Strengthening Economic Resilience Following the COVID-19 Crisis

A FIRM AND INDUSTRY PERSPECTIVE

OECD

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Foreword

This publication, *Strengthening Economic Resilience Following the COVID-19 Crisis: A Firm and Industry Perspective*, adds a new and unique contribution to the OECD's extensive body of work on the COVID-19 crisis and resilience. It aims to identify the factors that determine the impact of economic shocks and crises – like the COVID-19 pandemic – on economies, by looking at firm and industry data that illustrate trends beyond the aggregate, economy-wide level.

The work presents several topical chapters to identify areas of vulnerability across countries, industries, firms and workers to better understand what issues might be the most pressing to address for a strong recovery and future resilience. The impacts of the crisis on the business sector are heterogeneous and multidimensional, making it crucial to analyse and understand which factors and channels can mitigate or exacerbate the effects of shocks. This publication looks at industry characteristics, business dynamics, digital transformation, international connectedness and inclusion across groups of workers, to identify possible ways to achieve greater resilience and successfully navigate the world's pressing economic and social issues. This starts with a strong and inclusive recovery, but the report also pays special attention to ways this period can be harnessed to achieve long-term progress towards the green and digital transformations.

Perhaps most importantly, this publication aims to act as a source of evidence and inspiration for policy makers. Building resilience into economies – and coming back stronger from periods of crisis – are attainable goals that can be achieved through the design and implementation of well co-ordinated, evidence-based policy. The analysis and recommendations presented in this publication are intended to aid policy makers in this goal.

The OECD Committee on Industry, Innovation and Entrepreneurship (CIIE) declassified the contents of *Strengthening Economic Resilience Following the COVID-19 Crisis: A Firm and Industry Perspective* as follows, by written procedure: Chapter 1 on 6 July 2021; Chapter 2 and Annexes A to D on 2 July 2021; Chapter 3 on 26 May 2021; Chapter 4 on 21 May 2021; Chapter 5 on 14 June 2021; Chapter 6 on 29 June 2021; and Chapter 7 on 18 May 2021. The OECD Secretariat prepared the report for publication.

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The publication was written and prepared by Nathalie Scholl, Alana Christensen Baker, Chiara Criscuolo and Isabelle Desnoyers-James. The authors are very grateful to Márcio Carvalho, who provided indispensable support throughout the process.

In addition to the above team, specialist authors worked extensively on contributions to the topical chapters of this publication. Its comprehensive scope would not have been possible without the work and analysis of these OECD PIE experts, particularly Leonidas Aristodemou, Sara Calligaris, Flavio Calvino, Antoine Dechezleprêtre, Milenko Fadic, Nicolas Gonne, Joaquim Guilhoto, Alexander Himbert, Peter Horvát, Kohei Kitazawa, Clara Kögel, Guy Lalanne, Francesco Manaresi, Lea Samek, Lynda Sanderson, Mariagrazia Squicciarini, Rudy Verlhac, Colin Webb and Nori Yamano, as well as Peter Gal and Timo Leidecker from the OECD Global Forum on Productivity.

Colleagues across other OECD Directorates and Divisions also generously gave their time to review and guide content, including from the Economics Department; the Directorate for Employment, Labour and Social Affairs; the Trade and Agriculture Directorate; and the Digital Economy Policy Division within STI. Delegates from the CIIE and its Working Party on Industry Analysis (WPIA) also provided valuable feedback to the publication throughout the process, including during Committee and Working Party meetings and through webinars, which we are very grateful for.

All chapters were reviewed by Sarah Box, Dirk Pilat and Andrew Wyckoff of STI, whose direction, inputs, and feedback were invaluable. The publication also owes much to Jennifer Lee, for administrative support through the various stages of the process. Angela Gosmann assisted greatly in the publication stage.

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Acronyms, abbreviations and units of measure

ACEA	*Association des Constructeurs Automobiles Européens* (European Automobile Manufacturers Association)
AI	Artificial intelligence
B-IP	Background intellectual property
BAU	Business-as-usual
BEPS	Base erosion and profit shifting
BIAC	Business at OECD
CCC	Cash conversion cycle
COVID-19	Coronavirus disease 2019
DSL	Digital subscriber line
DSR	Debt service ratio
ECEC	Early childhood education and care
EU	European Union
EUR	Euro
EV	Electric vehicle
FTTB	Fibre-to-the-building
FTTH	Fibre-to-the-home
FTTP	Fibre-to-the-premises
F-IP	Foreground intellectual property
GBP	Great Britain pound
GDP	Gross domestic product
GFC	Global financial crisis
GVC	Global value chain
IATA	International Air Transport Association
ICIO	Inter-Country Input-Output
ICT	Information and communication technology

IEA	International Energy Agency
IP	Intellectual property
IPR	Intellectual property right
ISCED	International Standard Classification of Education
ISIC	International Standard Industrial Classification
IT	Information technology
JRC	Joint research centre
Kbps	Kilobits per second
LP	Labour productivity
Mbps	Megabits per second
MERS	Middle East Respiratory Syndrome
mRNA	Messenger ribonucleic acid
MV	Motor vehicle
NACE	Statistical Classification of Economic Activities in the European Community
NAICS	North American Industry Classification System
NBN	National Broadband Network
NGA	Next-generation access
O*NET	US Occupational Information Network
OEM	Original equipment manufacturer
PIAAC	Programme for International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
R&D	Research and development
SARS	Severe Acute Respiratory Syndrome
SMEs	Small and medium-sized enterprises
SNA	System of National Accounts
SSC	Social security contributions
STEM	Science, technology, engineering and mathematics
STI	Science, technology and innovation
TiVA	Trade in value added
TUAC	Trade Union Advisory Committee to the OECD
UK	United Kingdom
US	United States
USD	United States dollar
VC	Venture capital
VDSL	Very high-speed digital subscriber line

Executive summary

The rapid spread of the COVID-19 pandemic has affected people and economies across the world. The suddenness and magnitude of the shock sent countries into the worst recession since the Second World War. But while the effects of the pandemic are global, they have been far from uniform. Both the severity of the outbreak itself and the related economic impacts have differed in timing and intensity across countries, industries, firms and people.

It is vitally important to identify and decrypt the factors that can make economies more resilient to severe shocks like the one caused by COVID-19. Understanding the characteristics that enable sectors, firms and workers to maintain production and employment can help countries better prepare for future crises. It can also guide policy makers in monitoring impacts as shocks unfold, as well as in developing and targeting inclusive support and recovery strategies.

This report takes a forward-looking, analytical perspective, combining recent evidence from the crisis with long-term structural firm and industry indicators to offer insights into the transmission channels that ultimately determine the resilience of economies. As well as analysing the supply restrictions characterising the lockdowns that marked the COVID-19 pandemic, it takes a forward-looking perspective on the impacts of the recession and the societal changes catalysed by the crisis.

The impacts of crises differ markedly between countries, industries, types of firms and groups of workers. Characteristics of each can amplify – or mitigate – the effects of crises. The analysis shows that industry characteristics can leave some sectors of activity more vulnerable – or more resilient – to crises such as the COVID-19 pandemic. Much of the initial heterogeneity in the pandemic's impact can be attributed to whether or not sectors were considered essential by governments, and therefore allowed to operate through lockdowns. For non-essential industries, specific features at this level play a large role. The ability to telework and the digitally enabled delivery of goods and services were key factors for resilience and continued productivity. Beyond the immediate crisis period, interlinkages between industries and countries, the sources of demand for the final products (e.g. consumers, government spending, private investment) and financial constraints faced by firms will play a key role in shaping the impact on production and demand.

At the firm level, the crisis risks having long-lasting effects on business dynamics and exacerbating the pre-existing divides between firms – especially gaps between large and small firms. Both the entry of new firms and the exit of existing ones slowed considerably during the initial stages of the pandemic – reflecting high uncertainty, a temporary halt to business activity in many areas, and measures put in place to temporarily prevent insolvencies. That said, there is optimism in the recovery period for productive resource reallocation to new and innovative start-ups, as firm entry rebounded in several countries. Policies for the post-COVID-19 era must seek to reinforce business dynamism while embracing possible long-term changes in consumer preferences and demand. Although supporting viable firms is important, enabling the exit of unviable businesses is crucial to allow a redirection of resources to new firms. To help drive the recovery, young firms in particular merit ongoing support given their critical role for innovation, new employment and productivity growth, and ensuring competition. Policy should also address difficulties firms will likely face in accessing finance for longer-term, productivity-enhancing investments, which are important for productivity and economic growth.

As the virus spread globally via the movement of people, the COVID-19 pandemic demonstrated the interconnectedness of countries and industries. Restrictions in mobility and economic activity reignited a longstanding debate about the risks associated with internationally fragmented production. Even though small and open economies are most exposed to these disruptions, more connections can also imply higher resilience. For example, disruptions to domestic production can be mitigated by relying on imports, and demand surges can be met through global value chains. Instead of reshoring, strengthening international co-operation and diversifying suppliers can be efficient risk mitigation strategies.

Workers have experienced the crisis differently, depending on their gender and also their skills, with potentially adverse effects on inclusiveness and labour market inequality. Women have been less exposed to job loss during the crisis, due to making up the majority of the workforce in primarily essential – but also "teleworkable" – industries. However, mothers were often hit hardest by lockdowns due to increased childcare obligations, forcing some women to drop out of the labour force, or to reduce working hours. The ability to telework also critically hinges on having the skills to do so, and women possess lower average digital skills than men. The pandemic demonstrated the urgent need to close digital skills gaps, not only by gender, but also for disadvantaged age and education groups.

Digital upskilling is also crucial from a longer-term perspective: one of the main insights from the pandemic has been the key role of digital technologies for resilience. The digital transformation has accelerated through the crisis, with these skills having become indispensable for many aspects of life, including work, social contact and well-being. If accompanied by the right policies, digital technologies can increase productivity, create new business opportunities and help reduce carbon emissions over the long term. Telework has a large transformative potential and can increase worker well-being and productivity. However, the ability to use digital technologies depends on many supporting factors, including firms' ability to finance investments, access to communications infrastructure, and knowledge and skills.

As countries recover from COVID-19, it is vitally important not to lose sight of other grand challenges the world is facing. The recovery period is not only a time to build back stronger with more resilient systems; its power can also be harnessed – through strategic policy and strengthened international co-operation – to address challenges such as inequality and the green and digital transformations. Governments and firms should take advantage of this rare opportunity to rebuild in a way that helps to achieve these urgent global goals.

1 Economic resilience during crisis: Opportunities and challenges from COVID-19

The impacts of the COVID-19 pandemic have been far from uniform across individuals, firms, industries and countries. Understanding the factors that have underpinned greater resilience is essential for building back stronger in the recovery period and for weathering future crises. This chapter provides an overview of the report and its lessons on economic resilience for workers, firms and industries. It highlights the importance of drawing on multiple angles to assess the effects of the economic shock, by examining shifting business dynamics, the rise of digital technologies, international firm connectedness, and the disproportionate impact of the crisis across different types of workers. Following an overview of the main policy recommendations, this chapter concludes by providing a look ahead at how countries can harness the transformative potential of the recovery phase – with a focus on the digital and green transformations.

Introduction

The COVID-19 crisis has had a previously unfathomable impact on every country, public and private organisation, and person in the world. Nearly two years after the emergence of the virus, its broad and all-encompassing effects can still be felt globally, even as vaccine coverage expands and the pandemic itself begins to dissipate in many OECD countries. The economic shock caused by the crisis was unlike any other the world has experienced in modern times, presenting unprecedented challenges to people, businesses and governments. This was not only due to its intensity, but also because of the nature of the required containment responses to the virus, which involved social distancing and restrictions on mobility, and consequently rendered certain types of economic activity impossible.

Though times have been difficult, important lessons have been learned about the resilience of economies and firms in periods of crisis. It is critical to harness these insights for designing policies that not only support recovery, but also enable economies to better weather future crises. The ultimate aim of this publication is to boost the evidence base that can help governments and businesses build back stronger in the recovery period, to increase resilience for the future. Through an industry and firm perspective, the analysis focuses on business dynamics, productivity, innovation and digital technology, global connectedness, and worker skills and inclusiveness. The work complements the extensive OECD analysis undertaken since the start of the COVID-19 crisis, by providing insights not only on the crisis itself, but on policy for strengthening resilience for potential future shocks as well.[1] This report provides a comprehensive overview of the channels and factors through which countries, firms and people were impacted by – and reacted to – the crisis, focusing on topics related to the business sector.

This introductory chapter provides an overview of the book content for policy makers. It first provides a summary of the publication's key messages, outlining the main factors underlying the impact of the crisis on economic outcomes at the worker, firm, industry, and country level. Because, like the world itself, the topics of this publication are interconnected and highly dependent on one another, the brief summary in this section cuts across different policy areas, highlighting the key messages emerging from the different topics covered in this publication. This chapter then provides policy recommendations and proposed support measures related to the topical chapters of this report (Chapters 4 to 7). It closes with a forward-looking section on harnessing the potential of the COVID-19 recovery phase, to meet future challenges.

Roadmap for this publication

Following this chapter, this report continues by outlining the context of the crisis, in Chapter 2. The chapter highlights the containment responses to limit the spread of the virus and the support measures implemented to mitigate the economic consequences that resulted from the restrictions on activity and mobility. It focuses on areas most relevant for the impact of the crisis across the dimensions analysed in the topical chapters that follow.

The subsequent components of this publication look at the ability of economies to weather the COVID-19 crisis. They investigate key themes and characteristics that relate to the ability of firms, workers and consumers to maintain production, employment and consumption during and after the pandemic. The analysis combines data from different sources and different time frames to provide a broad perspective on the topics (see Box 1.1 for a discussion on data).

They offer insights from three main analytical approaches:

- An overview of *industry* characteristics, identifying the different channels through which the crisis might affect firms and workers differently.
- Identification of *country* or *firm* characteristics that mediate these channels, and may mitigate or amplify the impacts of this and future crises. This analysis can inform longer-term policies and investment decisions, to enable a strong economic recovery and build resilience in the face of future shocks.

- An exploration of systematic differences in the impacts the pandemic is likely to have across *workers* and *population subgroups,* to help guide policies that avoid exacerbating social disparity and ensure an inclusive recovery.

Chapter 3 sets up a framework for the topical chapters that follow it. It focuses on industries, setting out the structural characteristics that channel the direct and indirect impacts of the pandemic in different sectors of the economy. These characteristics include the ability of firms and workers in different industries to continue producing goods and services and supplying them to customers, possible indirect impacts through demand, and financial constraints faced by firms over the short and medium term.

The analysis that follows in Chapters 4 to 7 covers four topics, as they relate to the consequences of, and resilience to, COVID-19-induced shocks: Business dynamics and financial vulnerability (Chapter 4); Supporting productivity through digital technologies (Chapter 5); Industrial and international connectedness (Chapter 6); and Inclusiveness across gender and skills groups (Chapter 7). The policy recommendations that follow in this introductory chapter relate directly to Chapters 4 to 7, providing a quick reference guide to the content, which is expanded on in these chapters.

Box 1.1. Data challenges in the COVID-19 crisis

This publication provides extensive empirical analysis on the structural, long-term characteristics of sectors, firms, and workers that mediate the impacts of the COVID-19 crisis. This is made possible through custom-built datasets, containing comparable cross-country aggregated microdata curated by the OECD. Combining pre-crisis data on these main structural characteristics with what is known about how shocks propagate through the economy helps to identify areas of vulnerability and resilience.

However, the availability and collection of data remains a significant challenge, in particular for more recent data covering the crisis period. Analysing the impacts of the COVID-19 crisis on economies in a causal manner is a challenging undertaking in itself, and a lack of timely or comprehensive data represents an additional complication, even for outcomes that appear in the short term. Data are rarely collected in a standardised manner across countries, and while this is often a reflection of the heterogeneous statistical systems of countries, it also makes comparative analysis more difficult. Where early evidence is available – often in a single-country context – this report incorporates it, drawing on both internal OECD work and external studies, and links it with the structural analysis representing the core of this volume.

In many ways, the COVID-19 crisis has magnified the need for timely and systematically collected data – not only for an assessment of impacts, but also to identify the most effective policy responses and guide future strategies for similar shocks. A reliable and comparable quantitative evidence base is essential for a rapid and effective economic policy response, to identify the most affected and vulnerable groups of workers and firms; to shape a speedy, efficient, inclusive and green recovery; and to design effective longer-term policies. This is an important lesson for policy makers to take from this report: timely data and solid analytical evidence that capture the heterogeneity of different economic actors are crucial to enable fast and effective policy responses to shocks.

What made the difference? A summary of factors affecting resilience during COVID-19

Identifying the factors that have helped firms and workers in different industries make it through the crisis, and those that may have created difficulties, is fundamental for strengthening resilience and addressing vulnerabilities. In addition, new challenges arise from the differential impacts of the crisis across industries,

firms, and worker groups. The analysis in this volume brings together a range of firm, industry, and country-level data to shed light on factors that may have increased economies' ability to continue operating during the initial phases of the crisis, and those that may allow them to recover more rapidly afterwards. It also helps to identify critical divides that must be factored into policy design to ensure a sustainable and inclusive recovery.

These insights are especially important given that the impacts of the pandemic – and the restrictions and supports that accompanied it – were far from uniform globally. This report encompasses a collection of factors that, considered together, capture and help explain the varying degrees of resilience of economies to the shock caused by the COVID-19 pandemic. While some of these factors are direct determinants of how well firms and workers can adapt to the crisis, others are mediating factors that interact with policies and measures taken by governments, firms, or workers, making their actions more or less effective.

The industry dimension has been highly relevant throughout the COVID-19 crisis as it directly affects the ability of firms to operate. Certain industries, designated as essential by governments, have been allowed to continue operating with few restrictions, while others were forced to shut down almost entirely (with many still yet to resume, even in the recovery phase). Some could adapt to the restrictions and operate remotely; but others that needed face-to-face interactions were forced to shut. Sectors relying on movements of people, such as aviation and tourism, were particularly hard-hit, and the retail and personal services industries were also greatly affected, given their reliance on face-to-face contact for the traditional in-person business model. A shift to e-commerce was essential for retail firms and may be a longer-lasting outcome of the crisis.

The firm perspective is equally important, as firms within different sectors were able to cope with the crisis and the associated measures to differing extents, depending on their location, their workforce, their digital preparedness and their financial health, among other things. Workers within firms were also affected differently depending on their skills, gender, and other factors. This work incorporates this granular perspective, which allows the analysis to identify some of the roots of the differences in resilience across countries, industries, firms and workers.

The publication also provides a dynamic view of the impact of the crisis on the business sector, made possible by a new, timely data collection effort.[2] New firm entries slowed substantially, especially during the first wave of the pandemic, and many existing businesses struggled to stay afloat, let alone grow. Young and small firms, which are essential for a dynamic and innovative business environment, have been especially at risk, due to factors such as having smaller market footholds and fewer financial resources to weather the storm and invest in the future.

There were some bright spots, though, with new businesses forming through recovery phases. While some emerged temporarily to cater to pandemic-related market opportunities or surges in demand, others are likely to stay in the market, in part because some of the behavioural changes induced by the pandemic are expected to persist. Many firms suffered cash flow problems, though insolvency rates during the pandemic remained low due to effective government intervention that temporarily changed official bankruptcy procedures. There are also longer-term challenges related to the financing of new investments which, if unaddressed, might drag down future productivity and economic growth. If cash flow issues faced by young and small firms translate to long-term financial issues, this can also lead to adverse effects in terms of concentration, with larger firms growing and gaining market shares and smaller ones lagging behind. While many firms will require support well into the recovery period, those that are not viable must be allowed to exit the market, in order to enable productivity-enhancing resource reallocation.

There are many reasons for optimism about the post-pandemic future, however, and policies that foster and support the positive changes induced by the COVID-19 crisis have the potential to transform them into long-term benefits. Alongside the severe economic shocks, uncertainty, and disruptions to individual, social and economic life, the upheaval brought by the pandemic has the potential to usher in a new wave of innovation, opportunity, and technology development and diffusion.[3] In a strong recovery, efficient resource reallocation to new firms can aid in creating opportunities for higher levels of productivity and innovation.

The speed at which technology adoption – particularly of digital tools such as telework – has progressed during the pandemic is unprecedented, and bureaucratic hurdles have often been relaxed to facilitate their use. Social distancing measures in place through the crisis have pushed people to find alternative ways of staying connected, leading to widespread digital technology uptake. This uptake has extended to industries, firms, products and activities that were previously not highly digitalised. Many firms quickly started using digital tools to stay operational, and new business models were developed that facilitated reduced physical contact and interaction. In addition, new technologies emerged, many of which supported containment and healthcare.[4] While this accelerated digital transformation holds many benefits, it also requires accompanying policies to address new challenges, to sustain progress over the long term, and to prevent a further widening of digital divides across firms and people.[5] The need to work remotely has clearly accelerated existing trends towards digitalisation, holds the potential for significant benefits for workers and firms in the future, and can also potentially assist in the transition towards a carbon-neutral world.

Fostering uptake by firms not only boosts technology diffusion and builds resilience, but can also help achieve other goals, including productivity growth, business dynamism, increased inclusiveness, and environmental improvements such as reducing greenhouse gas emissions. Of course, there are also policy challenges associated with this technological revolution. Digital divides – for instance between urban and rural regions, firm types or population subgroups – have become even more relevant, and addressing them even more urgent, as digital skills and technology have become crucial to navigate many aspects of life other than work. Reducing inequality in access to technology and skills for firms and workers will help with sharing the productivity gains provided by a digital world. High-speed broadband must reach entire populations, including firms and workers in rural areas. Reducing inequality in digital skills via up- or reskilling is key to increasing the resilience of the business sector, as a growing number of jobs can be conducted remotely. During the pandemic, workers who did not have the necessary digital skills to telework, or whose jobs could simply not be done remotely due to tasks of the job or a lack of firm infrastructure, were more at risk of job and income loss. These workers are often from population groups that also face additional challenges on the labour market, such as women and older people. Creating a digitally inclusive recovery must be a priority for governments as the digital transformation unfolds.

The impacts of the pandemic – and the restrictions and supports that accompanied it – were far from uniform. Besides digital skills, the pandemic laid bare other pre-existing divides. Women were affected differently by the COVID-19 crisis, and faced a disproportionate burden as a result. They have been less exposed to job loss during the crisis, due to making up the majority of the workforce in primarily essential – but also "teleworkable" – industries. However, mothers were often hit hardest by lockdowns due to increased childcare obligations, forcing some women to drop out of the labour force, or to reduce working hours. The ability to telework also critically hinges on having the skills to do so, and women possess lower average digital skills than men. A truly inclusive future for women must include policies to address these issues.

