,2017}\right),$$

$$n_{0,2017+\tau} = n_{0,2017} + \frac{\tau}{2}\left(\bar{n}_0 - n_{0,2017}\right).$$

for τ = 1, 2 and a = 1, 2,…, 15, and where $\bar{x}_a$, $\bar{s}_a$, and $\bar{n}_0$ denote the 2008 to 2017 averages of age specific exit rates, firm sizes and the number of start-ups, respectively. Using the above, we can then recover the number of firms for the ages of 1 to 15 as $n_{a,t} = n_{a-1,t-1}\left(1 - x_{a,t}\right)$, *for* a = 1, 2, …, 15 and t = 2018, 2019.

In order to compute aggregate employment, it is also necessary to assume a particular

time-path for employment of 16+ year old firms. However, because 16+ year old firms are unaffected by our scenarios, the particular time-path is quantitatively unimportant for the results which are reported in deviations from the assumed trend. For this reason, we simply assume that employment in 16+ year old firms stays fixed at its 2017 level.

Having the above information, we are ready to conduct scenarios starting in 2020 and running through to 2030. We consider three types of margins: (i) changes in the number of start-ups, (ii) changes in growth potential and (iii) changes in survival rates. To be concrete, for a given scenario, let us denote the initial percentage decrease in the number of start-ups, the growth potential of start-ups and the survival rate of young firms by $\zeta_j \in (0,1)$ where j = {n, s, x}, respectively. Let us further denote the duration of these effects by $\tau_j > 0$, where j = {n, s, x}, respectively. The given scenarios are then given by:

$$n_{0,2019+t} = n_{0,2019}(1-\zeta_n), \qquad \text{for } t = 1, \dots, \tau_n,$$

$$s_{a,2019+t+a} = s_{a,2019}(1-\zeta_s), \qquad \text{for } t = 1, \dots, \tau_s \text{ and } a = 0, 1, 2, \dots, 15,$$

$$x_{a,2019+t} = x_{a,2019}(1-\zeta_x), \qquad \text{for } t = 1, \dots, \tau_x \text{ and } a = 1, 2, \dots, 15.$$

The calculator can also accommodate bounce-back scenarios. These are always defined as certain values above the 2008-2017 averages of the number of start-ups, average sizes and survival rates of young firms. Recall that all these margins converge precisely to the respective 2008-2017 averages by 2019.

Specifically, let us denote the percentage increase (above the respective long-run average) in the bounce-back scenario related to the number of start-ups, the growth potential of young firms and their survival rates by χ_j , where j = {n, s, x}, respectively. Furthermore, let us denote the length of the bounce-back period by τ_j, where j = {n, s, x}, respectively. The given bounce-back scenarios are then given by

$$n_{0,2019+\tau_n+t} = n_{0,2019}(1-\chi_n), \qquad \text{for } t = 1, \dots, \tau_n,$$

$$s_{a,2019+\tau_s+t+a} = s_{a,2019}(1-\chi_s), \qquad \text{for } t = 1, \dots, \tau_s \text{ and } a = 0, 1, 2, \dots, 15,$$

$$x_{a,2019+\tau_x+t} = x_{a,2019}(1-\chi_x), \qquad \text{for } t = 1, \dots, \tau_x \text{ and } a = 1, 2, \dots, 15.$$

Appendix II. Adjusting for general equilibrium effects

The calculator *per se* is an accounting tool that abstracts from potential general equilibrium effects. To capture the partial reallocation of labour towards surviving firm, the calculator is embedded in a canonical model with firm heterogeneity. In what follow, we briefly describe the model economy and it contribution to the calculator.

In the model, there is a measure *M* of heterogeneous firms.[35] Let the production

[35] Although the model is dynamic, it can be described entirely in static terms, hence we omit time subscripts.

function of firm *i* be given by:

$$y_i = z_i n_i^{\alpha}$$

where y_i is the firm's output, n_i its employment level, z_i is the firm's productivity level, and $\alpha \in (0,1)$ is the elasticity of production with respect to labour input.[36] The wage per employee is taken as given by firms, and denoted by *w*. The firm chooses its level of employment in order to maximize profits, given by $\pi_i(n) = z_i n_i^{\alpha} - w n_i$. This implies

the following familiar solution for labor demand by firm *i*:

$$n_i = (z_i)^{\frac{1}{1-\alpha}} \left(\frac{w}{\alpha}\right)^{\frac{1}{\alpha-1}}$$

Aggregating over all firms, aggregate labor demand is given by:

$$\mathrm{N} = M \left(\frac{w}{\alpha}\right)^{\frac{1}{\alpha-1}} \int z^{\frac{1}{1-\alpha}} dF(z)$$

where $\chi \equiv \int z^{\frac{1}{1-\alpha}} dF(z)$, with F is the CDF of the productivity distribution. Taking logs and differentiating (keeping idiosyncratic productivities constant), we can decompose changes in aggregate labour demand as:

$$d \ln N = \left(d \ln M + d \ln \chi + \frac{1}{\alpha - 1} ln\ w \right) \qquad (1)$$

The first two terms reflect changes in, respectively, the number of firms and their growth potential (productivity), whereas the third term captures equilibrium effects due to wage conditions.[37] Equation (1) can be understood as an aggregate labour demand curve, which is shifted by the number of firms and their growth potential. To close the model, we need to specify how labour supply is determined. We assume there is a representative household with Greenwood-Hercowitz-Huffmann preferences. Specifically, the household's level of utility is given by:

$$\mathrm{U}(C, N) = \left(C - \mu \frac{N^{1+k}}{1+k} \right)^{1-\sigma}$$

where *C* denotes consumption and $\kappa, \mu, \sigma > 0$ are preference parameters. The household chooses *C* and *N* to maximize utility, subject to a budget constraint given by $C = wN + \Pi$, where Π are aggregate firm profits. Utility maximization implies the following labour supply curve: $\mu N^{\kappa} = w$. Taking logs and differentiating gives the labour supply schedule:

$$d \ln N = \frac{1}{\kappa} ln\ w \qquad (2)$$

[36] We abstract from capital for simplicity. Augmenting the model with capital would not change any of our results.

[37] Other sources of equilibrium dampening could derive from endogenous entry and exit, which we abstract from here.

Combining the labour demand and supply schedules, Equations (1) and (2), we can solve for the equilibrium level of aggregate employment:

$$d \ln N = \psi \left(d \ln M + d \ln \chi \right) \quad (3)$$

Equation (3) expresses aggregate employment (in deviation from some baseline trend) as a function of the number of firms and their growth potential. The latter two are outputs from the calculator, while $\psi = \frac{1}{1-k\varepsilon_{nw}} \in (0,1)$ is the equilibrium dampening effect, where $\varepsilon_{nw} = \frac{1}{\alpha-1}$ is the wage elasticity of labour demand and $1/k$ is the Frisch elasticity of labour supply. Based on these two parameters and the output from the calculator, we can thus compute the equilibrium change in aggregate employment from Equation (3). Using elasticities consistent with the literature and with the values adopted by the European Commission QUEST and RHOMOLO models, we set the labour supply elasticity, $1/k$, at 0.25 and the labour demand elasticity, ε_{nw}, at -0.1. These elasticities result in a dampening effect of 29%.

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doi:10.2760/049945

ISBN 978-92-76-21710-7