Many of the policy measures and solutions implemented during the crisis were developed and implemented rapidly, to address the new challenges posed by the crisis, such as the need for social distancing. Governments have been continuously learning how to best support workers and firms, through the recovery period and in potential future crises, and can gain further insight from the outcomes of various policy measures around the world. The importance of international co-operation for policy and resilience has been highlighted in the COVID-19 crisis. The interconnectedness of countries and industries is a source of incredible value creation, knowledge sharing, and productivity growth. This was made abundantly clear during the crisis as borders closed, the movement of goods and services stopped, and economies suffered the results. At the beginning of the crisis, certain global value chains (GVCs) were disrupted; this had immediate implications for the supply of some essential goods, but GVCs later contributed to satisfying the demand surges related to the pandemic (e.g. the supply of personal protective equipment). While bringing production back to home countries may be a tempting solution, it is in fact not the best answer for long-term resilience and growth. Instead, co-operation and communication between countries and the diversification of supply chains hold the key.

The transition to a greener world is a global effort, and the opportunities for increased global co-operation in the low-carbon transition must not be lost. The crisis has created openings for significant advances on this front, for example from lower rates of commuting and decreases in air travel. While some of these changes – such as the very high rates of telework observed in some countries, or the collapse of travel – are likely to be temporary, some of the induced changes are likely to stay. Even though they might make a relatively small impact on overall environmental outcomes, the successful navigation of transitions, such as to a greener and more digital society, may become a lasting positive legacy of the COVID-19 crisis.

The pandemic has undoubtedly accelerated the digital transformation of economies and societies. Yet, the very nature of digital technologies – in particular their reliance on complementary intangible assets characterised by high scalability, and the resulting increase in concentration – may increase divergence between high- and low-performing firms and dampen the impact on growth. To counteract these effects, policies need to support innovation by both top-performing firms and start-ups, and boost technology diffusion to the rest of the business sector.

The COVID-19 crisis also highlights the incredibly globalised and interconnected nature of economies. Some argue that the multi-decade expansion of international trade and international supply chains may have come to an end – and may even recede – as the crisis brought attention to perceived vulnerabilities of GVCs. In contrast to the trends in green and digital, which will indisputably continue to transform the economy in the coming decades, the structural nature of a slowdown in international trade and economic interconnectedness is still in question. In the hopes of building more resilient production systems and strategic autonomy in key products or technologies, some governments are discussing investing in the re-shoring of parts of their manufacturing value chains. It is important to acknowledge that such interventions may increase production costs, reduce competition and jeopardise the rule-based global trade and capital flows system. Rather, policies aiming to strengthen the resilience of GVCs, diversify risk, and increase international co-operation are likely to be better solutions in the long term.

Policy recommendations

In the recovery period from the crisis, governments must design and implement policies to help economies rebound strongly, inclusively, and with more resilience against possible future shocks. The following guide provides a concise summary of the key policy implications and recommendations arising from the analysis in the four topical chapters of this publication (Chapters 4 to 7).

Business dynamics and financial vulnerability (Chapter 4)

The crisis had implications for many aspects of business dynamics, including firm entry, exit and bankruptcy rates. Small and young firms appeared to be particularly vulnerable to the crisis, especially through liquidity shortfalls. The risk of debt overhang is generally higher for these firms in the recovery phase than it is for large firms, which has implications for business dynamism as well as innovation, increasing divides across leader and laggard firms, resource allocation and, ultimately, economic growth. Thus, going into the recovery phase, effective policy design and implementation is especially important.

- Financial support to firms must strike a balance between phasing out support too early – risking failures of viable businesses – and maintaining it for too long, thereby propping up unviable firms and preventing necessary firm exit and efficient resource allocation.
- Stimulating new firm creation is key to foster reallocation and business dynamism. Suggested policies include decreasing barriers to entry through simplifying and reducing administrative procedures and red tape, lowering the cost and complexity of product market regulation and ensuring access to finance.
- Support measures should ensure that small and young firms can access programmes and benefit from policies to the same degree as their larger counterparts. This is also important in light of the

potential adverse effects of the crisis itself on market structure and concentration, as well as the dynamics of recovery, requiring a careful analysis of the potentially anti-competitive effects of support policies.

- Strengthening innovation and technology diffusion is important, especially in smaller and younger firms. Direct government financing of research and development (R&D) is more effective than tax credits, which are less suited to support innovation spending in cash-strapped or profit-losing firms. Alternative methods of financial support should be provided, such as equity and quasi-equity (especially for small and young firms) injections, and allowance for corporate equity and debt-equity swaps. These may also play a longer-term role in recapitalising firms while minimising the negative impacts of debt overhang.
- Measures to support debt restructuring, such as granting priority over unsecured existing creditors for new financing and promoting pre-insolvency frameworks, may also help to reduce default and enable distressed firms to invest during the recovery.
- To speed up the reallocative process and foster re-employment, ensuring efficient exit of unviable firms is equally important. For this, bankruptcy procedures should be simple, fast and efficient.

Supporting productivity through digital technologies (Chapter 5)

The crisis saw the rapid uptake and diffusion of digital technologies, driven by social distancing restrictions and a sudden need for telework and e-commerce. These technologies support productivity, and can have wide-reaching positive effects societally over the long term. Policies should harness the potential of the digital transition while also working to minimise potential increases in inequalities.

- Ensuring digital access for all firms and workers is key to ensure broad productivity benefits and a smooth transition to new forms of doing business, including via telework and e-commerce. Upgrading and maintaining communications infrastructure – which is a prerequisite for the use of digital technologies – is fundamental. Investments in rural areas, which often lag behind urban areas in their availability and quality, can be particularly effective in increasing digital uptake. The same is true for digital skills.
- Among the digital technologies that flourished during the crisis, telework has been particularly pronounced. Policy makers should ensure that it can be continued after the immediate crisis, on a voluntary basis, to reap its beneficial productivity effects, as well as to improve worker satisfaction.
- Governments can facilitate the use of telework with supportive legislation and regulation on workplace health and safety, and by providing workers with the right to telework or work under flexible conditions (e.g. choice of start and end times). Uptake can also be fostered by addressing legal or cultural hurdles (e.g. established protocols for presence in the workplace), and through tackling barriers to uptake of telework such as digital security and data protection concerns.
- Some reasons for telework not being feasible, such as inherent task-related features of jobs, will persist. Ensuring and supporting the flexibility and upkeep of digital skills for workers who are not able to telework should therefore also remain on the policy agenda, to ensure equality and inclusion across worker groups.
- Policy makers need to ensure that the gap in digital technology use between the “best” firms and “the rest” is not exacerbated at a time when shifts to digital modes of production are becoming more and more important. Because firms that can adopt digital technologies more easily are often large and well established, policies should specifically target small and medium-sized enterprises (SMEs), to support them in innovating and adopting new technologies.
- Similarly, boosting digital technology diffusion can help ensure an inclusive digital transformation across firm types, and increase competition, which will raise incentives for firms at the frontier to innovate. It will also support productivity growth, including across industries and firms that were

less digitalised before the crisis and therefore hold a large potential for catch-up, with additional positive implications for wage inequality.

- The diffusion of improved information and communication technology (ICT) infrastructure within firms can be accelerated through financial support for upgrades aimed at performing a number of functions online, including to work remotely.
- The policy mix that harnesses the complementarities between the green and digital transformations must reflect the multi-faceted nature of the underlying processes and requires financial support for innovation, the development of innovative ecosystems, intellectual property rules, and a strong public research system.

Industrial and international connectedness (Chapter 6)

Restrictions on personal mobility and economic activity during the pandemic laid bare both the challenges and benefits of international connectedness. Though some GVCs were initially disrupted by these restrictions, the crisis also showed them to be crucial to ensure the provision of essential goods. Their resilience should therefore be an important goal, and should be tackled with international co-operation and diversification in supply chains rather than on-shoring. Many industries, such as aviation and tourism, are also highly interconnected and dependent on global co-operation. Policy must aim to mitigate and manage the risks associated with international and industry interconnectedness.

- Ensuring the transport of goods and services across borders is a precondition for maintaining the functioning of globalised production networks and the movement of goods and services. International co-operation and policy coherence – for example to establish travel corridors, including for immunised people – will also be crucial to allow the travel and tourism industries to recover.
- Measures to make GVCs more robust to production shocks, such as those caused by lockdowns due to COVID-19, include diversification of suppliers at the firm level, and co-ordination and information networks to foster transparency and the provision of backup options at the macro level.
- Transparency and predictability should also be promoted through clear decision-making processes and regulation and the lowering of trade barriers via harmonisation of standards and norms, striking a balance between fostering integration and consumer and environmental safety.
- Other suggested areas for government action to help make GVCs more robust include regular stress tests, and international co-ordination to avoid unilateral actions such as export restrictions, which may trigger harmful effects on other countries through globalised production networks.

Inclusiveness across gender and skill groups (Chapter 7)

Certain population subgroups in the labour market were affected differently by the pandemic and the restrictions put in place to contain it. Women faced many disproportionate burdens related to childcare and job types, and workers across different skills groups saw differing levels of job security and differences in the ability to telework. Policies such as those below are important to minimise adverse effects on inequality caused by economic shocks like the COVID-19 crisis.

- Immediate support measures and recovery policies must incorporate a gender perspective to avoid risking the inversion of pre-crisis progress towards gender equality on the labour market. The crisis impacted women differently, forcing some of them to take over additional care responsibilities at home. Enabling women, and especially mothers, to uphold their labour supply during crises is crucial and will also help preserve job matches, which will be beneficial for a stronger recovery.
- Support policies targeting working parents should take into account not only mandatory school closures, but also periods of reduced working hours due to quarantines of children or other care obligations. When providing emergency childcare facilities, these should be extended to women in non-essential jobs who are unable to continue working due to childcare obligations.

- Special consideration and financial support should be granted to self-employed single parents, and in particular female entrepreneurs, who were unable to work in the COVID-19 crisis due to childcare obligations. Prioritising the reopening of childcare services, and the provision of affordable and universal childcare during the recovery, are important to keep the disruptions on the labour supply of parents and carers as small as possible.
- A more equal division of unpaid home and care work can be fostered through incentives at the firm level (e.g. well-paid parental leave for fathers, or offering more flexible working time arrangements), as well as removing disincentives such as excessive overtime or those inherent in the tax structure for second earners.
- Employment support measures introduced during the crisis should be extended to cover atypical forms of employment, such as temporary or agency work, self-employment and part-time work. Not covering these types of workers will deepen pre-existing inequalities, further penalising worker groups that were already in more precarious forms of employment before the crisis.
- The ICT and digital skills gap has become even more relevant during the crisis, underscoring the need for digital upskilling, especially for low-skilled workers and older parts of the population, as well as for women to help close the digital gender gap.
- Providing training, skill upgrading, or fully-fledged career change programmes to workers whose jobs are at risk over the longer term, for example due to pre-crisis trends in automation, can help accelerate structural change and efficient labour market reallocation more generally.

Looking forward

The COVID-19 crisis has unleashed an unprecedented and extraordinary period in economic history, and its impacts on countries, industries, firms and workers have yet to be fully seen. At the same time, the global economy, and individual countries and societies, will continue to face both new and existing challenges, some of which have been amplified by the crisis. As vaccine coverage expands collective immunity against COVID-19, and lockdowns and restrictive measures are progressively lifted, the focus of policy action is shifting from crisis management to reigniting growth. The challenges ahead go beyond just economic recovery; the world is facing transformative megatrends, entailing complex economic and societal challenges that demand action on several fronts. New policies must promote more inclusive and environmentally sustainable economic progress. The following sections present some suggestions on how countries can harness the transformative potential of the recovery phase for the post-COVID future.

From cyclical to structural policies

Without effective policy interventions, market forces are unlikely to enable economic growth by themselves, as pre-crisis trends were already indicating. Before the crisis, the already-existing slowdown in productivity and investments was expected to continue through the 2020s. The November 2019 *OECD Economic Outlook* (OECD, 2019[1]) already predicted potential output of OECD countries to grow by only 1.8% in 2020 and 1.7% in 2021 – the slowest pace in over 40 years, apart from the global financial crisis (GFC) period. According to the May 2021 *OECD Economic Outlook* (OECD, 2021[2]), the COVID-19 crisis is profoundly affecting the economy, and potential output is now expected to grow at an even slower rate: 1.4% in 2021 and 1.5% in 2022.

As the economy recovers, governments will gradually phase out emergency support measures to firms and employees. This phasing out will require some sectoral differentiation, given that some sectors are recovering faster than others. It is of course necessary to ensure continued support to sectors for which demand can be expected to only gradually return to pre-crisis levels, such as tourism or aviation.

As in most times of economic crisis, one of the main challenges for policy makers is to disentangle the cyclical component from structural demand changes, to avoid slowing down efficient resource reallocation

by supporting unviable business models (for example, restaurants located in business districts that may face structurally lower demand due to sustained teleworking). The structural impacts of the COVID-19 crisis can be pervasive, requiring tailored policies at a very granular level and a deep understanding of the systematic consequences of the pandemic.

One way to approach the immense challenge of identifying which businesses to provide with continued support is to progressively change the paradigm by supporting technologies and workers, rather than individual firms. This means fostering and steering structural changes in the long run, and advancing the transition to a digital and green economy, through support for innovation and technology diffusion, upskilling, productivity growth and adaptability of workers. Accounting for this long-term structural transformation of the economy implies that bringing workers back to jobs in industries that are likely to soon become obsolete (e.g. in carbon-intensive energy) is not a good long-term investment for governments. Directing funds to support the transition of these workers, for instance by retraining them for work in the green and digital economy, should be a priority in any recovery package.

A focus on the green and digital transitions

The COVID-19 crisis influenced structural megatrends in digitalisation and decarbonisation. The pandemic has also reminded us about the vulnerability of our societies to severe global shocks, and in many ways made a further case for the need for immediate and decisive climate mitigation actions. This structural transformation, which will take several decades, now seems truly underway, as illustrated by commitments of many governments towards a green recovery, and carbon neutrality at the 2050 horizon.

Importantly, digital technologies can be a key enabler of the green transition, suggesting that these two ongoing shifts, which are fundamentally transforming the economy, need to be addressed jointly in the recovery phase and beyond. There are synergies and opportunities for double-dividends in policy implementation. For example, digital technologies such as artificial intelligence (AI) can help reduce energy demand and associated greenhouse gas emissions, catalyse smart grid management, and save fuel thanks to autonomous vehicles and connected smart sensors. Adoption of digital solutions can improve environmental performance while at the same time raising productivity, thereby ensuring that the green transition goes hand in hand with economic growth and shared prosperity. Nevertheless, there are concerns about the carbon and material footprints of some digital technologies themselves. Despite ongoing efficiency improvements, the large amount of energy consumed by digital solutions such as data storage and high-capacity computing can imply high related carbon emissions. Rising demand can also diminish energy savings. This will require careful consideration and the right policies going forward.

The rise of automation is another long-term, transformative trend affecting both the green and digital transitions, as well as industry and the demand for skills. Automated technology can increase energy efficiency (thus potentially reducing greenhouse gas emissions), provide new solutions to complex problems and contribute to worker safety, increasing well-being and quality of life. Importantly, it reduces the need for physical contact among workers, and hence has an important role for robustness against health-related shocks such as the COVID-19 pandemic. However, alongside tremendous positive contributions to productivity, daily life, and the climate emergency, automation also poses a threat to certain jobs, particularly those involving mainly routine tasks such as those in manufacturing, agriculture and certain service positions. Governments must ensure that policy keeps up with the changing future of work, focusing on skills and employment, while also harnessing the potential of automation.

Looking to supply-side measures

Actions to harness the recovery to speed up and manage the transition to a more green and digitalised world must take into account lessons learnt from previous recovery packages, such as those adopted following the GFC. For example, industrial policies adopted during that time as part of green recovery

packages were clearly focused on the demand side, with measures such as vehicle scrappage schemes to subsidise the adoption of electric or energy-efficient cars. While these measures are useful to encourage adoption of market-ready low-carbon technologies, targeted policies need to carefully take into consideration a multitude of other factors, such as talents and skills, firm and industry structure and infrastructure. Importantly, they also need to complement instruments targeted at the supply side, which can redirect economies and societies onto a greener path in the long run. Suggested supply-side measures to achieve this include:

- support to research and development (in the form of R&D tax credits, targeted research subsidies or prizes)
- education and lifelong training to ensure an adequate supply of green skills
- competition policies to level the playing field for young firms and SMEs
- investment to encourage funding for green start-ups (particularly through venture capital)
- public infrastructure programmes (e.g. for the transportation of electricity and hydrogen, or charging stations for electric vehicles)
- defining new product standards (e.g. in terms of minimum recycled content).

Importantly, demand- and supply-side policies for a green recovery complement each other. There is evidence, for example, that green stimulus investments adopted after the GFC were most effective in communities that had workers who already possessed the skills required for green jobs.

Supporting skills and human capital

Support to human capital accumulation, be it through on-the-job training, formal education or other means, is likely to have multiple benefits. It will help stimulate innovation and technology diffusion, and – by equipping workers with skills demanded by employers – promote growth. This is particularly important at a time when the simultaneous transitions of green and digital are heavily changing the skills demanded in the labour market. While human capital is in essence multidimensional, the following three considerations are especially important:

- Rapid technological change, and in particular the increasing pervasiveness of advanced digital technologies (including AI) has the potential to significantly affect labour demand. Policy makers need to boost lifelong learning and workplace training and adapt the curricula, so that skill upgrading can match the pace of technological change.
- The same applies to skills necessary for green jobs, and support to R&D in green technologies, particularly for technologies further from the market (e.g. green hydrogen or energy storage).
- To enable and steer the digital and green shifts of firms, and to ensure they can make the most of new business opportunities provided by the digital and green transformations, particular attention must be paid to the skills of managers and top executives. Over the last decade, a host of studies have shown that managerial and organisational capabilities are important determinants of productivity across countries, industries, and firms. Policies to support this may directly target skill accumulation through measures such as public support for training and access to resources, and adapting tertiary education curricula, but should also entail incentives to select better managers. This can be achieved by increasing competition and removing frictions that prevent firms from replacing less productive managerial structures.

As the world emerges from a deep economic crisis, countries are facing major long-term economic, social, and environmental challenges that need to be addressed decisively and on a global scale. The extent to which policy makers will be able to firmly commit to address these challenges, and the degree to which they will be able to collaborate and coordinate their efforts internationally, will ultimately determine whether steady, inclusive, and sustainable growth can be achieved in the near future.

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Notes

[1] Data, analysis and recommendations are delivered via the OECD COVID-19 Hub (OECD, 2021[4]). In addition, flagship OECD publications such as the *OECD Economic Outlook* (OECD, 2021[2]), the *OECD Science, Technology and Innovation Outlook* (OECD, 2021[3]), the *OECD Skills Outlook* (OECD, 2021[6]), the *OECD Digital Economy Outlook* (OECD, 2020[5]) and numerous working and policy papers from across the Organisation, have provided analysis and evidence to support governments in their efforts to design and implement policy supports and coordinated responses across countries.

[2] The DynEmp website (http://oe.cd/dynemp) provides recent evidence on firm dynamics during the crisis period alongside different long-term indicators related to business and employment dynamics, as well as additional reading on the topic.

[3] For more detailed OECD analysis of some of the areas for opportunity emerging from the crisis, alongside guidance for policy-making approaches, see the *OECD Science, Technology and Innovation Outlook* (OECD, 2021[3]).

[4] See https://www.covidinnovations.com/home for examples.

[5] In-depth analysis and policy guidance on this topic, including on digital divides, can be found in the *OECD Digital Economy Outlook* (OECD, 2020[5]).

2 Context of the crisis

This chapter provides an overview of the economic and policy context in which firms and workers have operated since the unfolding of the COVID-19 crisis in early 2020, and its evolution into 2021. The chapter outlines the initial events of the pandemic, the impacts of the virus as it spread across OECD countries, and the efforts of governments as they raced to implement containment and support measures. It demonstrates the varying degrees of severity of restrictions, country by country, and outlines the subsequent measures put in place to support firms and workers through the crisis. The chapter then reviews immediate aggregate economic impacts, and describes the changes in policy and strategy as the pandemic evolved over time. This chapter aims to help establish contextual understanding for the chapters that follow.

Key findings

- **The COVID-19 pandemic set off the worst global economic crisis since the Second World War**. Beyond its severity, the crisis differed from past downturns in several ways:
  - The economic shock was rooted in a health crisis, exogenous to the economy, which spread quickly and globally. Its immediacy, severity and unpredictability left many governments a step behind, often without best practices to guide policy decisions to flatten the contagion curve.
  - Supply-side restrictions on economic activity and social distancing had not been factors in other economic crises, adding another complicating factor in designing and implementing support measures and restrictions. Governments had to resort to strict containment actions, effectively halting production and consumption for a large part of the economy – often with little certainty on their tightness, duration, or possible repetition – while simultaneously supporting the survival of businesses that were forced to close down.
  - The effects of the pandemic abruptly disrupted the real economy via both supply and demand. This, in turn, caused a ripple effect through supply networks, which affected large swathes of the economy that were generally not strongly impacted in previous recessions (e.g. aviation, retail, hospitality and tourism).
  - Government decisions affected not only livelihoods, but also lives themselves, with few areas of the globe unaffected and policy implementations sometimes a matter of life or death.
- **Despite the severity of the economic shock, numerous examples of policy successes through government intervention are evident in the time after the initial waves of the pandemic**. Governments implemented restrictions to contain the spread of the virus, but did so alongside suites of policy to keep economies afloat through supporting workers, firms and existing employment. Many firms survived the crisis as a result, and despite the challenging conditions, some new firms emerged during the period; these firms can now contribute to a strong and robust recovery.
- **The recovery period will be long and uncertain, but there are many reasons for hope**. Some economies and industries are showing signs of tremendous resilience, with economic activity rebounding strongly as some countries lift restrictions. As vaccines become widespread and the health crisis subsides, governments must learn from this crisis to ensure not only a swift, strong and inclusive recovery, but also resilience and preparedness for the future.

Introduction

The rapid spread of COVID-19 around the globe affected nearly every aspect of people's lives – health, income, work, leisure, and social interaction. Setting off the most severe economic shock since the Second World War, the COVID-19 pandemic led to a dramatic global recession.

The jolt to the economy differs from previous economic crises in several respects. First, it affected both demand and supply, as efforts on the part of both governments and individuals to limit the spread of the virus curtailed large areas of economic activity. The crisis has changed the *modus operandi* of firms and individuals, and thereby aggregate patterns of demand. Activities requiring physical proximity were suspended, reduced and substituted over the short term, with potential long-term changes in behaviour and preferences.[1] Further, virtually every country in the world has been hit, both through the direct impacts of the pandemic itself, and by its indirect consequences. The latter include changes in consumption, production and aggregate demand; economic recession; impaired movement of individuals and a decrease in travel; disruptions to global value chains and last but surely not least, an acceleration in the adoption of digital technologies.

While the impacts of the pandemic have been global, they have been far from uniform across countries, firms, and population groups. Both the severity of the outbreak itself, and the related economic impacts, have differed in timing and intensity. This reflects differences in not only government approaches and decisions taken by individuals and firms in response to the crisis, but also underlying economic and social conditions at the onset of the outbreak, such as industry structure, development and adoption of digital technologies, innovation and business models and financial soundness.

Although activity rebounded after the initial relaxation of the stringent government-imposed restrictions on mobility and interaction that characterised most of 2020, many countries have continued to face further waves of contagion, and suffer the effects of new restrictions. Global gross domestic product (GDP) projections depend highly on the possible emergence of COVID-19 variants, as well as the successful implementation of vaccination programmes (OECD, 2021[1]). While an upside scenario – with few variants of concern and successful vaccine rollouts – could lead to a strong and fast global economic recovery, the downside scenario – in which vaccination programmes lag and variants cause new waves of contagion – could see productivity and economic growth well below pre-pandemic projections for years to come.

The lifting of supply-side restrictions, after the first wave of the virus in early 2020, marked the beginning of a first recovery phase for many economies, with activity picking up in several sectors. However, concerns persist that the pandemic is far from over, may see resurgences (OECD, 2021[1]), or may become a seasonally repeating issue (Burra et al., 2021[2]).[2] Reduced incomes and increased unemployment across a wide swathe of the population, changes in demand and preferences as individuals and employers act to reduce the risk of infection, and shifts in habits established through this period will affect economic activity even as vaccines become more widely available and the immediate health crisis recedes. Many government support packages implemented during the crisis have been essential "life preservers" for both workers and firms. Governments put strong supports in place alongside restrictions, the results of which provided opportunities to identify areas of economic weakness and learn lessons on best policy practice. Policy makers can apply this knowledge to build back economies that are stronger and more resilient against future crises.

While the COVID-19 crisis has affected all aspects of life, this report focuses on the business sector; that is, on aspects of the crisis that affect industries, firms and workers. It begins with this chapter, which describes the context of the crisis. The chapter outlines some of the early measures put in place to contain the virus, as well as accompanying support policies, and then identifies some of the resulting economic impacts across countries.

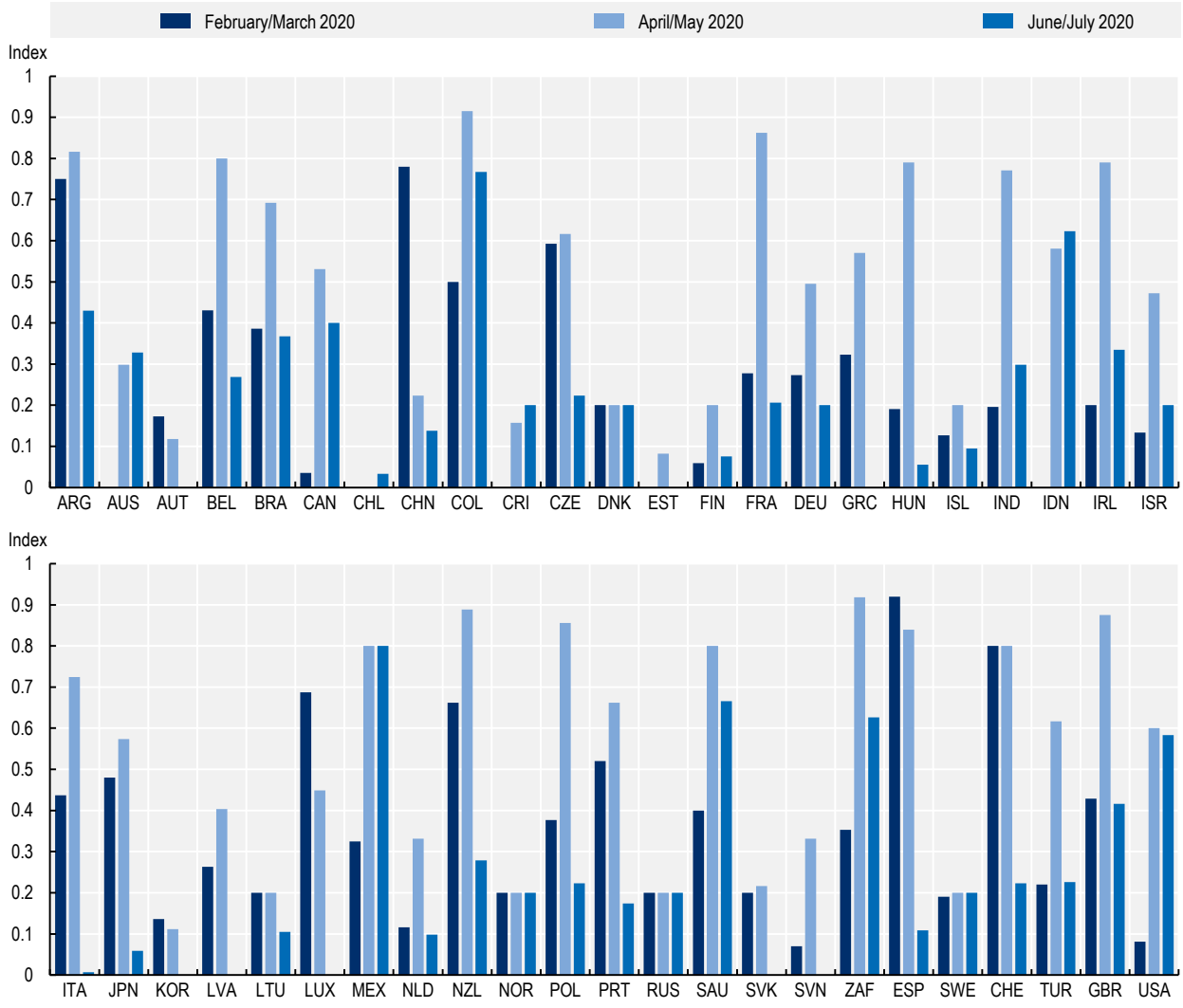
Containment measures in response to COVID-19

Throughout the pandemic, governments and individuals have attempted to strike a balance between protecting people's lives and well-being from the virus, and keeping the economy going.[3] Containment measures, in which non-essential activities and movement are heavily restricted, were put in place by many governments, both at local and national levels. Many of these measures helped slow the spread of the virus, reduce the death toll and bought time for health systems to respond. However, they also had severe negative economic consequences,[4] and even despite these efforts, many countries and regions have continued to face high and rising infection and fatality rates over 2020 and 2021. A return to fully unrestricted activity may remain a long way in the future – with recovery largely dependent on both vaccinations, and possible continued outbreaks and mutations of the virus (OECD, 2021[1]).

In most OECD countries, initial restrictions on activity peaked in April 2020 (Figure 2.1) before being gradually relaxed in May and June. While all countries imposed some form of restrictions, their severity, the speed at which they were established (and subsequently relaxed), and the activities they targeted differed across – and to a lesser degree, within – countries. Figure 2.2 shows the average level of initial restrictions (in April 2020) across five different measures (confinement and lockdowns, travel bans and restrictions, closure of schools, cancellation of public events and closure of public spaces, and obligatory shutdown of

economic activity), based on the OECD COVID-19 Country Policy Tracker.[5] While many countries reacted strongly across all five dimensions (e.g. Italy, Greece, New Zealand and Colombia), countries such as Sweden and Japan put in place minimal restrictions, instead promoting personal and collective responsibility to minimise the spread of the virus.[6] Iceland, meanwhile, imposed few outright restrictions and instead rapidly embarking on an extensive programme of testing and contact tracing.[7]

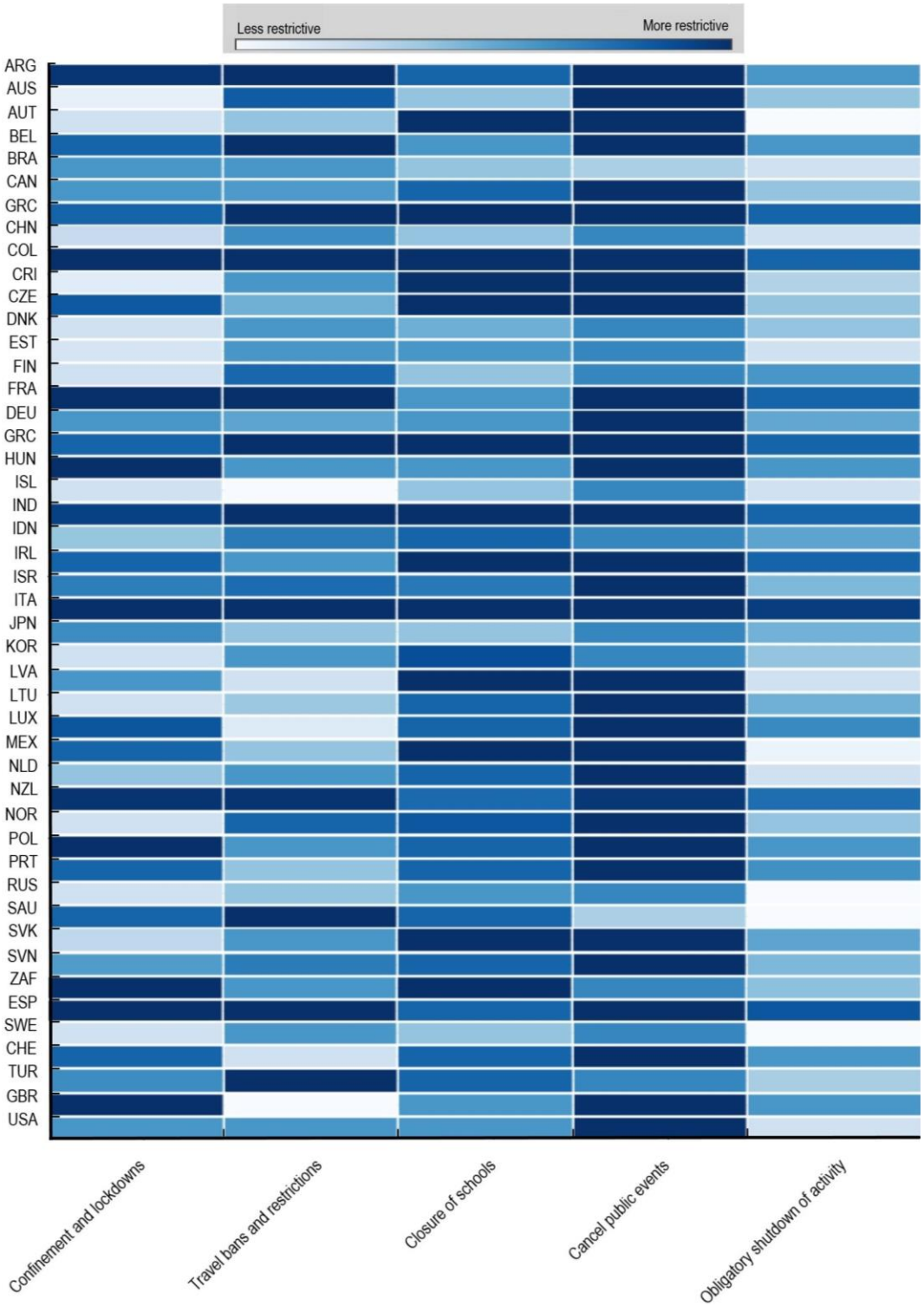
Figure 2.1. Severity/restrictiveness of confinement and lockdown measures



Note: Indexed from 0 to 1, with 1 being the most restrictive measures (original indicator measured on a scale of 0 to 5). The OECD COVID-19 Policy Tracker is a centralised database of government responses to the COVID-19 crisis, compiled and verified by OECD country experts. Daily indices of the strictness of confinement measures have been averaged across two-month windows (February/March, April/May and June/July).
Source: OECD calculations based on OECD (2020[3]), *COVID-19 Country Policy Tracker* (database), https://www.oecd.org/coronavirus/country-policy-tracker/ (accessed on 6 August 2020).

StatLink https://doi.org/10.1787/888934260928

Figure 2.2. Mean level of restrictions in April 2020



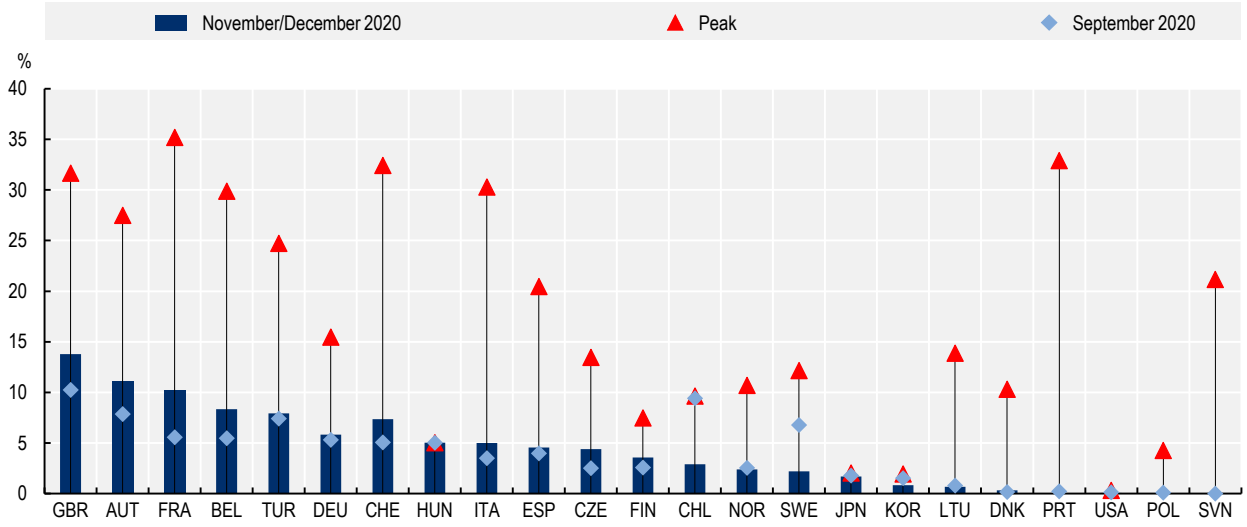
Note: The OECD COVID-19 Policy Tracker is a centralised database of government responses to the COVID-19 crisis, compiled and verified by OECD country experts. The graph reports daily measures averaged for the month of April 2020 for each of the five indicators: Confinement and lockdowns, travel bans and restrictions, closure of schools, and obligatory shutdown of economic activities measured on a scale of 0 to 5, where five represents the strictest measures. Cancellation of public events/Closure of public spaces is rescaled from a scale of 0 to 3 to a scale of 0 to 5 for comparability with other measures.
Source: OECD calculations based on OECD (2020[3]), *COVID-19 Country Policy Tracker* (database), https://www.oecd.org/coronavirus/country-policy-tracker/ (accessed on 28 July 2020).

Support measures in response to containment responses

The restrictions put in place resulted in much business activity coming to a temporarily halt. However, governments also provided support to guarantee livelihoods; alongside restrictions and containment measures, they implemented extensive policy packages to keep households, firms and economies afloat.[8] These policies varied widely (e.g. country by country, industry by industry), focusing on both employment and social areas, as well as fiscal and monetary stability. Initial support measures included worker pay supports (e.g. furlough schemes, basic income support), financial assistance, loan guarantees and cash grants to firms, tax deferrals, and changes to insolvency procedures as the crisis wore on. For the recovery period, governments need to implement different policies that enable resource allocation, enhance access to finance, and support investment in reskilling and digital infrastructure. Recovery plans thus far put significant emphasis on supporting small and medium-size enterprises (SMEs) in rebuilding business, continuing the digital transformation, and financial and support for workers to re- or upskill during the job reallocation phase.[9]

Worker support initially relied on pre-existing systems already established in labour market institutions, to support workers' incomes and employment in the face of idiosyncratic shocks. Such policies generally focus on either job retention or unemployment support (Annex D of this report describes these systems in more detail). Most OECD countries mainly had job retention schemes in place before the crisis (see Table A D.1 in Annex D for a detailed list), and had the ability to rapidly scale up programmes when the pandemic hit. While the use of job retention schemes in response to COVID-19 is widespread in all sectors, and across all types of firms, take-up varies across countries (OECD, 2020[4]; 2021[5]). Figure 2.3 below demonstrates the variation in uptake of such supports during the initial waves of the crisis.[10]

Figure 2.3. Participation in job retention schemes



Note: Take-up rates defined as approved applications or actual participants in job retention schemes as a share of dependent employees in Q1 2020. Peak date refers to April/May 2020 for most countries (July 2020 for Chile, Korea and the United States, October 2020 for Hungary and Japan).
Source: OECD (2021[5]), "Supporting jobs and companies: A bridge to the recovery phase", https://doi.org/10.1787/08962553-en.

StatLink https://doi.org/10.1787/888934260947

In the case of the COVID-19 crisis, job retention policies such as temporary layoff schemes or salary payment programmes by governments were more effective than many of those designed to help people find alternative employment, such as reallocation or temporary work schemes, due to nature of the crisis limiting the availability of work and jobs. Measures designed to support the adaptation of jobs to keep them viable, such as through telework, were widespread across OECD countries.[11] Recent OECD work suggests that employment resilience during the current COVID-19 crisis has been higher in countries relying on comprehensive job retention

schemes, rather than unemployment insurance schemes, as the former preserves job matches and may allow countries to bounce back faster to pre-crisis productivity levels (OECD, 2020[6]; 2021[7]).

Unemployment support schemes helped in the beginning of the crisis to immediately support workers who lost their jobs. However, these types of schemes were often not designed for the large volumes of newly unemployed workers from a systematic shock such as the COVID-19 pandemic, making retention schemes a potentially better support policy in many instances and over the longer term.

It should be noted that the type and quality of social safety nets already in place in countries often affected the extent of further support to firms, and make comparing the level of business support country by country somewhat difficult. Countries with broader supports already in place likely required fewer new measures, simply due to having pre-established systems. Nevertheless, to help the business sector, most OECD countries immediately implemented extensive measures to support firms, which remained in place in some form throughout the pandemic. As the crisis wore on, more targeted policies became possible as data emerged and the evidence base grew, and countries were able to adapt interventions to target the most at-risk industries, firms and workers. An example is the extension of employment retention and furlough schemes to include atypical forms of employment, such as self-employed and agency workers (OECD, 2020[8])

Public sector-funded subsidies, grants, loans and loan guarantees to businesses have been a common type of policy support in OECD countries. Across OECD countries, direct financial support of firms totalled unprecedented sums. Direct payments to businesses affected by restrictions on activity were designed to allow firms to stay solvent by covering necessary expenses, such as rent payments (while staffing costs were often under the umbrella of employment schemes, as discussed above). Such financial support was often provided without the need to repay, or as interest-free loans. Similar measures targeted specific hard-hit sectors, and encouraged economic re-starts where possible. An example of an intervention that did both is the “Eat Out to Help Out” scheme in the United Kingdom, a programme worth nearly GBP 1 billion, which gave consumers a discount at restaurants in the summer of 2020, when outdoor dining was possible (Hutton, 2020[9]).

Along similar lines, it has been important for governments to ensure firms’ access to finance, allow direct capital injections, and make changes to insolvency procedure and regulation. These policy areas have been particularly important for SMEs, which often face greater barriers to finance and have fewer cash reserves to rely on in periods of crisis. Government-backed loans with lower interest rates, subscription of shares, and extensions of lines of credit are examples of implemented policies. Moratoria on insolvency procedures have also prevented a wave of bankruptcies; an example of a very successful policy measure that is discussed in further detail in Chapter 4.

Another common support measure among OECD countries has been to allow various tax deferrals, alongside changes to overall tax structures and systems. Governments used changes to tax policy to alleviate business cash flow difficulties through measures such as extending deadlines, lowering tax rates or eliminating certain types of taxes altogether, accelerating refunds and delaying payments to later periods (OECD, 2021[10]). Annex table A D.2 provides an overview of the main tax measures to support business cash flow in OECD countries in the initial stages of the pandemic.

Another area of substantial government spending is economic stimulus packages. These have been, in some cases, massive sums; for example, by April 2021, the United States had approved nearly USD 5 trillion in dedicated stimulus spending since the pandemic began. Comparisons between countries’ stimulus spending are not always straightforward, due to differences in what is classified as stimulus rather than business or social support. For example, while the US fiscal stimulus amounts to 27% of GDP, Japan’s reported amount is 55%. However, Japan’s tally includes spending on existing long-term goals (e.g. climate neutrality) and financial policy classified as industry support by other nations.[12] While important to mention in the discussion on support measures, packages of stimulus spending are outside the scope of this publication, and therefore not discussed in more detail.

Economic consequences

Measures put in place to limit the health costs of the pandemic exacted a high economic cost, bringing business activity to an abrupt halt in many sectors (OECD, 2020[6]). As economies continue to languish under the strain of prior and continued restrictions and interruptions, one can clearly see the magnitude and suddenness of the first shocks through monthly data on economic activity. Figure 2.4 depicts the percentage change in industrial production across OECD and G20 countries, for the months of February to May 2020, as well as March 2021, relative to the same month of the previous year.

Figure 2.4. Percentage change in total industry production from previous year

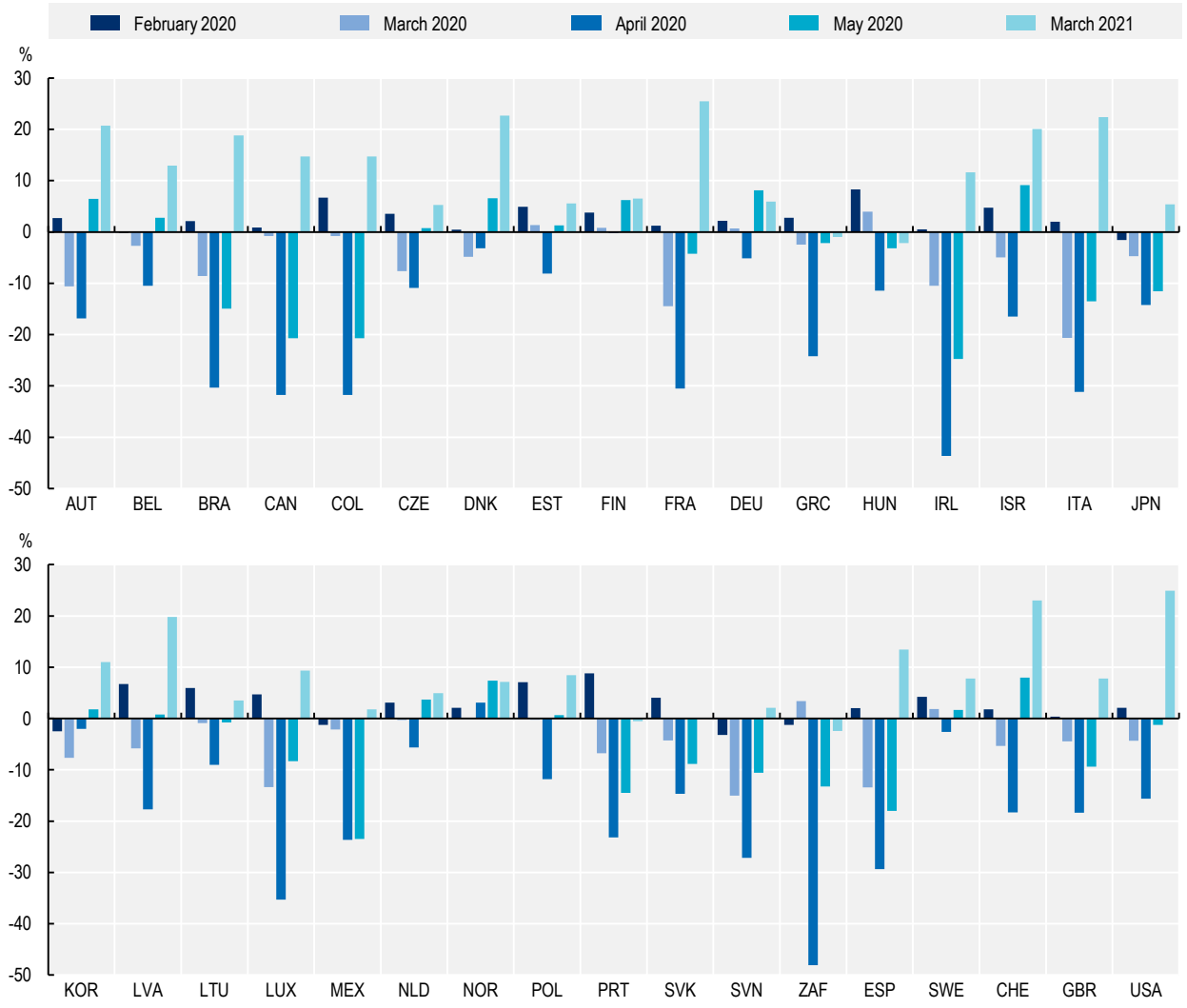
Note: Percentage change in total industry production (encompassing mining, manufacturing and utilities, but excluding construction and related finance), relative to the same month the previous year. Construction included for Costa Rica and Mexico. January 2021 instead of March 2021 for Austria, February 2021 for Canada, Costa Rica and the United Kingdom.
Source: OECD calculations based on OECD (2021[11]), "Production and sales", *Main Economic Indicators* (database), https://doi.org/10.1787/data-00048-en (accessed on 7 June 2021).

StatLink https://doi.org/10.1787/888934260966

Three patterns are apparent. First, the abruptness of the decrease in production was substantial. For the OECD as a whole, total industrial production in January 2020 was only 0.7% lower than in January 2019. In February, it was 0.4% lower, and by March it was 6.4% lower than the previous year. In April and May,

when the pandemic spread globally and restrictions on activity peaked, production experienced its most dramatic decrease – 20.0% for April and 17.5% for May. Second, there was substantial variation in impact across countries. For some countries (e.g. Chile, Norway, Finland, Lithuania and Korea), the drop in industrial activity over the period from February to May 2020 was limited (less than 10% in any month relative to the previous year). More heavily affected countries such as France and Italy – which also put in place stricter restrictions – experienced a fall in output of more than 30% during lockdowns. Third, there was also variation in rebound and recovery periods. While two-thirds of the countries were beginning to see a recovery in industrial production by May 2020, many of the countries that experienced a relatively muted impact in the first few months instead saw continued declines in production (e.g. Costa Rica, Korea, Denmark, the Netherlands and the Russian Federation). Similar patterns emerge for retail trade volumes (Figure 2.5), although the recovery in retail sales seems to have been relatively stronger than in industrial production. This may be owed partly to retailers reorganising activities towards online sales and contactless or low-contact delivery (OECD, 2020[12]; 2020[13]), but may also reflect the – often discounted – sale of existing inventories that had seen a backlog (Morgan, 2020[14]).

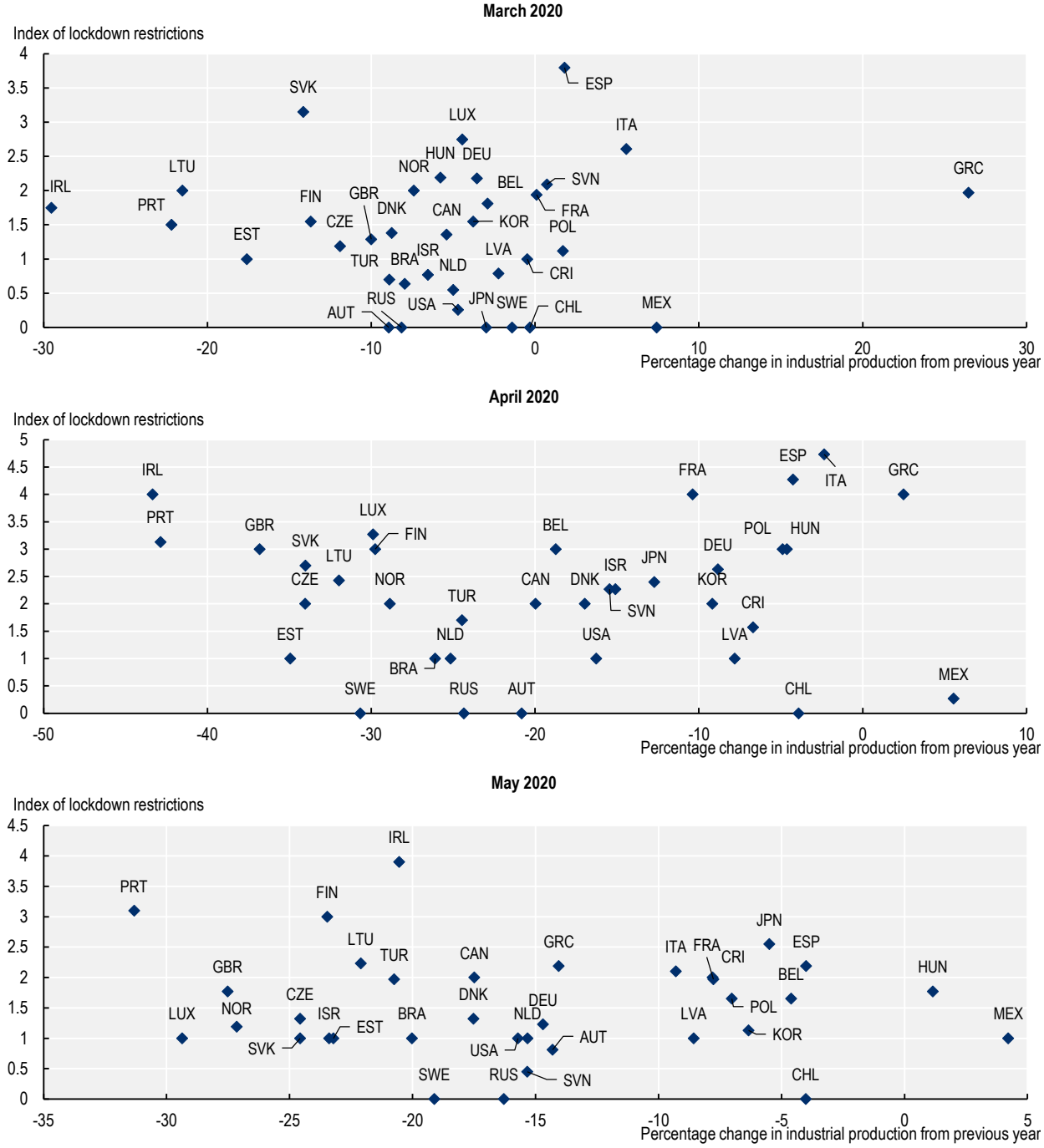
Figure 2.5. Percentage change in retail trade volume from previous year



Note: Percentage change in retail trade volume, relative to the same month the previous year. February 2021 instead of March 2021 for Slovenia.
Source: OECD calculations based on OECD (2021[11]), "Production and sales", *Main Economic Indicators* (database), https://doi.org/10.1787/data-00048-en (accessed on 7 June 2021).

StatLink https://doi.org/10.1787/888934260985

Figure 2.6. Severity of economic lockdown measures and fall in industrial production



Note: Monthly averages of the daily levels of the economic lockdown restrictions (y axis, expressed as a negative: lower numbers indicate more restrictive containment measures) plotted against percentage change in total industry production since the same month of 2019 (x-axis). A matching panel for February shows little variation, with data points clustered around the 0,0 point. For the sake of readability, each panel has its own scale.
Sources: OECD (2020[3]), *COVID-19 Policy Tracker* (database), https://www.oecd.org/coronavirus/country-policy-tracker/ (accessed on 6 August 2020); OECD calculations based on OECD (2021[11]), "Production and sales", *Main Economic Indicators* (database), https://doi.org/10.1787/data-00048-en (accessed on 5 March 2021).

StatLink https://doi.org/10.1787/888934261004

The duration and severity of government-imposed lockdowns have affected the extent and timing of the drop in economic activity. Figure 2.5 and Figure 2.6 provide an indication of the magnitude of these effects. Although production and sales picked up in the months following the first wave of the pandemic, the relaxation

of initial lockdowns did not imply a return to normality as many had hoped. By the beginning of 2021, many OECD countries were again under lockdowns. Resurgences of the virus continued to lead to re-imposition of containment measures at national or local levels. Economic activity had rebounded in only a few countries (Belgium, France, Ireland, Estonia, Israel, Norway, the Czech Republic, the United Kingdom and the United States), while still being substantially below business-as-usual in others (Greece, Italy, Latvia, Mexico, the Netherlands, Portugal and Slovenia). Initial impacts continued to propagate through the economy as prolonged uncertainty and sharp declines in consumer and business confidence restricted both investment and consumption demand, with adverse effects on productivity, innovation and entrepreneurship.

Evidence from previous, and less global, health crises indicates that the economic recovery period from COVID-19 is likely to be long. World Bank analysis (World Bank, 2020[15]) finds that the MERS, SARS, Zika and Ebola epidemics had long-lasting economic effects. Five years after the epidemics, labour productivity was estimated to be 6% lower, and output 9% lower, in affected countries, though total factor productivity was less affected. Comparability to the COVID-19 crisis is limited, however, as far fewer resources were mobilised to support economies through these previous crises.

Even in the absence of further periods of prolonged lockdowns, changes in consumption behaviour due to ongoing health concerns (Andersen et al., 2020[16]; Goolsbee and Syverson, 2020[17]) and the longer-term impacts of economic recession and uncertainty will reduce output and investment for some time. Concurrently, higher production costs associated with social distancing in the workplace, and a potential reduction in productivity and innovation due to required changes in work organisation and a move towards remote work (OECD, 2020[18]), are likely to further dampen economic output.[13] Certain changes – such as those having to do with work organisation, consumer behaviour, and social interactions – are also likely to be permanent to some extent. For example, many firms and workers have expressed an intention to maintain higher levels of telework in the post-pandemic future, which will not only have direct consequences for workers and firms themselves (OECD, 2020[18]), but also impact commercial property prices[14] and the local servicing industries that support urban centres, among other things. The acceleration of digital technology use and investment in related infrastructure and skills can also lead to higher productivity if accompanied by the right policies, as discussed in Chapter 5.

The activity of industries that have been most affected by distancing restrictions and consumer behaviour changes may be slow to recover, and changes to the location of workplaces and mix of jobs available may be long lasting (OECD, 2021[1]). While some of the long-term consequences are likely negative for some industries (e.g. reduced business travel, lower demand for office space and services catering to the needs of employees and firms on the premises), there are also positive demand shocks, boosting existing and newly emerging industries (e.g. videoconferencing tools, individual forms of mobility) (OECD, 2021[19]). Further, for the duration that the virus continues to circulate, it is unlikely that large-scale events or non-essential activities involving prolonged direct interaction between people will bounce back to pre-crisis levels.[15] Additionally, changes in behaviour – in particular lower levels of business travel – might have significant implications for global knowledge exchange and transfer (Coscia, Neffke and Hausmann, 2020[20]), which may have long-term consequences through reduced innovation.

The initial impacts of the crisis have been very heterogeneous across industries. In some sectors, large parts of economic activity have been able to continue, either through shifting to remote work or because they have been designated as essential industries. In others, activity has been severely curtailed. Many service sectors catering to the domestic market, which have traditionally helped to insulate economies from shocks (Hashiguchi, Yamano and Webb, 2017[21]), have been hit especially hard by social distancing requirements and restrictions on activity. Chapter 3 of this document relates structural characteristics at the industry level with the potential direct and indirect impacts of the crisis. It provides a framework for the analysis in the remaining chapters, which focus on country- and firm-level factors relating to: Business dynamics and financial vulnerabilities (Chapter 4), Supporting productivity through digital technologies (Chapter 5), Industrial and international connectedness (Chapter 6), and Inclusiveness across gender and skill groups (Chapter 7). This volume, in its entirety, presents a whole picture of the factors influencing economic resilience in the crisis.

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Notes

[1] Since the beginning of the COVID-19 crisis, the OECD has been providing support to governments on a range of topics to address the emerging health, economic and societal crisis. Data, analysis and recommendations are delivered via the OECD COVID-19 Hub (OECD[27]). The guidance includes information pertaining to short-term measures needed in affected sectors, with a specific focus on the vulnerable sectors of society, as well as analysis on the longer-term consequences and impacts of COVID-19. In addition, flagship OECD publications such as the *OECD Economic Outlook* (OECD, 2021[7]), the *OECD Science, Technology and Innovation Outlook* (OECD, 2021[19]), the *OECD Digital Economy Outlook* (OECD, 2020[28]) and numerous working and policy papers from directorates across the Organisation, have provided analysis and evidence to support governments in their efforts to design and implement policy supports and coordinated responses across countries.

[2] For more on this concern, see for example https://ccdd.hsph.harvard.edu/will-covid-19-go-away-on-its-own-in-warmer-weather/.

[3] Quick and decisive action has been required to effectively contain the virus, alongside a thorough assessment of the impacts of such actions on economies, firms and people. To counteract adverse impacts, extensive support measures were required in conjunction with restrictions. Early OECD work outlining the decisions regarding this trade-off can be found in OECD (2020[29]). More information on support measures is also in the next section of this chapter.

[4] Besides adverse economic effects, restrictions on economic and social activity have also had negative consequences on mental health. Unemployment and furlough due to restrictions are risk factors for mental ill-health (Colombo, 2021[24]), and mental health levels deteriorated globally in 2020 (Santé publique France, 2020[25]).

[5] See Bulman and Koirala (2020[26]) for further discussion of the OECD Policy Tracker database. See also Hale et al. (2020[22]) for a more recently updated policy tracker developed at Oxford University.

[6] For coverage of these policy strategies, see for example: https://www.businessinsider.fr/us/sweden-covid-19-policy-experts-too-early-judge-2020-7, https://www.euronews.com/2020/07/28/sweden-s-

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[7] See for example https://www.newyorker.com/magazine/2020/06/08/how-iceland-beat-the-coronavirus.

[8] See Bulman and Koirala (2020[26]) for details.

[9] See for example https://www.gov.uk/government/publications/build-back-better-our-plan-for-growth/build-back-better-our-plan-for-growth-html and https://www.whitehouse.gov/briefing-room/legislation/2021/01/20/president-biden-announces-american-rescue-plan/.

[10] About 50 million employees participated in job retention schemes across the OECD as of May 2020, roughly ten times as many as during the global financial crisis. See OECD (2020[4]) for details.

[11] Policy measures supporting each area are, country-by-country, are available in detail at https://www.oecd.org/coronavirus/country-policy-tracker/.

[12] Information from: https://www.washingtonpost.com/world/2021/03/10/coronavirus-stimulus-international-comparison/.

[13] In the longer term, some of these costs might be offset if firms are able to reduce the amount of office space they require, economise on travel and transport costs, or attract better-matched workers due to having greater flexibility in the location of work. However, these benefits can be expected to take some time to materialise, and will depend strongly on the characteristics of the firms and their ability to successfully manage the move to remote work.

[14] See for example Gupta et al. (2021[23]).

[15] https://www.economist.com/graphic-detail/2020/08/08/covid-19-seems-to-have-changed-lifestyles-for-good?fsrc=scn/fb/te/bl/ed/90economy120gastronomycovid19seemstohavechangedlifestylesforgoodgraphicdetail&fbclid=IwAR3aaxU8ZcCv4GNFNXtLvOyi1BDwE9n5u5ZJTDZNAgZOzpL2JwXgQEaMK2I (accessed on 19 August 2020).

3 Resilience across industries

This chapter identifies industry characteristics that can help explain observed differences in resilience to the COVID-19 economic shock. It provides a framework for policy makers to analyse the ability of industries to withstand the shock and rebound after the crisis, aiding in understanding the heterogeneity of the impact and facilitating a targeted policy response. The chapter focuses first on industries' ability to continue operating in the short run, based on the extent that their functioning is essential or can be done through telework. It then evaluates pre-existing characteristics that determine the extent that firms and workers in different industries are affected beyond the direct consequences of restrictions on economic activity, distinguishing between factors relating to demand, liquidity and credit. In an annex, a dashboard presents the identified channels as an indicator set, for direct comparison of the potential extent industries are affected by – and their resilience to – the economic shock.

Key findings

- **Industry characteristics can help to explain the propagation of economic shocks, and consequently to deliver targeted and more effective economic support measures – both during a crisis, and to foster long-term resilience**. The COVID-19 crisis impacted firms and workers differently depending on their industry, and the degree to and ways in which they are vulnerable to economic shocks like the one resulting from the pandemic depends significantly on industry characteristics. An industry perspective can therefore help governments anticipate concerns affecting firms and workers in specific parts of the economy.
- **The way in which firms produce and supply, demand patterns and consumer behaviour, and firms' financial positions are key determinants for the type of support needed to keep viable businesses afloat**. Policy should consider the extent to which firms and industries are affected across these three broad dimensions, both in the immediate term and during the recovery period. These factors can determine what type of support is needed to keep viable firms in an industry afloat – for example, governments may have to address constraints related to the financing of intangible investments, differing to a large extent across industries, to stimulate the recovery.
- **Whether firms in industries deemed non-essential can conduct business through telework – and for how long – is a major determinant for their survival**. Around 31% of workers across the OECD could do their jobs via telework, but telework rates varied widely by industry, with 70% of jobs being teleworkable in IT and financial services but fewer than 20% in the hospitality, agriculture, and construction sectors. The ability to shift to telework is also often only a partial solution. For instance, if firms are able to convert employees to telework, but cannot supply their product or service remotely. Portions of a firm's supply chain may also be cut off, even if the firm itself can function remotely.

Introduction

The COVID-19 crisis is different from previous economic crises and shocks in several ways, as outlined in Chapter 2. Importantly, it affected economic players differently – not only between countries, but also between industries and sectors. The pandemic triggered a severe supply-side shock through the immediate and severe containment response, with partial or complete shutdowns of certain types of economic activity implemented in most countries.[1] However, most of these shutdowns exempted industries deemed as essential, and other industries could largely continue operating through digital technologies such as telework or e-commerce. In addition to these immediate impacts, recessionary effects and changes to consumer behaviours as a result of restrictions and health concerns alter demand patterns – again affecting industries differently. Lastly, firms vary substantially in their ability to cushion the financial shocks induced by the COVID-19 crisis; this ability can also be related to underlying industry characteristics.

Different types of economic activity may thus be more vulnerable or more resilient to a crisis like the COVID-19 outbreak, and the ensuing containment response and restrictions on activity. Pre-existing characteristics of industries may amplify or mitigate the impact of the economic shock. The goal of this chapter is thus to identify industry characteristics that affect resilience to different aspects of the COVID-19 shock, in order to provide an industry-based assessment of the potential affectedness of firms and workers in industries with different underlying structural characteristics.

Industry characteristics that are relatively similar across countries can help explain the propagation of the COVID-19 economic crisis, and accordingly, in developing targeted and effective policies to tackle it. An industry perspective provides a framework of influencing channels, which also serves as a basis for the

analysis in the subsequent topical chapters. How shocks might play out at the country level, and across different types of firms and workers that are differently exposed to the impacts of the pandemic, depending on their industry and the nature of production (e.g. remote work, supply through e-commerce, or due to being essential) will be the focus of these chapters.

The industry perspective is also relevant for policy, as different types of policy and forms of support are likely to be relevant to varying degrees for different industries, depending on the exposure to the shocks and the types of risk that industries face. Through an industry-centred analysis, this chapter identifies a range of pre-existing factors (e.g. the tangibility of the asset base to bridge liquidity constraints, or the extent to which supplying goods and services relies on face-to-face customer contact) that vary to a great extent between industries and have affected how firms and governments responded to the unprecedented shock induced by COVID-19. Many of these factors continue to be relevant for further adjustments as the pandemic continues and economies move into the recovery phase.

The chapter is organised by three broad mechanisms through which the pandemic has affected industries. First, the initial impact on production and provision of goods and services (i.e. the ability of firms in different industries to produce and supply in the short run). Second, the indirect demand implications (i.e. exposure to demand changes). Third, liquidity and credit constraints (i.e. the likelihood of firms in different industries encountering financial difficulties, both in terms of immediate liquidity needs and longer-term investment funding).

This chapter refrains from providing an aggregate assessment of how the industry effects will combine and play out at the country level, acknowledging the fact that many other factors will shape the overall impact in different countries. The country perspective is covered in the topical chapters in the remainder of this volume, which aim to incorporate the most important of these factors, focusing on issues related to the business sector (comprising both workers and firms) such as business dynamics, innovation, productivity, technology, and skills.

Nevertheless, to facilitate a comparison – at the level of the aggregate economy – of factors that are important in shaping the effects of the crisis across industries, Annex A provides a dashboard of the identified channels. They are presented in the form of indicators at the industry level, with the aim of comparing their importance for single industries. Annex B also provides an overview of the relative size of industries across countries, both in terms of value added and employment, to allow policy makers to gauge the importance of individual channels depending on the importance of the affected industries in single economies.[2] Summarising the industry channels in a dashboard also enables an easier assessment of how industries are likely to be affected differently, which may indicate the need for different types of policy support in different sectors.

Ability to produce and supply in the short run

Two of the most critical and unique features of the COVID-19 pandemic have been the immediacy of the containment response, with many countries moving from normal operating conditions to a state of lockdown almost overnight, and the supply-side shock this induced, with large variations across sectors. As many governments moved to rapidly close borders and restrict mobility, sectors and firms with heavy reliance on mobility (e.g. through tourism inflows) experienced a sharp reduction in demand. Confinement measures in domestic labour markets in turn prevented activities that could not be undertaken by teleworking in all but a few designated essential industries. Even where lockdown measures were weaker, changes in consumer behaviour still occurred in many countries, as individuals acted to protect their own health by altering how they accessed and purchased essential goods and services (e.g. moving to online ordering and interactions), and purchasing fewer goods that were considered non-essential, thereby lowering demand (Andersen et al., 2020[1]; Goolsbee and Syverson, 2020[2]).

This section provides an overview of the ability of industries to produce and supply goods and services, and potential disruptions to supply chains due to restrictions on the production of intermediate inputs. This

reflects both the specific measures put in place by governments to protect public health, and changes in behaviour adopted by individuals and firms, such as encouraging remote work beyond the confinement period or reducing consumption of activities requiring physical proximity.

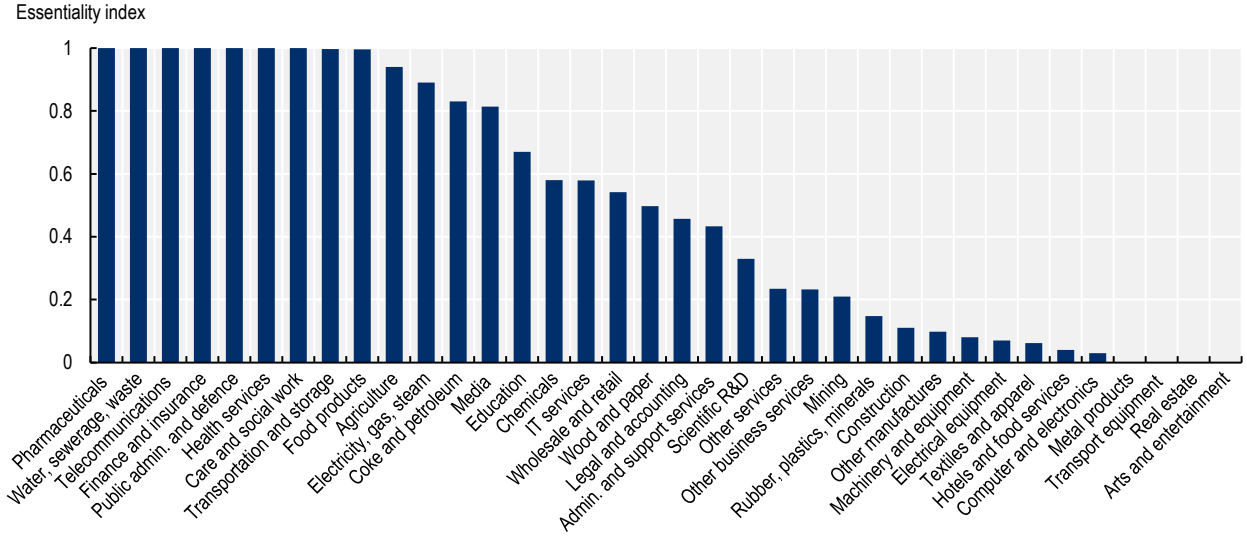
Essential industries

As governments shut down entire sectors of the economy during the most serious periods of the health emergency, they explicitly authorised economic activities deemed essential[3] to continue operating with weaker restrictions (e.g. workers were permitted on-site but needed to meet new safety requirements). While both the severity of confinement measures and the specifics of essential industry definitions varied across countries, the latter tend to be faced with a similar set of defining conditions. Economic activities deemed essential and legally authorised to continue operating during shutdowns can be placed into three categories:

- activities forming part of the health response to the crisis (e.g. health services, R&D, pharmaceutical manufacturing and retail pharmacies)
- activities forming part of the supply chain for basic necessary goods and services (e.g. farming, food processing and grocery retailers)
- activities related to critical systems and infrastructures whose incapacity would have a debilitating impact on security, safety or health (e.g. energy production; public administration).

All else equal, these activities are expected to be relatively sheltered from the direct impact of measures aimed at containing the spread of COVID-19, making them structurally more resilient in the short run. In some cases, output and employment have even risen in essential industries such as healthcare and food retail, as demand shifted from other areas.[4] However, the COVID-19 crisis can still create significant disruptions within such essential industries even though they are relatively sheltered overall (e.g. in parts of the retail industry) (see Box 5.3).

Figure 3.1. Level of economic essentiality, by industry



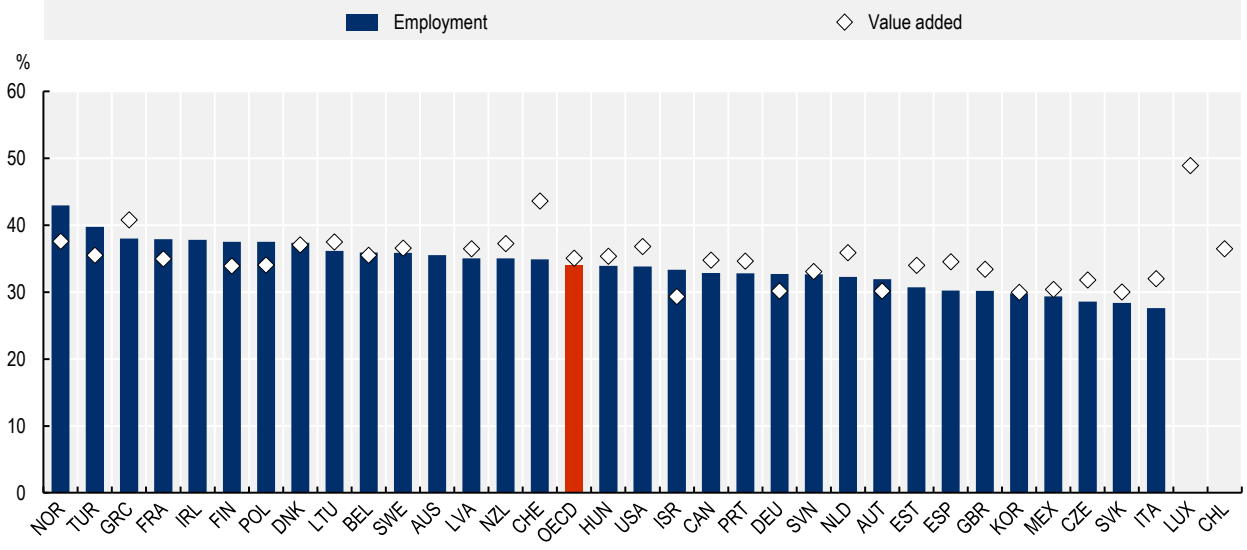
Note: Published NACE two-digit indicators have been aggregated to SNA A38 level for each country based on employment shares taken from the OECD *Structural Analysis (STAN) Database* (OECD, 2020[3]). The cross-country median of the resulting country-industry value is then taken as the Essential Industry indicator. This indicator is a continuous variable between zero and one, where higher values indicate higher essentiality, and thus less direct impacts from the initial shocks. The analysis is based on three countries: Germany, Italy and Spain.
Source: OECD calculations based on Fana et al. (2020[4]), "The COVID confinement measures and EU labour markets", https://doi.org/10.2760/079230.
StatLink https://doi.org/10.1787/888934261023

Figure 3.1 provides an overview of the extent to which industries are deemed essential in the context of the COVID-19 pandemic,[5] based on an index constructed by the European Commission's Joint Research Centre (JRC) (Fana et al., 2020[4]). The JRC list assigns an "essentiality" index for each NACE[6] two-digit industry, based on a review of COVID-19-specific legislation passed by Italy, Spain and Germany during the first wave of the pandemic. While the degree, focus and implementation of containment measures has differed across countries and over time (see Chapter 2), this index is taken as a broad indicator of the likelihood that different sectors were permitted to also continue operating in other countries.

Differentiating between essential and non-essential industries is useful for helping to understand and contextualise the role of other factors in mediating the impacts of the crisis. For example, remote work has been critical to continued operations throughout the economy, but the impact of this mitigating factor is most relevant in the group of industries that are restricted from their usual operations (i.e. those that are less essential). For example, transport equipment manufacturing is likely to have been affected more strongly than real estate, even though both were deemed to be largely non-essential in the short term, as reported in Figure 3.1. This is because many of the tasks involved in the real estate industry can be performed remotely while the ability of manufacturing to continue producing is more limited.

Figure 3.2 shows the share of employment and value added accounted for by essential industries at the country level. Values for employment range from 42.9% in Norway to 27.6% in Italy, and the combined share of value added in the same industries is quite similar in most countries.

Figure 3.2. Share of employment and value added in essential industries



Note: Essential industries defined as having an index value above 0.8 on the essential industry indicator. These include Agriculture, Food products, Coke and petroleum, Pharmaceuticals, Electricity, gas and steam, Water, sewerage and waste, Transportation and storage, Finance and insurance, Media, Telecommunications, Public administration and defence, Health services, Care and social work. Average refers to the unweighted average across the reported countries. Data refer to 2018 except for: Australia, France, Germany, Latvia, Lithuania, Luxembourg, Norway, Portugal, Switzerland and the United Kingdom (2017); Chile, Greece, Israel and Slovenia (2016); Sweden and Turkey (2015); Canada and Ireland (2014).

Source: OECD calculations based on OECD (2020[3]), *Structural Analysis (STAN) Database*, http://oe.cd/stan (accessed in December 2020).

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Ability to work remotely

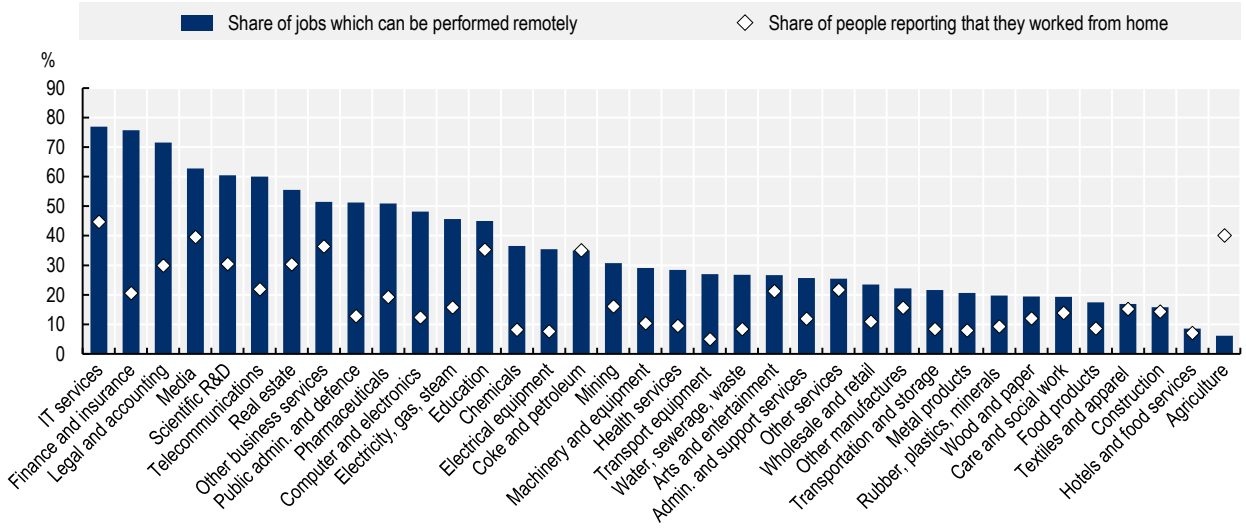
One aspect of economic resilience that has been crucial throughout the pandemic is the extent to which activity can shift rapidly from on-site to remote work. As business premises had to close their doors and workers were confined to their homes, digital tools have become indispensable for continuing work and

connecting people. The ability to work remotely depends on a number of different factors at the worker, firm, and country levels. These include the existence and availability of appropriate technology and communications infrastructure, as well as worker skills and the types of tasks and activities required on the job, as discussed in more detail in Chapter 5.

This argument is supported by recent OECD analysis (OECD, 2021[5]) that uses disaggregated sectoral data to investigate the link between the decline in firm entry and structural sectoral characteristics. It shows that industries with a higher information and communication technology (ICT) task content of jobs have experienced significantly lower declines in business registrations during the second quarter of 2020. The latter result may be related to the higher propensity to telework in industries that require more ICT tasks from workers, as ICT content and ability to telework are empirically strongly correlated (as explored in more detail in Chapter 5). The importance of the industry dimension is also evidenced by a lower decline in business activity in high-telework industries, compared to other industries (OECD, 2020[6]).

OECD analysis using a task-based approach to evaluate data from the Programme for the International Assessment of Adult Competencies (PIAAC) estimates that an average of 31% of workers in the OECD could work from home (Espinoza and Reznikova, 2020[7]). However, the cross-sectoral disparity of telework potential is very high, with more than 70% of jobs in digital intensive services sectors such as IT and Finance being considered viable for telework, compared to fewer than 20% in Hotels and Restaurants, Agriculture, Construction, and a number of manufacturing sectors (Figure 3.3).[7] This implies that the industry composition of the economy is an important factor in how well countries can be expected to maintain production through the crisis.

Figure 3.3. Task-based indicator of telework potential vs. pre-crisis observed teleworking



Note: Espinoza and Reznikova (2020[7]) task-based measure of potential telework, aggregated to A38 industries. This measure classifies an individual job as teleworkable if the worker reports that their job organisation is highly flexible (six questions on flexibility in organising and planning their own activities), involves daily use of ICT (five questions on specific tasks including e-mail, use of word processors and spreadsheet software), and seldom or never involves long periods of physical work. Jobs are classified as telework compatible if they have at least one indicator within each of the three domains which is compatible with teleworking. An analysis of the sources of variation in the potential telework measure finds that industry dummies account for 63% of the total variation in the indicator across OECD countries, with country dummies accounting for a further 9%, implying that the variation in the index is indeed structural, in the sense of relating to the production methods of specific industries. Share of people reporting that they worked from home at least several times a month in Eurofound (2017[8]).

Sources: Espinoza and Reznikova (2020[7]), "Who can log in? The importance of skills for the feasibility of teleworking arrangements across OECD countries", https://doi.org/10.1787/3f115a10-en; OECD calculations using Eurofound (2017[8]), *European Working Conditions Survey, 2015* (data collection), https://doi.org/10.5255/UKDA-SN-8098-4.

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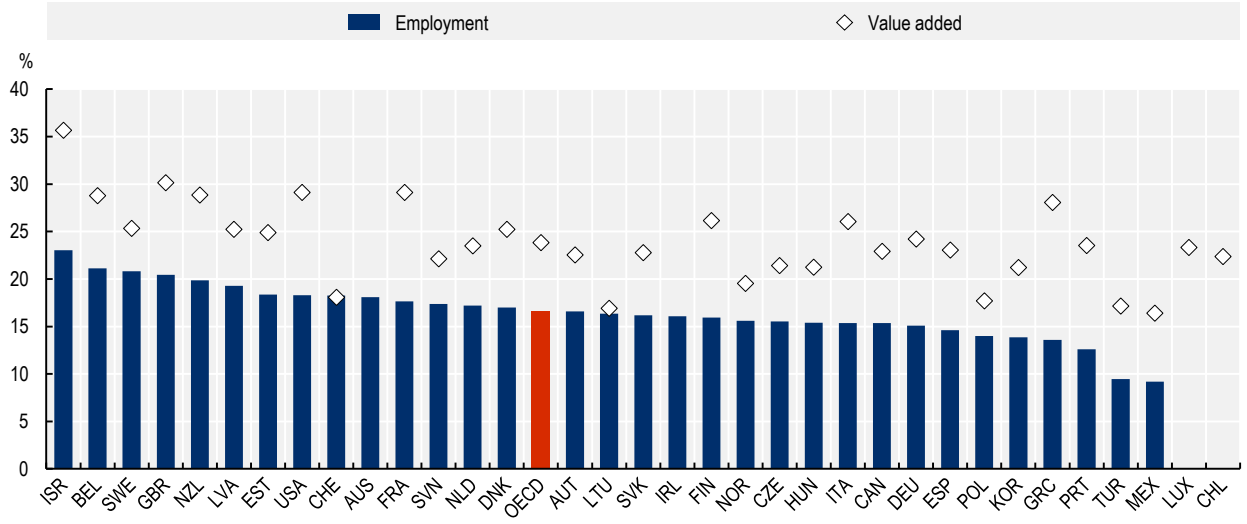
The cross-industry patterns in telework potential predicted on the basis of work tasks are closely correlated with actual observed telework activity in Europe in 2015. However, actual telework experience before the pandemic was far below the estimated potential level.[8] Besides required physical presence, factors that are associated with lower levels of telework at the firm level include a lack of relevant technical skills and management practices (OECD, 2020[9]), as further analysed also in Chapter 5 of this report.

Finally, it is important to note that even in industries where a large proportion of workers can work remotely, the extent to which remote work can wholly substitute for normal operations remains limited in most cases. An example of this is legal services that deal with highly confidential issues, which cannot be conducted remotely for security reasons. Another example is the real estate sector: while it is possible to close an existing real estate sale through online communications, it is less likely that individuals or firms will be willing to enter into a contract based solely on digital inspection of a property. This suggests that in some instances, only a subset of the tasks critical to an occupation or to an industry can be performed remotely. As such, while the ability to telework has been key to reducing the spread of the virus and maintaining economic activity in the short run, even industries with high telework potential may be unable to sustain functional operations in the long term, and may also require significant reorganisation to conduct even limited activity while many staff work remotely.

While the share of employment in non-essential but "teleworkable"[9] industries is relatively low in most countries (ranging from 9.2% in Mexico to 23.0% in Israel, Figure 3.4), these industries tend to account for a higher share of value added due to their relatively high levels of labour productivity (see also Chapter 7 on differential exposure and inclusiveness across skill groups).

Figure 3.4. Share of employment and value added in non-essential industries with high telework potential



Note: Non-essential industries defined as having an index value below 0.8 on the essential industry indicator. High telework potential defined as more than 40% of jobs classified as able to be worked remotely. These include IT services, Real estate, Legal and accounting, Scientific R&D, Other business services, Education. Average refers to the unweighted average across the reported countries. Data refer to 2018 except for: Australia, France, Germany, Latvia, Lithuania, Luxembourg, Norway, Portugal, Switzerland and the United Kingdom (2017); Chile, Greece, Israel and Slovenia (2016); Sweden and Turkey (2015); Canada and Ireland (2014).

Source: OECD calculations based on OECD (2020[3]), *Structural Analysis (STAN) Database*, http://oe.cd/stan (accessed in December 2020).

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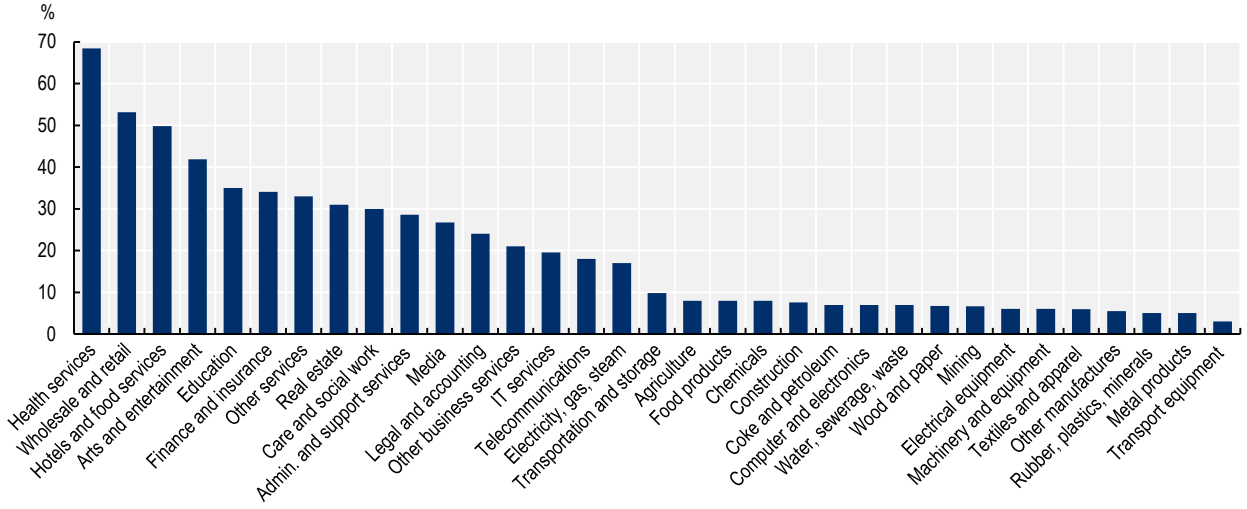
Ability to supply remotely

Although many industries have a high percentage of jobs that can be done remotely at least in part, this does not automatically imply that goods and services produced remotely can also be supplied to customers. The ability of firms to continue operating during periods of confinement depends not only on whether employees can continue to work, but also on whether customers can continue to purchase and obtain the produced goods and services.

E-commerce has played an important role in allowing firms to shift to contactless modes of sale. Recent OECD work (OECD, 2020[10]) finds that the COVID-19 crisis has led not only to an increase in overall e-commerce, but also to an expansion to products which were previously not typically purchased online, in particular everyday staples such as groceries.[10] However, shifting to e-commerce is not an option for all types of products and firms. In particular, in many service sectors, the production and supply of a service are closely intertwined.

Figure 3.5. Share of employment in occupations involving regular face-to-face contact with customers



Note: Share of jobs in each industry that involve face-to-face contact with customers. A job is defined as involving face-to-face contact if job tasks include tasks such as dealing with external customers, assisting and caring for others, or providing consultation and advice to others, and face-to-face communication occurs at least several times a week. Indicators constructed by matching the tasks associated with different occupations in O*NET, then matching these to the occupation structure of NAICS17 three-digit industries using the US Bureau of Labour Statistics industry-occupation matrix for February 2020. Koren and Petö's three-digit industry-level measures have been aggregated to SNA A38 industries to match the book definition. The reported Agriculture industry does not include Agriculture, but does include Forestry and logging; Fishing, hunting and trapping; and Services to agriculture. Three A38 industries could not be matched to the three-digit NAICS information: Pharmaceuticals, Scientific R&D, Public administration and defence.

Source: Measures from Koren and Petö (2020[11]), "Business disruptions from social distancing", https://cepr.org/sites/default/files/news/CovidEconomics2.pdf, aggregated to A38 industry classification.

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One important determinant of the ability to switch to e-commerce is the extent to which the purchase of a good or service relies on face-to-face contact. Figure 3.5 shows the extent to which different industries usually rely on face-to-face interaction with customers (Koren and Petö, 2020[11]), which can be compared with the proportion of jobs that can be done remotely. Even in service industries where remote work is feasible, such as IT services, Finance, Marketing and other business services, and Education, a substantial number of activities rely not only on the ability of firms and workers to switch to online modes of production, but also on the ability of consumers and households to shift towards online modes of identifying, ordering, and consuming goods and services (an issue elaborated on in Chapter 5). Moreover, as restrictions on

economic activity are relaxed, industries that deal directly with customers, as well as the upstream industries supplying them, face a delayed and gradual recovery in demand. This is due to being subject, directly and indirectly, to longer or repeated periods of restrictions in many countries and because consumers may continue to limit activity in order to protect their own health.

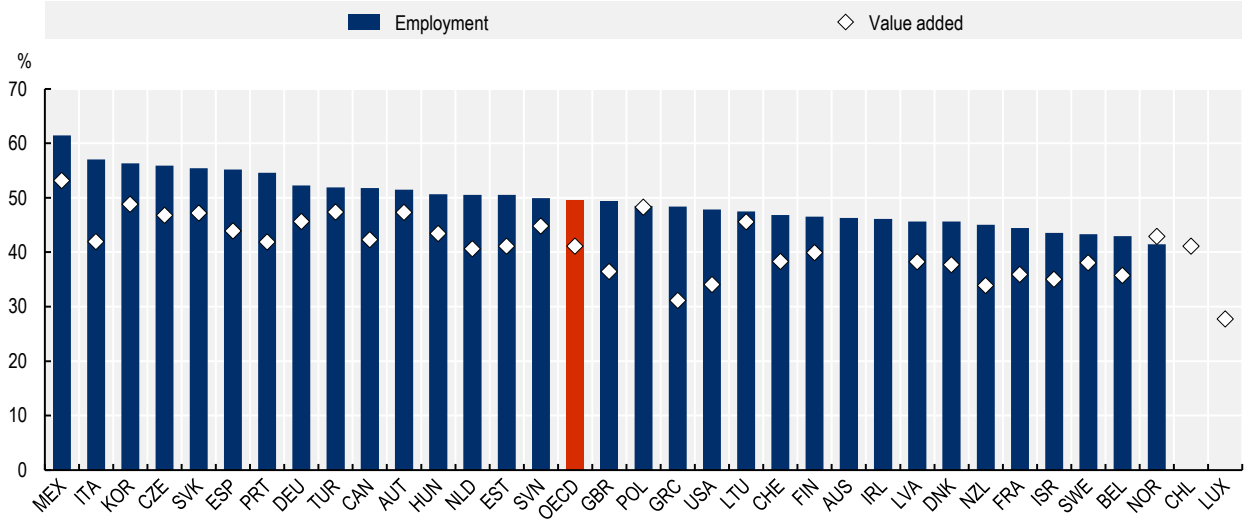
Recent evidence (OECD, 2021[5]), focusing on a subset of five OECD countries (Belgium, Finland, the Netherlands, Portugal, and the United States), supports this hypothesis: the decline in entry during the first period of national lockdowns – in the second quarter of 2020 – was more pronounced in industries in which occupations involving more regular face-to-face contact with customers account for a larger share of total employment, based on the same data as the paragraph above (Koren and Petö, 2020[11]).[11]

The remaining industries that are neither essential nor teleworkable, and do not rely heavily on face-to-face contact with customers, are those in which production requires a physical on-site presence (e.g. Manufacturing industries, Mining, Construction, Wholesale and retail trade).

Both types of non-essential industries with low telework potential – those relying on face-to-face contact and those requiring on-site presence – were heavily affected by the initial impacts of the crisis, and make up a sizeable share of employment in most economies (Figure 3.6).

Importantly for policy making in the post-COVID-19 recovery, these industries are also particularly vulnerable over the medium to long term, as they are unlikely to be able to return to normal activities for the duration of the pandemic or beyond. Thus, a careful evaluation of longer-term impacts is required, whereby it is important to distinguish between effects stemming from continued restrictions on production due to social distancing rules, recessionary effects due to demand drops through reduces incomes, and structural changes in demand due to crisis-induced changes in preferences.

Figure 3.6. Share of employment and value added in non-essential industries with low telework potential



Note: Essential industries defined as having an index value above 0.8 on the essential industry indicator. Low telework potential industries defined as having an estimated share of employment less than 40% in jobs which can be worked remotely. These include Mining, Textiles and apparel, Wood and paper, Chemicals, Rubber, plastics and minerals, Metal products, Computer and electronics, Electrical equipment, Machinery and equipment, Transport equipment, Other manufactures, Construction, Wholesale and retail trade, Hotels and food services, Administrative and support services, Arts and entertainment, Other services. Average refers to the unweighted average across the reported countries. Data refer to 2018 except for: Australia, France, Germany, Latvia, Lithuania, Luxembourg, Norway, Portugal, Switzerland and the United Kingdom (2017); Chile, Greece, Israel and Slovenia (2016); Sweden and Turkey (2015); Canada and Ireland (2014).
Source: OECD calculations based on OECD (2020[3]), *Structural Analysis (STAN) Database*, http://oe.cd/stan (accessed in December 2020).
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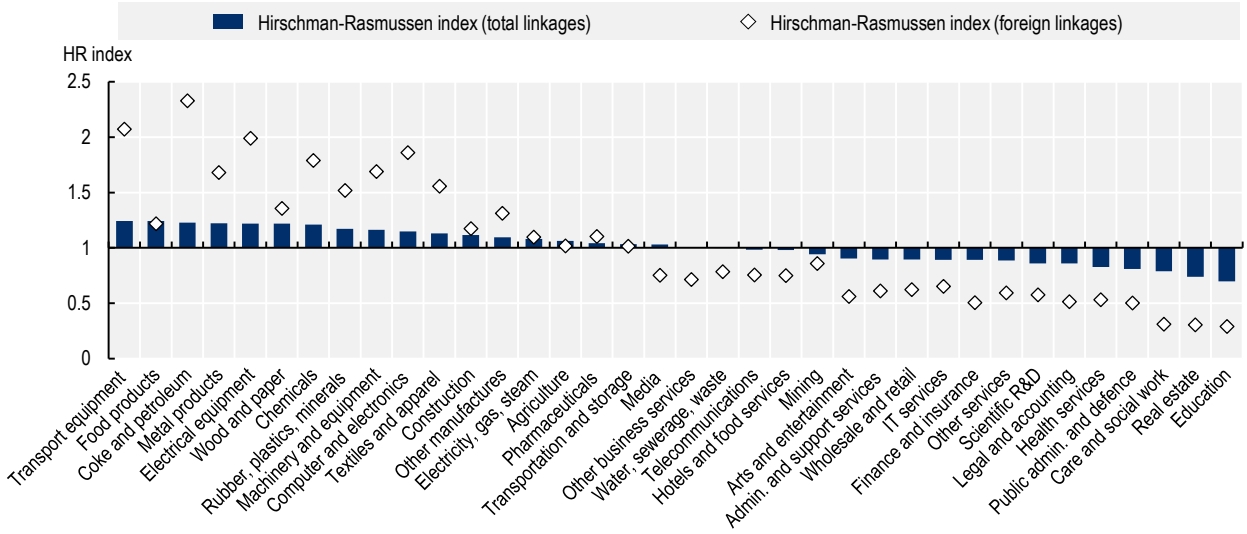
Potential supply chain disruptions

Another aspect of production affected by prolonged and repeated periods of confinement and lockdown across countries is the ability of firms to source intermediate inputs. The role of supply chains in the transmission of the crisis is complex and depends on a range of factors, including the extent of the pandemic and associated restrictions on activity in source countries, transportation methods (air vs. surface freight), and the degree of substitutability of inputs. Many of these factors are discussed in more detail at the country level in Chapter 6.

One simple proxy for exposure to potential supply chain disruptions is the extent to which different industries rely on intermediate goods from other industries.[12] Given that some industries continued to operate while others had to shut down completely, the potential for disruptions is higher when intermediate inputs are sourced from a different industry than the one in which the downstream firm is active. A measure of the degree of backward and forward linkages in the economy is provided by the Hirschman-Rasmussen index. This measure is normalised within each country, such that an index value above one implies that the industry has above average reliance on other sectors for providing intermediate inputs.

Figure 3.7. Hirschman-Rasmussen index of total and foreign backward linkages



Note: "Total" = foreign and domestic combined. The Hirschman-Rasmussen indexes (HR) provide information about the backward and forward linkages in the economic system considering its productive structure. The HR index is normalised to the average industry in each country, such that index value above one implies that the industry has above average reliance on other sectors for providing intermediate inputs. An analysis of the sources of variation of the index finds that industry dummies account for 76% of the total variation in the index across OECD countries between 2005 and 2015, implying that the variation in the index is indeed structural, in the sense of relating to the production methods of specific industries. The measure reported is averaged over years at the country level for 2013-15, then reported as the unweighted average across 37 OECD countries.

Source: OECD calculations based on OECD (2018[12]), *Inter-Country Input-Output (ICIO) Database*, http://oe.cd/icio (accessed in May 2020), following the methodology of Guilhoto, Sonis and Hewings (2005[13]).

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Figure 3.7 shows the Hirschman-Rasmussen index for each industry, distinguishing between all linkages (domestic and foreign) and foreign linkages only, indicating the extent to which the industry relies on intermediates from abroad. While manufacturing industries and construction tend to rely quite heavily on intermediate inputs from other industries, the opposite is true for many service industries. The "benchmark" group of industries, with close to average level of backward linkages, includes services such as Water, sewerage and waste, Telecommunications, and Media, as well as Transportation and storage and Hotels and food services. In most industries, looking specifically at foreign linkages accentuates the existing

relationships and ranking, with a few exceptions. In particular, while Food products and Wood and paper manufacturing tend to be highly reliant on other industries for their inputs, these links are mainly domestic. This may provide some degree of protection from global supply chain disruptions, especially those related to cross-border transport bottlenecks or to difficulties accessing inputs from abroad due to mismatch in the timing of lockdowns across countries.[13]

Chapter 6 provides a more in-depth discussion of international connectedness, including through global value chains. The chapter complements the industry perspective presented here, and also highlights country-level factors – such as economic centrality – that play a role in the extent to which economies are interconnected as a whole.

Indirect demand implications

The COVID-19 crisis will continue to affect the demand side of the economy beyond the initial impacts of the health crisis and associated containment measures, through decreased household income and wealth and increased economic uncertainty. The global nature of the crisis, and ongoing restrictions on international travel, imply that export volumes will continue to be affected alongside domestic consumption. The extent to which industries are affected differently by these indirect effects depends on the magnitude of the fall in the different components of demand, and industries' direct and indirect exposure.

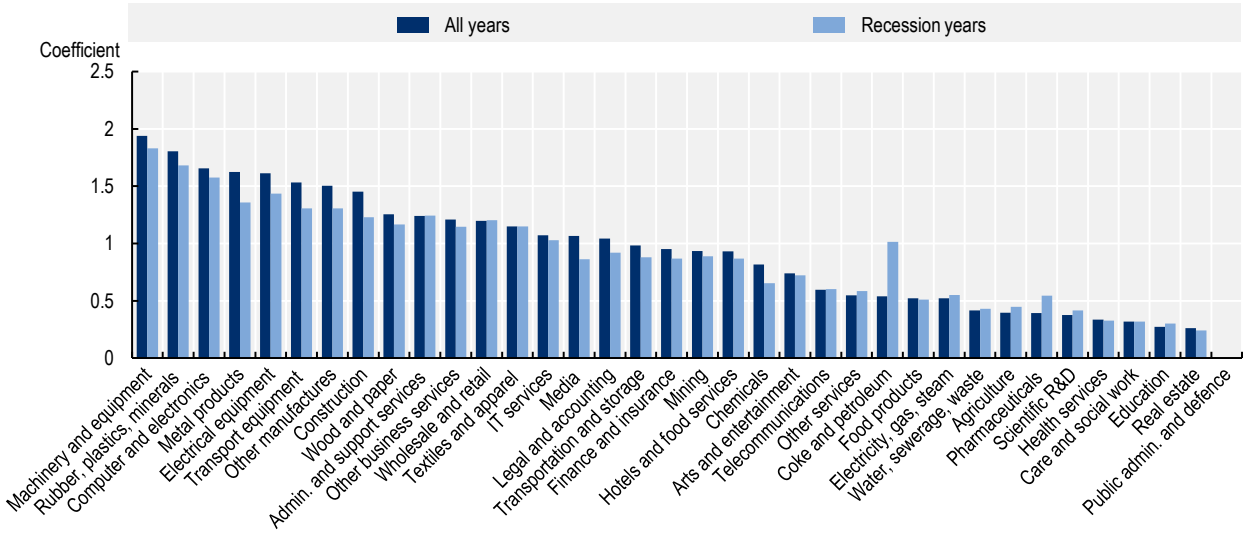
This section provides an initial assessment of the relative strength of indirect demand shocks across industries, by disentangling some of the main components of demand – investment, household consumption, government consumption and exports – that can be expected to evolve differently and may be targeted by different policies. This approach complements OECD work estimating fluctuations in demand for specific industries in direct response to measures aimed at addressing the health crisis (OECD, 2020[14]), and provides a sectoral lens to complement macro-economic scenarios.

Cyclicality of demand

Beyond the initial impact of the containment measures on the ability to produce and supply, industries also differ in terms of the extent to which the demand for their products varies in response to changes in current and expected incomes. In response to an actual or expected decrease in income, households cut back on spending. This is especially relevant for purchases of luxury goods and consumer durables, which typically have a high elasticity of demand based on income. However, even beyond this drop, firms that produce basic items will still be affected, due to a fall in business confidence and increased uncertainty about the future. These factors reduce firms' willingness to invest, even if they have escaped relatively unscathed from the direct impacts of the crisis.

A simple proxy measure of the sensitivity of demand at the industry level is the correlation between industry value-added growth and national gross domestic product (GDP) growth, shown in Figure 3.8. Essential services to the household sector, such as Health, Education, and Care and social work (all of which have a significant degree of government funding in most countries), core utilities such as Electricity and gas, and Water, sewerage and waste, and the production of food and related items (Agriculture, Food and beverage manufacturing) tend to be relatively insulated from fluctuations in aggregate demand.[14] In contrast, most other manufacturing industries, and particularly those that produce durable investment goods (such as Machinery and equipment), experience much stronger fluctuations through the business cycle and therefore tend to suffer more during recessions.

Figure 3.8. Correlation between industry value-added growth and national GDP growth



Note: The cyclicality indicator is constructed by using the industry-specific coefficients from a regression of growth in industry-level value added on growth in aggregate GDP, controlling for country-industry fixed effects, and therefore controlling for the industry relative size in the country's economy. Public administration and defence is the reference industry – its coefficient is zero by definition and other industries are expressed relative to it. A larger coefficient indicates greater cyclical variation in industry output associated with changes in aggregate production. While this indicator provides a simple proxy for the relative demand effects of recessions on different industries, it may also be reflective of the industrial structure of OECD countries, with supply shocks in large sectors having a greater influence over aggregate GDP than in smaller sectors. This indicator is computed based on 35 OECD countries (Australia, Austria, Belgium, Canada, Costa Rica, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States) over the period 1970-2017.

Source: OECD calculations based on OECD (2020[3]), *Structural Analysis Database (STAN)*, http://oe.cd/stan (accessed in May 2020).

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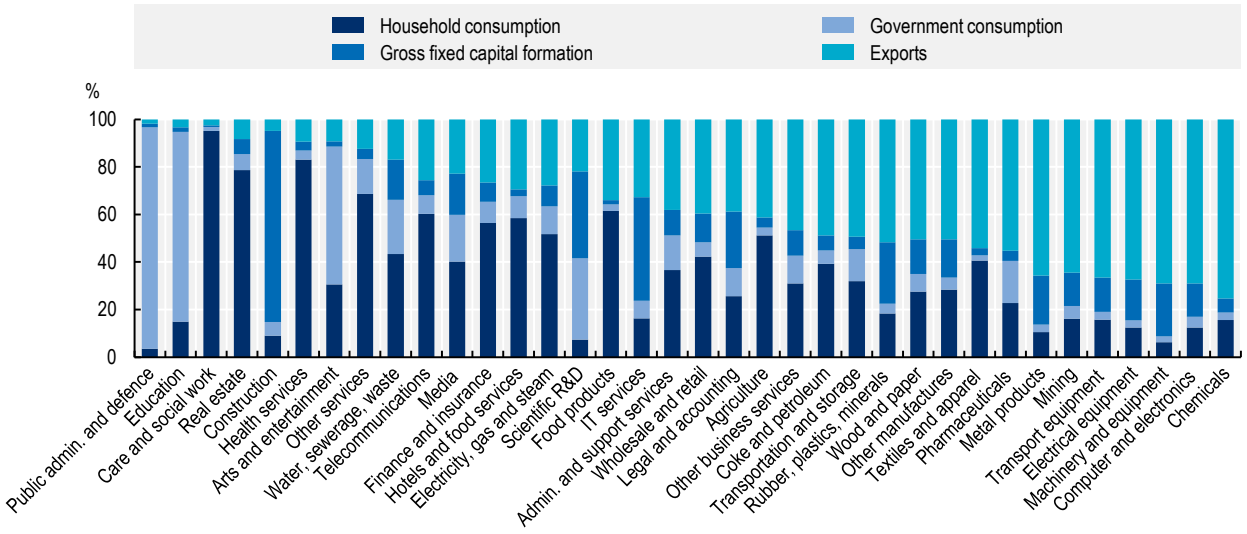
Destination of industry output

A second factor determining aggregate demand for products at the industry level is the final destination of those products; that is, whether the industry primarily serves households, other businesses, government, or foreign demand. This is particularly relevant in the case of COVID-19, as governments step in to provide different forms of support. For example, while demand for investment goods can be expected to drop relatively more than for consumption goods, policies that ease firms' borrowing constraints may help to mitigate the reduction in investment spending that is due to financing constraints rather than reduced profitability of investment projects and increased uncertainty. Similarly, where industries are primarily serving private demand, government support to employment and household incomes can dampen the strength of the demand shock. Figure 3.9 shows the share of value added accounted for by the final destination of each industry's output.

Fluctuations in output of investment- and export-heavy industries are more closely linked to the business cycle than those that serve governments or households. This includes investment both in physical goods (e.g. the Construction sector) and also in intangible assets (e.g. IT services, Legal and accounting, and Scientific R&D that feed into final investment). Trade flows tend to contract more strongly than GDP, and the global nature of the COVID-19 pandemic suggests that export-reliant sectors – particularly those supplying investment or durable consumer goods (e.g. Electrical equipment, Machinery and equipment manufacturing) – may also be strongly affected. In contrast, industries which primarily serve the public sector are expected to be relatively less affected by medium-term demand fluctuations, as governments step in to support core services and infrastructure spending.[15]

Figure 3.9. Share of industry value added by final destination



Note: Share of household consumption, exports, gross fixed capital formation ("investment"), and government consumption in the final destination of value added for the industry. For example, the share of exports – just like the other components of demand – captures both products which are directly exported, and value added which is embodied in export goods. Data available for 2005-15. Reported data is averaged over the period 2013-15 for each country, then an unweighted average is taken across 37 OECD countries. Industry composition accounts for 77% (household), 62% (exports), 73% (GFCF), and 84% (government consumption) of the total variation in these shares across OECD countries between 2005 and 2015, suggesting that cross-time and cross-country variation is moderate compared to industry variation.
Source: OECD calculations based on OECD (2018[12]), *Inter-Country Input-Output (ICIO) Database*, http://oe.cd/icio (accessed in July 2020).
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Liquidity and credit constraints

Industries differ in the extent to which firms can cope financially with a period of inactivity or reduced demand. There are two types of financial vulnerability to consider. First, the extent to which industries structurally need more liquidity in the short run to operate, due to the characteristics of the production process. Second, the likelihood of financial constraints arising in the longer run due to borrowing constraints, as firms attempt to access credit to fund future investment and growth, which are likely to affect the speed of the recovery as economic activity resumes.

Short-term liquidity needs: Cash conversion cycle

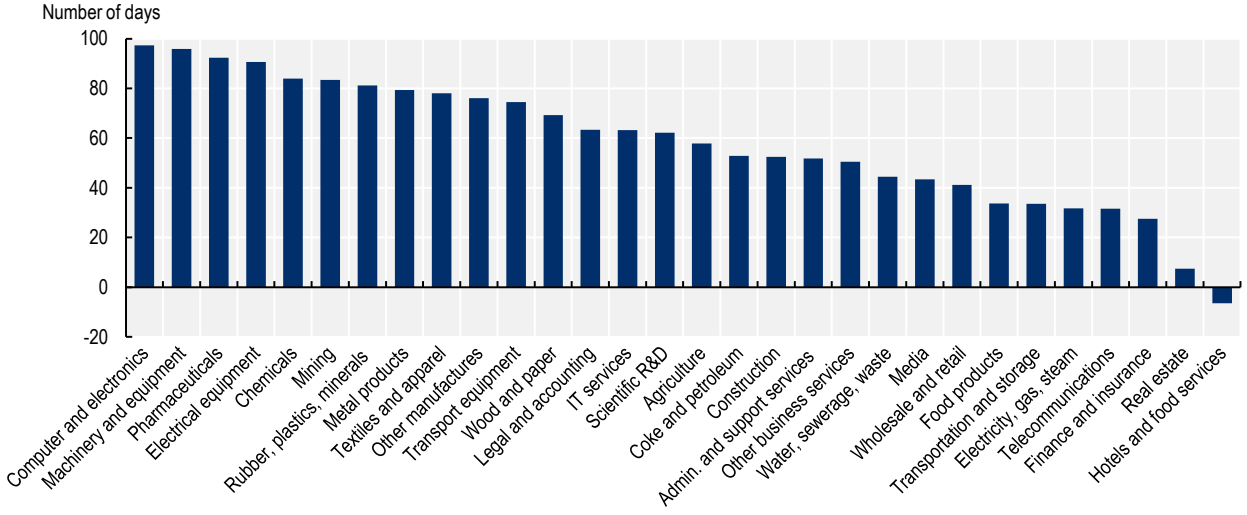
In the short run, firms are exposed to a liquidity risk resulting from a collapse in cash inflows in the wake of reduced demand or restrictions on their operations imposed to reduce the spread of the virus. Some liquidity needs may be reduced as firms downscale their production and variable costs (e.g. firms reducing their labour inputs and their purchase of raw materials, adjusting inventories, etc.), but this might not be enough to offset the effect of the drop in sales revenue entirely. Additionally, firms also incur expenses such as rents or interest payments that are fixed (at least in the short term) and therefore inelastic to demand and supply conditions.

This section sheds light on the industry dimension of liquidity risks, complementing OECD work on modelling short-term liquidity risks that is discussed in more detail in Chapter 4 (OECD, 2020[15]). It presents a measure of liquidity needs – the cash conversion cycle (CCC) – that is related to the nature of the activity and the production process of firms in particular sectors, rather than to aggregate financial stability, debt-servicing levels, or financial sector development.

The CCC refers to the average length, in days, between the moment a firm pays for its raw materials and intermediate inputs and the moment it receives payment for the sale of the final output. As such, it measures the time it takes for a company to convert resources used into cash flows from sales. As activity resumes following lockdowns, industries that typically experience a long delay between incurring expenses and realising the value of those expenses (a long CCC) may face difficulties if their activity is liquidity intensive, as most firms have experienced a reduction of their liquidity cushions.

As shown in Figure 3.10, manufacturing industries tend to have a relatively longer CCC, with high-tech manufacturing experiencing a particularly long delay between incurring expenses and receiving payment. In contrast, services industries and utilities tend to have a rapid turn-around between expenses and receipts, such that liquidity constraints may ease relatively quickly once production picks up.

Figure 3.10. Cash conversion cycle



Note: Average length in days within an industry between the moment a firm pays for its raw materials and the moment it is paid for the sale of its final output during the normal course of operations. The CCC used here is based on non-deflated firm-level data for active firms with more than ten employees. For reasons of data availability, unconsolidated accounts are used by default. Consolidated accounts used when unconsolidated accounts are not available. For each indicator, a minimum number of non-missing observations is required: 10 observations per country-industry, and 4 000 per country (irrespective of industry distribution). The industry coverage is adjusted to match the SNA A38 classification; however, data for some industries are not available for the financial indicators (SNA A38 industries Public administration, Education, Health, Social work, Arts and entertainment, and Other service). Data is averaged over 2011-15, and the median is taken over the following countries: Austria, Belgium, Finland, France, Hungary, Italy, Japan, Norway, Portugal, Spain and Sweden.
Source: OECD calculations based on ORBIS (2017) (accessed in May 2020).

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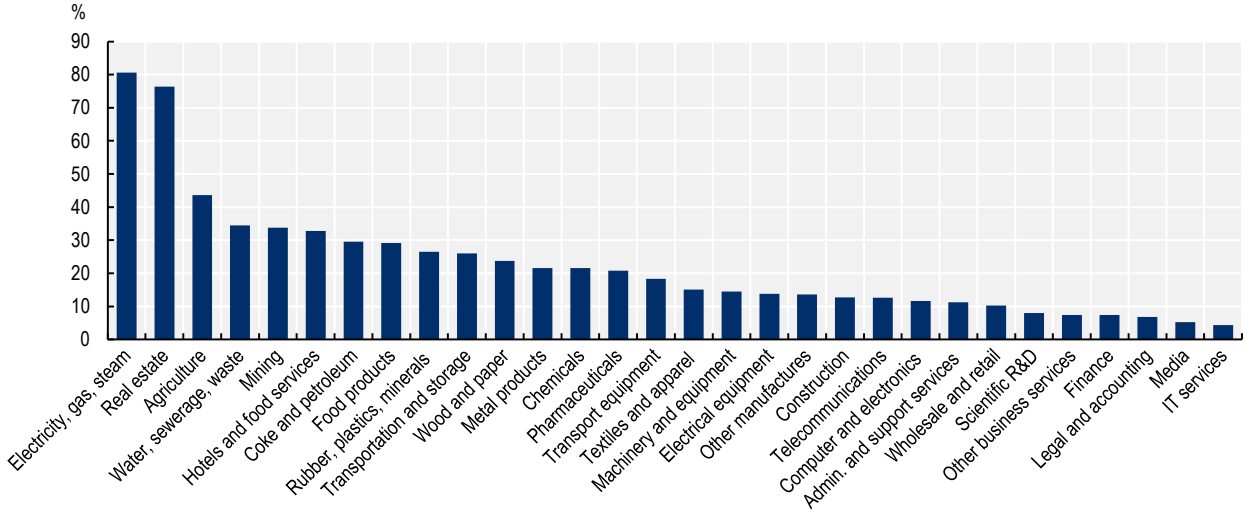
Longer-term borrowing constraints and the tangibility of assets

Policy makers reacted swiftly to prevent the dramatic effects of liquidity shortages, but firms also face longer-term financial challenges that continue in the recovery period, and beyond. That is, besides immediate financing needs to ensure day-to-day operations, in the longer term, firms will likely also face financing constraints for new investment. For instance, banks may be reluctant to extend new loans, either because they are vulnerable due to a prolonged crisis with a surge in non-performing loans, or simply due to added economic uncertainty.

At the sectoral level, a commonly used indicator of potential borrowing constraints relates to the extent to which firms rely on tangible vs. intangible assets. Industries that have a highly intangible asset base may struggle more to secure loans, as these assets are less widely accepted as collateral (Braun, 2005[16]; Manova, 2008[17]; Demmou, Franco and Stefanescu, 2020[18]). Industries with particularly heavy reliance

on intangible assets include a number of professional services industries, such as Media, IT services, Legal and accounting, and Other business services, as well as Wholesale and retail trade, and several high-tech manufacturing industries. Over the short-term, these industries may have been less affected by the direct effects of COVID-19 (as confirmed by recent OECD work (Demmou et al., 2021[19])) due to relatively high telework potential (from lower reliance on physical capital during lockdowns), better management and skills, and a reliable customer base. However, they may still face challenges over the longer term in accessing finance for recovery and expansion. Government policies that address constraints related to the financing of intangible investments can stimulate the recovery and future productivity growth.

Figure 3.11. Tangibility of assets



Note: The graph depicts the share of tangible fixed assets over total assets. Indicators are financial ratios from non-deflated firm-level data, for active firms with more than ten employees. For reasons of data availability, unconsolidated accounts are used by default. Consolidated accounts used when unconsolidated accounts are not available. For each indicator, a minimum number of non-missing observations is required: 10 observations per country-industry, and 4 000 per country (irrespective of industry distribution). The industry coverage is adjusted to match the SNA A38 classification; however, data for some industries are not available for the financial indicators (SNA A38 Public administration, Education, Health, Social work, Arts and entertainment, and Other services). The financial indicator based on firm-level micro-data refers to the industry fixed effect from a regression of the financial variable on industry and country-year fixed effects, but also gives consistent results computed as median by industry. An analysis of the sources of variation finds that industry fixed effects alone explain 30% of variation in asset tangibility at the firm level, while including also country-year fixed effects raises this only slightly to 33%. Braun (2005[16]) shows that asset tangibility is fairly stable across industries over time. Reported data is averaged over 2011-15 and the median is taken across the following countries: Austria, Belgium, Brazil, Finland, France, Hungary, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden and Turkey.
Source: OECD calculations based on ORBIS (2017) (accessed in May 2020).

StatLink https://doi.org/10.1787/888934261213

Conclusions and policy implications

The COVID-19 crisis has affected firms and workers differently not only between countries, but also between industries. The initial impact of the pandemic set this crisis apart from many previous economic crises, due to the immediacy and severity of the containment response and the supply-side shock it induced. Shutdowns to all but essential industries disrupted production and cut off the flow of services that could not be provided remotely, and changes to consumer behaviour as a result of restrictions altered demand patterns.

Different sectors of activity are more vulnerable or more resilient to crises like the COVID-19 pandemic, in part because of structural characteristics. These include how goods and services are produced, procured and supplied; how firms and industries are interconnected, including with other parts of the economy like

the financial sector; and the structure of demand for their outputs. Importantly for policy, different forms of restrictions and support measures are likely to have different impacts based on these characteristics.

For example, focusing on the ability to work remotely, only around 31% of workers across the OECD could do their jobs via telework, but telework rates varied widely by industry. Roughly 70% of jobs in IT and financial services can be done remotely, whereas in industries such as Hospitality and food services, Agriculture and Construction, fewer than 20% of jobs can be done through telework. The continuation of normal functioning also depends on whether customers could continue to purchase and receive goods and services remotely through digital modes of supply, such as e-commerce. Highly customer-facing industries such as Hotels and food services, and Arts and entertainment, are more at risk of suffering from containment restrictions.

The COVID-19 crisis has continued to affect the demand side of the economy beyond the impacts of the initial containment measures (e.g. due to changes in household income, investment, liquidity, economic uncertainty and travel restrictions). Industries more sensitive to changes in demand (e.g. manufacturing, luxury retail), and those that are heavily dependent on foreign exports, are subject to much stronger declines or fluctuations than industries with more inelastic demand, or that produce essential goods (e.g. utility services, healthcare, food).

Industries also differ in the extent to which firms can cope with financial difficulty. The abrupt collapse of cash inflows led to immediate concerns, but in the long term, firms may face borrowing and investment constraints that leave them unable to survive – let alone grow – through the recovery period. An industry perspective can help governments anticipate these concerns in particular parts of the economy, and implement targeted measures to help viable firms access finance during and beyond the crisis. Chapter 4 complements this industry perspective on financial constraints, drawing on more fine-grained analysis at the firm level.

While analysing the potential role of structural characteristics of industries can provide valuable insight for policy targeting and design, this chapter does not assess how the differential impacts at the industry level combine and play out on a more aggregate level, acknowledging the fact that many other factors will shape these effects. Instead, the topical chapters that follow discuss some of these and provide the basis for more specific policy recommendations.

Annex A provides a structured overview of the different industry characteristics discussed in this chapter, summarising the individual dimensions into indicators and presenting them in different ways, to enable comparisons across indicators as well as across industries. Annex B also contains an overview table of the relative size of industries across countries to allow a case-by-case assessment of the relative importance of single industries – and hence the identified vulnerabilities and potential channels of impact of the crisis – for individual countries.

Subsequent sections of this volume explore in further detail the many factors shaping the economic impacts of the crisis beyond structural industry characteristics, and relate these to individual countries. These factors are organised into the overarching topics of Business dynamics and financial vulnerabilities (Chapter 4), Supporting productivity through digital technologies (Chapter 5), Industrial and international connectedness (Chapter 6), and Inclusiveness across gender and skill groups (Chapter 7).

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Notes

[1] Many of the general features of the crisis have been covered in the various contributions on the OECD COVID-19 Hub (OECD[26]), as well as in OECD (2021[22]) and OECD (2020[23]).

[2] Where cross-country data is available at the firm or industry level, simple diagnostic regressions have been performed to confirm that observed variations are largely explained by industry characteristics, rather than by country-specific or idiosyncratic variations. Details of these assessments are included in the notes below the relevant figures.

[3] Note that essential industries are different from what are often considered essential goods, which include pharmaceutical products such as diagnostic tests, respiratory devices, or personal protective equipment (masks). Previous OECD work has looked at policies to ensure the supply of essential goods, e.g. OECD (2021[29]; 2020[30]; 2020[27]).

[4] For example, ongoing OECD work based on Burning Glass Technologies data indicates that vacancies – taken as a proxy for hires – increased in the UK healthcare sector during the lockdown period (OECD, 2020[21]). Similarly, the rapid increase in demand for some specific goods such as medical and personal protective equipment led to shortages in many countries, with producers moving rapidly to ramp up supply despite temporary disruptions and transport constraints (OECD, 2020[27]).

[5] Note that this is different from what are often considered essential goods, which include pharmaceutical products such as diagnostic tests, respiratory devices, or personal protective equipment (masks) (OECD, 2021[29]; 2020[30]; 2020[27]).

[6] Statistical classification of economic activities in the European Community.

[7] An alternative measure of potential telework is that of Dingel and Neiman (2020[25]) who estimate the number of jobs that can be done entirely at home in the United States. These authors link information from O*NET on regular tasks performed in different occupations with information on the occupational composition of the United States workforce. Aggregated to the A38 industry level, Dingel and Neiman's estimates of telework potential for the United States are strongly correlated with the cross-country average from Espinoza and Reznikova (2020[7]) (correlation coefficient of 0.9).

[8] One exception is the Agriculture, Forestry and Fishing sector, in which surveys show that 39% of workers in the United Kingdom (2019) and 48% in Europe (2015) reported that they sometimes worked from home, and 40% of workers in Europe reported that they worked from home on a regular basis (at least several times per month). This is in stark contrast to the predicted level of remote work based on tasks, and may reflect instead a tendency for farm owners and workers to live on the premises.

[9] "Teleworkable" and "teleworkability" are terms used throughout the report to describe jobs and tasks that are able to be done through telework. Originating mainly in the COVID-19 crisis, given extensive literature and research arising from the rapid global uptake of telework, the terms are now of demonstrated accepted and common use in many official documents. As such, they are used within this context in this document.

[10] In addition to this expansion to new product types, new firms and new consumer groups have also shifted to e-commerce, as discussed in more detail also in Chapter 5.

[11] More specifically, a one percentage point increase in the share of employment in occupations involving regular face-to-face contact with customers is associated with a 0.4 percentage point additional decline in entry.

[12] For further discussion of supply chain issues in COVID-19, see for example OECD (2020[28]), OECD (2020[27]), Baldwin and Freeman (2020[20]), Arriola et al. (2020[24]).

[13] While relying on foreign inputs through global value chains may increase risks on the production side, integration in international trade networks can also be a source of resilience for consumption, as domestically produced final products can be replaced by foreign ones in case of lockdowns.

[14] Specifically, value added growth in these industries varies by about half as much as the annual change in aggregate GDP growth. The majority of industries see around a one-to-one relationship between industry value-added growth and aggregate GDP growth, while in Construction and durable goods manufacturing, a 1.0 percentage point change in GDP is associated with a 1.5 percentage point change in industry value added, on average.

[15] The distinction between household and government consumption depends in part upon the model of service used in different countries. For example, while in some countries residential care (for example of elderly people) is directly operated by public institutions (government consumption), in others it is operated by private institutions, with governments directing funding to households through pension systems (household consumption).

4 Business dynamics and financial vulnerabilities

This chapter analyses the impact of the COVID-19 pandemic on business dynamics and firm financial vulnerability. It first outlines the short-term consequences of the crisis on firm entry and exit, examining reductions in the creation of new firms as well as the results of government policy measures to prevent immediate bankruptcies. This part of the chapter also highlights patterns of recovery and new business opportunities arising from the crisis. The chapter then discusses the influence of the pandemic on business dynamism, analysing how aggregate firm characteristics, such as age and size, affect the resilience of the economy, and how the crisis may further decrease business dynamism in the absence of carefully designed policy responses. It outlines how small and medium enterprises are particularly vulnerable to insolvency and increased debt loads, and face difficulty in accessing finance. It concludes with a discussion on policy implications to address concerns surrounding these issues.

Key findings

- **The crisis greatly impacted business dynamics in the *short term*, but many economies showed greater resilience than feared, which is partly the result of successful support policies**. In the initial stage of the crisis, global firm *entry* declined markedly. However, as the pandemic progressed, there was significant variation in entry across countries, and the crisis also created new business opportunities. Some countries have seen a fast V-shaped recovery, some a U-shaped recovery, and others had not yet rebounded to pre-crisis entry levels by the end of 2020. Firm *exit* also varied across countries. Contrary to initial fears that the COVID-19-induced shock would trigger a spike in firm closures, the number of bankruptcies in most countries remained below that of the previous year, indicating that government support packages, and the relaxation of legal constraints to firms, were successful policy tools over the short term.
- **Longer-term risks to business dynamism still remain**. Many viable firms will face continued financial hardship in the recovery period, and government support will be necessary to ensure both their survival and ability to invest. There is also a risk of a missing generation of entrants, which may have long-lasting consequences for innovation, employment and productivity growth, and could amplify the effects of the pre-crisis decline in entry rates.
- **To foster a dynamic recovery, governments should implement policies that target structural challenges**. Such policies can not only help make the recovery faster and more efficient, but also more sustainable and inclusive. Policy packages should reduce red tape and barriers to entry, ensure that bank credit or other sources of finance are available for young and small firms, support innovation and experimentation, and facilitate a broad uptake of new technologies and intangible assets. To ensure inclusion, governments should also support workers in upskilling and transitioning to new jobs during the resource reallocation process fostered by these policies.

Introduction

This chapter assesses impacts of the COVID-19 crisis along firm characteristics and examines pre-existing trends in business dynamics, mapping out a number of relevant channels – most importantly, financial vulnerabilities – that vary systematically across different types of firms.

The chapter starts by giving an overview of early impacts of the crisis on new firm entry and bankruptcies based on available data for 2020, and presents recent analytical work on the potential medium-term impacts of the crisis on firm financial health. Financial factors that have important longer-term implications for the recovery period – including on employment, productivity, and industry structure – are also discussed.

Beyond the immediate impact of the crisis, the chapter then discusses vulnerabilities arising from the structure of the business sector, which differ across both industries and countries. It describes pre-crisis characteristics of the business population at the country and industry level that may contribute to shape the aggregate effect of the crisis on business dynamics, and discusses challenges related to a pervasive slowdown in business dynamism over the last two decades. The analysis centres in particular on the prevalence of young and small firms, secular declines in entry rates, and the extent of corporate indebtedness, combining preliminary findings on early impacts with longer-term pre-crisis trends, to map out potential medium- to long-term impacts.

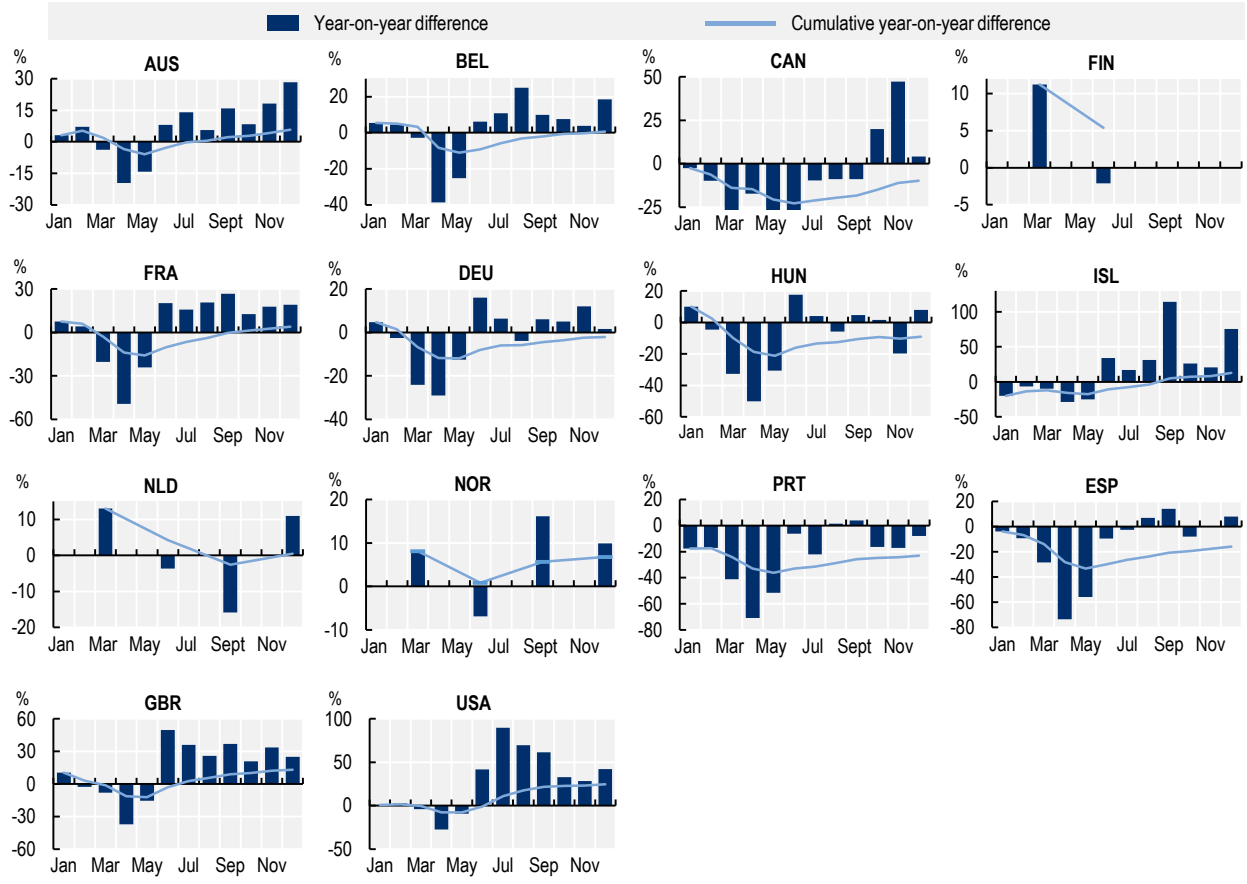
The chapter concludes with a summary of policy measures which may help to support business dynamics in the recovery period, and highlights potential adverse impacts on concentration. These policy suggestions and guidelines aim to help governments design and decide on interventions and measures to support firms through the pandemic and into the recovery period.

Initial impacts of the COVID-19 pandemic on firm entry and bankruptcies

Firm entry

New and young firms are key for job creation, innovation, and economic growth. On average, across OECD countries, they employ around 20% of the total workforce and create almost half of new jobs.[1] New firms also drive long-term sectoral transformation and contribute to innovation and long-term productivity growth. Analysing the impacts of the crisis on new firms – including firm entry, growth, and survival – is therefore of particular relevance for an assessment of its longer-term consequences.

Figure 4.1. Percentage change in number of entries per month in 2020 vs. 2019



Note: The figure plots the year-on-year difference in business openings each month (or quarter for Finland, the Netherlands and Norway) in percentage (dark blue bar), comparing the level of business openings to the same month (quarter) of 2019. The light blue line instead plots the difference in percentage of cumulative openings from January to each month considered. When the light blue line goes above the horizontal axis, this means that more firms have been created in 2020 than in 2019, since January of each year. The data usually refer to business registrations, including all businesses (including sole proprietorship) when possible, but similar dynamics are evident when focusing on legal entities only. Data may be preliminary, experimental and subject to revision, and differ from official data.

Source: OECD (2021[1]), "Business dynamism during the COVID-19 pandemic: Which policies for an inclusive recovery?", https://doi.org/10.1787/f08af011-en.

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Monthly and quarterly indicators of firm entry (Figure 4.1) point to substantial initial impacts of the crisis on business formation, with large declines observed between March and May 2020 in all countries. This initially raised concerns about a potential missing generation of new firms, with persistent negative effects on gross domestic product (GDP), aggregate employment and productivity (OECD, 2021[1]; OECD, 2021[2]; Gonzales-Torres, Manaresi and Scoccianti, 2020[3]; Sedláček and Sterk, 2020[4]; Sedláček, 2020[5]; Gourio, Messer and

Siemer, 2016[6]). Subsequent developments from May 2020 have proven more heterogeneous across countries, with some displaying a strong recovery in firm entry from June onwards. Indeed some countries (such as Australia, Canada, Norway, the United Kingdom, the United States and Singapore) experienced a V-type recovery, with high levels of business creation starting in June, whereas others (including Italy, Hungary, Portugal and Spain) faced depressed business creation for longer, reinforcing concerns about a missing generation of new firms.

In the first group of countries, the rebound was sufficiently swift to offset the drop in total entries registered since the beginning of the year within the third quarter of 2020, and sufficiently strong to end the year with a more than 10% increase in entry, relative to 2019. This illustrates that despite high levels of uncertainty and falling demand in many areas, the crisis has also presented new opportunities for firms. While some of these may be short-lived, catering specifically to the crisis period itself, others may persist. The use of new technologies, as well as changes in work and social habits brought about by the pandemic, are likely to continue. For instance, the rapid move towards remote work and e-commerce and the increasing digitalisation of health and education services provide room for start-ups that manage to identify and respond to these new opportunities. Box 4.1 provides an example of how the pandemic, and the resulting need for a rapid upscaling of vaccine production, have introduced new dynamics – but also created new challenges – in the pharmaceuticals industry. Indeed, many successful innovative companies have emerged during periods of crisis and recovery in the past, including a wide range of digital companies such as Dropbox, Uber, Airbnb, WhatsApp, Groupon and Pinterest – which were all founded during or just after the global financial crisis (GFC) – and Alibaba's Taobao – which was founded during the 2003 SARS outbreak in the People's Republic of China (hereafter "China") (OECD, 2020[7]). Such new opportunities could be particularly relevant during the recovery, as they may help firms innovate and adapt to the post-COVID environment, ease the transition to a more digital and green economy, contribute to job creation, and support inclusiveness (Calvino and Scholl, forthcoming[8]). Therefore, ensuring an efficient reallocation of resources and support for the entry of new players will be essential in the post-pandemic phase to help achieve an inclusive, digital and green recovery.

While some countries experienced a quick recovery, others (including Hungary, Italy, Portugal and Spain) seemed to struggle and did not show a clear rebound in entry. In these countries, business registrations rose less significantly after June (and continued to decline in some cases) and, as a result, by September 2020 the total number of entrants in these countries remained significantly below the 2019 level. Other countries for which data are available (Belgium, France, Germany and Iceland) had a U-shaped recovery, in which entry rates slowly increased and drops incurred in the first semester were only offset by the end of 2020.

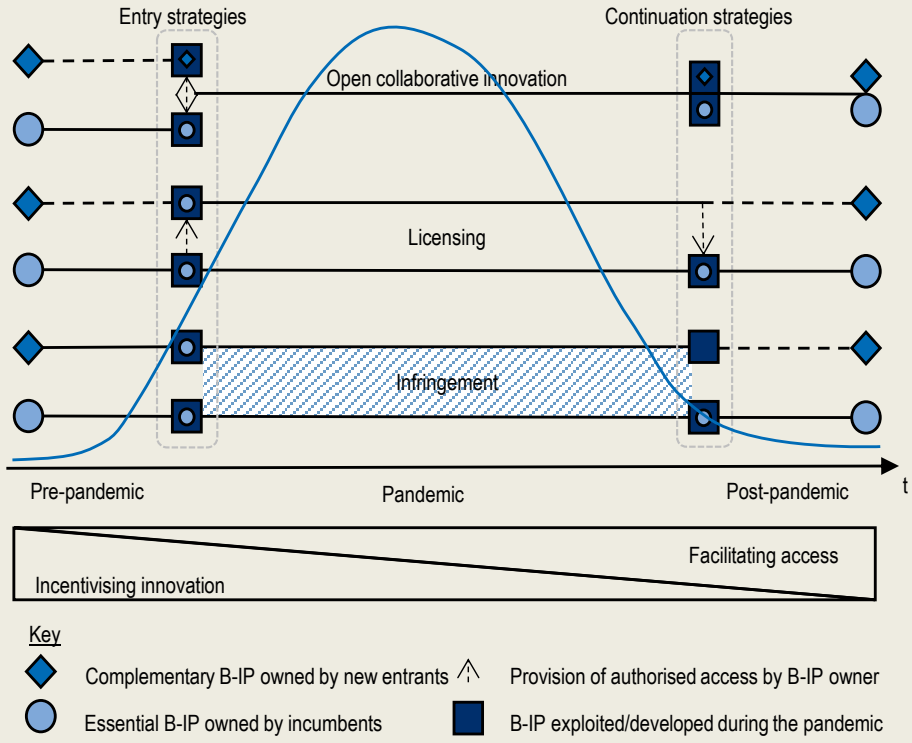
The impact of the pandemic on firm entry may have significant repercussions on economic outcomes in the long run, most notably on employment (OECD, 2021[1]). Simulations based on the OECD DynEmp3 database (see Box 4.3) indicate that a 25% decline in the number of entering firms in a single year (corresponding to the worst performance recorded across the sampled countries as of September 2020) may lead to a lasting decrease in aggregate employment (Figure 4.3). According to this simulation, such a "missing generation" of firms would depress aggregate employment by around 0.85% three years after the shock. In addition, the negative employment effects of a drop in entries may be exacerbated by below-average growth rates of entering firms, a pattern which has been observed in past recessionary episodes (Sedláček and Sterk, 2017[9]). Conversely, in the event of a strong V-shaped rebound, a 15% growth in entry rates (as registered on average by the best performing countries so far) would raise employment by around 0.5% over the same period, thereby mitigating the economic costs of the pandemic. However, new firms could also still experience lower post-entry growth, reinforcing the need for policies aimed at providing the right conditions for young firms to thrive, as further discussed at the end of the chapter.

Box 4.1. Business innovation dynamics and intellectual property challenges

The COVID-19 pandemic posed unprecedented challenges to the manufacture and distribution of some essential crisis-critical (cc-) products. These products are needed for the prevention, diagnosis and treatment of infections like COVID-19. Recurring waves of the virus, and new mutations, led to repeated demand surges for such products, as well as the rapid development of cc-innovations, such as mRNA-based vaccines (Tietze et al., 2020[10]). Established cc-sector incumbents possessed relevant background intellectual property (B-IP) to produce cc-products, but faced challenges to rapidly scale up production. To solve this problem, firms from other sectors that possessed complementary B-IP – being used in non-cc-sectors – joined incumbents in cc-sectors to deliver the required volumes, and quickly develop further cc-innovations.

Inducing dynamics into the cc-sector innovation ecosystems, these "new entrant" firms followed three entry strategies (Figure 4.2): 1) open innovation (incumbents and new entrants reciprocally cross-license their B-IP), 2) unidirectional licensing (incumbents formally provide authorised access to their B-IP to new entrants), and 3) infringement (new entrants risk injunctions and litigation by using incumbents' B-IP without seeking prior authorisation).

Figure 4.2. Innovation dynamics of new entrants and incumbents in crisis-critical sectors



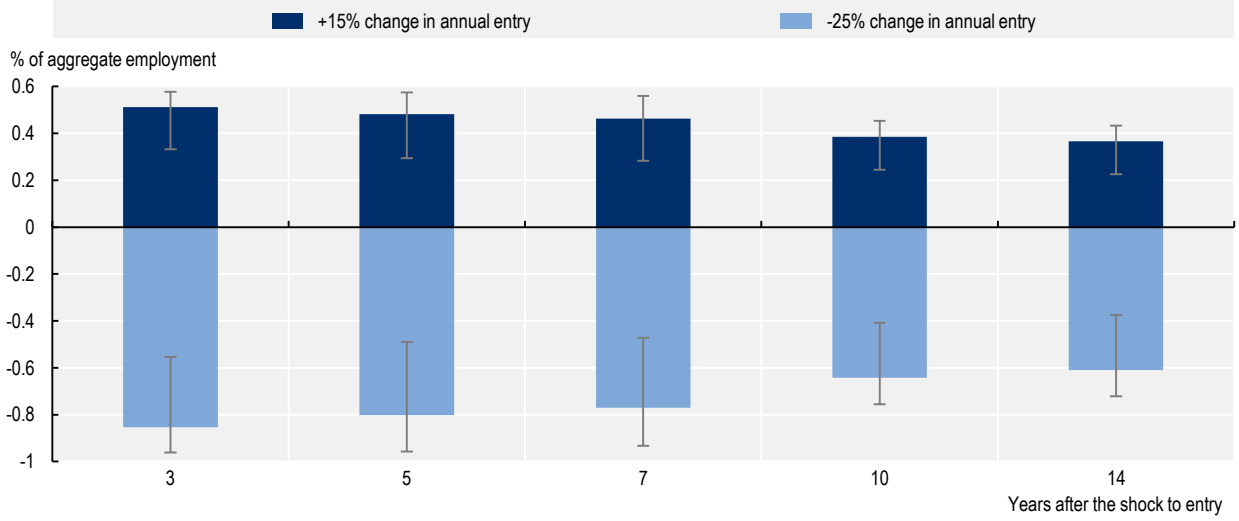
The entry dynamics in the cc-sector, combined with the time-critical nature of the production process in the face of the pandemic, create several challenges related to intellectual property rights. Responding quickly to the pandemic might have led some new entrants to infringe on incumbents' B-IP, but seeking ex-post authorisation to use incumbents' B-IP will be required for new entrants to stay in the cc-sector beyond the pandemic. Incumbents therefore consider carefully whether to officially grant new entrants – possible future competitors – access to their B-IP.

Rather than granting these rights, incumbents have several options to best leverage their B-IP, through licensing terms and conditions, such as termination and grant/assign-back clauses, in order to minimise the probability of new entrants staying in cc-sectors after the pandemic (Moerchel et al., 2020). An additional challenge is that recombining incumbents' and new entrants' B-IP during the pandemic is very likely to result in novel foreground IP (F-IP), for which incumbents and new entrants have to decide on ownership and usage rights. For incumbents, this F-IP might be valuable to strengthen their competitive advantage in a recessionary post-pandemic market setting. For new entrants staying in cc-sectors, ownership and access to this F-IP could prove essential (Moerchel et al., forthcoming[11]).

Policy makers can leverage IP policy instruments to help exit the crisis faster. They need to strike a balance between maximising incentives for investments to develop urgently-needed cc-innovations (e.g. vaccines) during the pandemic, and maximising access to these demanded cc-innovations at a later stage. Existing policy instruments (e.g. compulsory licensing) hardly proved popular among governments (Contreras et al., 2020[13]), and alternative approaches (e.g. IP pledges) for crisis-critical IP innovation policy should be further investigated.

Note: Contributors are (in alphabetical order): Leonidas Aristodemou, Alexander Moerchel, Frank Tietze and Pratheeba Vimalnath.
Sources: Moerchel et al. (forthcoming[11]), "Identifying Crisis-Critical Intellectual Property Challenges during the Covid-19 Pandemic: a visual mapping approach", https://aom.org/events/annual-meeting/annual-meeting-program/annual-meeting-proceedings; Moerchel et al. (2020[12]), "Identifying Crisis-Critical Intellectual Property Challenges during the Covid-19 Pandemic: A Scenario Analysis and Conceptual Extrapolation of Innovation Ecosystem Dynamics Using a Visual Mapping Approach", https://doi.org/10.17863/CAM.58372; Tietze et al. (2020[10]), "Crisis-Critical Intellectual Property: Findings From the COVID-19 Pandemic", https://doi.org/10.1109/tem.2020.2996982.

Figure 4.3. Simulated impact of a shock to firm entry under two scenarios on employment

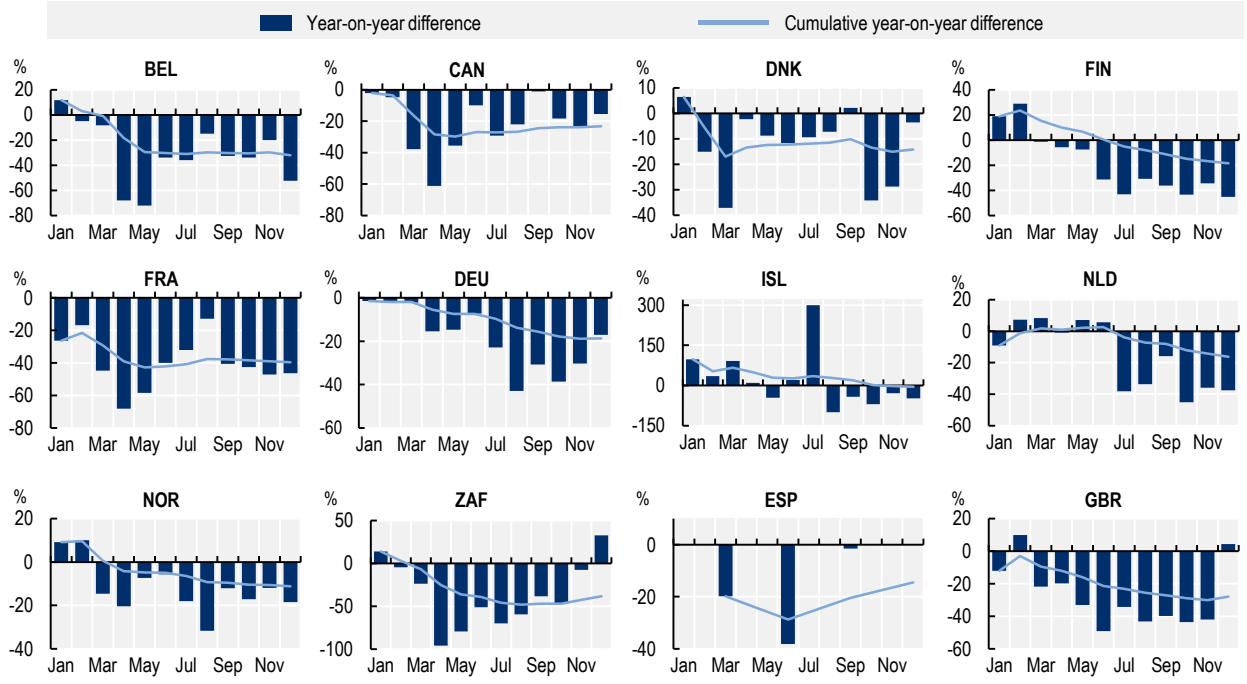


Note: The figure shows the employment losses or gains associated with a 25% decline (light blue bar) or 15% increase (dark blue bar) in the number of entrants, relative to aggregate employment in the initial year, on average across countries and cohorts of entrants in 1995, 1998, 2001, 2004, 2007, 2010, and 2012. The bands represent low and high values of the effects of the shocks, representing respectively the 25th and 75th percentiles. The simulation is based on the decomposition proposed by Calvino et al. (2016[14]), focusing on A38 industries in manufacturing and non-financial market services. Countries included are Austria, Belgium, Brazil, Canada, Costa Rica, Finland, Hungary, Italy, Japan, Korea, the Netherlands, Norway, Portugal, Spain, Sweden and Turkey.
Source: OECD (2021[1]), "Business dynamism during the COVID-19 pandemic: Which policies for an inclusive recovery?", https://doi.org/10.1787/f08af011-en.
StatLink https://doi.org/10.1787/888934261251

Bankruptcies and financial distress

Despite initial fears that the demand shock induced by the pandemic would trigger a wave of firm closures, data for 2020 suggest that government interventions have successfully curbed the potential spike in bankruptcies. Figure 4.4 shows that the number of bankruptcies has dropped substantially, relative to those observed in the same months of 2019, in the 12 OECD countries for which data were available (OECD, 2021[1]). On average, monthly bankruptcies fell by around 32% year-on-year since March 2019. As of November 2020, no significant increase had been observed. This fall in recorded bankruptcies contrasts sharply with estimates of potential financial risk to firms in the absence of policy intervention. It reflects both the financial and other support packages available to firms at this time,[2] but also significant changes in court processes and temporary suspensions of firms' obligations to file for bankruptcy.

Figure 4.4. Change in monthly bankruptcies, 2020 vs. 2019



Note: The figure plots the year-on-year difference in bankruptcies each month (or quarter for Spain) in percentages (dark blue bar), comparing the level of business openings to the same month (quarter) of 2019. The light blue line instead plots the difference in percentage of the cumulative number of bankruptcies from January to each month considered. Data presented, however, may refer to different definitions and bankruptcy laws differ markedly across countries. Data may be preliminary and subject to revisions and may differ from official data.
Source: OECD (2021[1]), "Business dynamism during the COVID-19 pandemic: Which policies for an inclusive recovery?", https://doi.org/10.1787/f08af011-en.
StatLink https://doi.org/10.1787/888934261270

While policy interventions may have prevented an initial damaging wave of bankruptcies, governments face increasing budgetary pressures as well as policy trade-offs. Limiting bankruptcies may be beneficial for the economy in the short run, as it allows for the support of viable firms that would otherwise exit or shrink, thereby reducing firing and re-hiring costs, and limiting the loss of potential output (OECD, 2020[15]). However, there is a growing concern that if unviable businesses are kept afloat, capital and labour are prevented from being channelled towards new business opportunities and more productive uses. This may negatively affect resource allocation and aggregate productivity growth in the longer run.

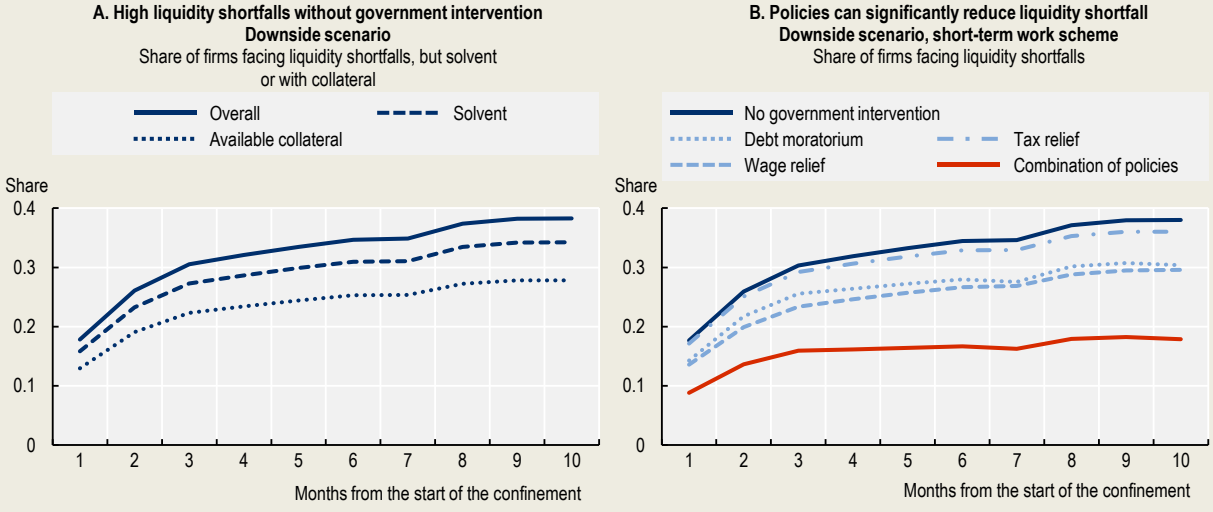
Box 4.2. Corporate sector vulnerabilities during the COVID-19 outbreak: Assessment and policy responses

The health crisis caused by the COVID-19 outbreak has led public authorities to take unprecedented measures to contain the propagation of the virus, with negative effects on economies. There is widespread concern that one of these negative effects will be COVID-19 crisis-induced liquidity shortages, which may cause firm bankruptcies on a large scale.

A recent OECD paper (Demmou et al., 2021[16]) examines the financial vulnerability of firms associated with confinement measures, and discusses the immediate steps that governments can take to reduce the risk of widespread bankruptcies. Using a sample of almost one million European firms, and building on existing work (Schivardi and Romano, 2020[17]), the share of firms that would turn illiquid with and without policy interventions are compared.

Figure 4.5 reports the main results for a "downside" scenario, foreseeing a sharp drop in activity lasting two months, a progressive but not complete recovery in the next seven months and a second – relatively smaller – outbreak from the eighth month onwards. Without policy actions (left panel), around 18% of firms in the sample would run out of liquidity after one month, 26% after two months and 30% after three months. The majority of these firms are potentially solvent, but may lack sufficient collateral to bridge a shortfall in liquidity. A decisive public intervention (right panel), in the form of tax deferrals, moratoria on short-term debt, but especially support to wage payments, is found to be crucial. The combination of these policies would decrease the number of firms running out of liquidity after two months by half, from 26% to around 13%, compared to the non-policy scenario.

Figure 4.5. Liquidity shortfalls and the impact of policies



Note: The figure shows the share of firms facing liquidity shortfalls: in panel A, overall (solid line); but still potentially solvent, i.e., if the value of their assets is larger than the value of the liabilities (dashed line); having collateral to pledge to obtain additional bank financing, i.e., if the value of their fixed assets is larger than the value of their non-current liabilities (dotted line). In panel B, the temporary support to wage payments is assumed to be a short-term work scheme, which is conditional on the sectoral size of the shock and modelled through an increase to 0.8 of the elasticity of wage bill to sales. The calculations are based on the downside scenario. The downside scenario foresees a sharp drop in activity lasting two months, a progressive but not complete recovery in the next seven months and a second, relatively smaller, outbreak from the eighth month onwards.

Source: Demmou, Franco, Calligaris and Dlugosch (2021[16]), "Liquidity shortfalls during the COVID-19 outbreak: Assessment and policy responses", https://doi.org/10.1787/581dba7f-en.

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Finally, the current drop in bankruptcies may be swiftly reversed if temporary support and regulatory moratoria were lifted abruptly. This could possibly translate into a significant increase in leverage, and a wave of corporate insolvencies, as poor economic conditions continue to weigh on the corporate sector and firms' long-term viability. These conflicting considerations highlight the need to implement a balanced strategy to phase out emergency support policies gradually (Demmou et al., 2021[18]). While support to distressed firms is still warranted, interventions should be tailored to avoid the risks associated with debt overhang, relying instead, for instance, on non-debt financing instruments, as well as state-contingent loans. In addition, encouraging timely debt restructuring may help firms continue operations in cases in which support measures do not alleviate financial distress. Finally, policies can help improve the efficiency of liquidation procedures for unviable firms in order to foster resource reallocation.

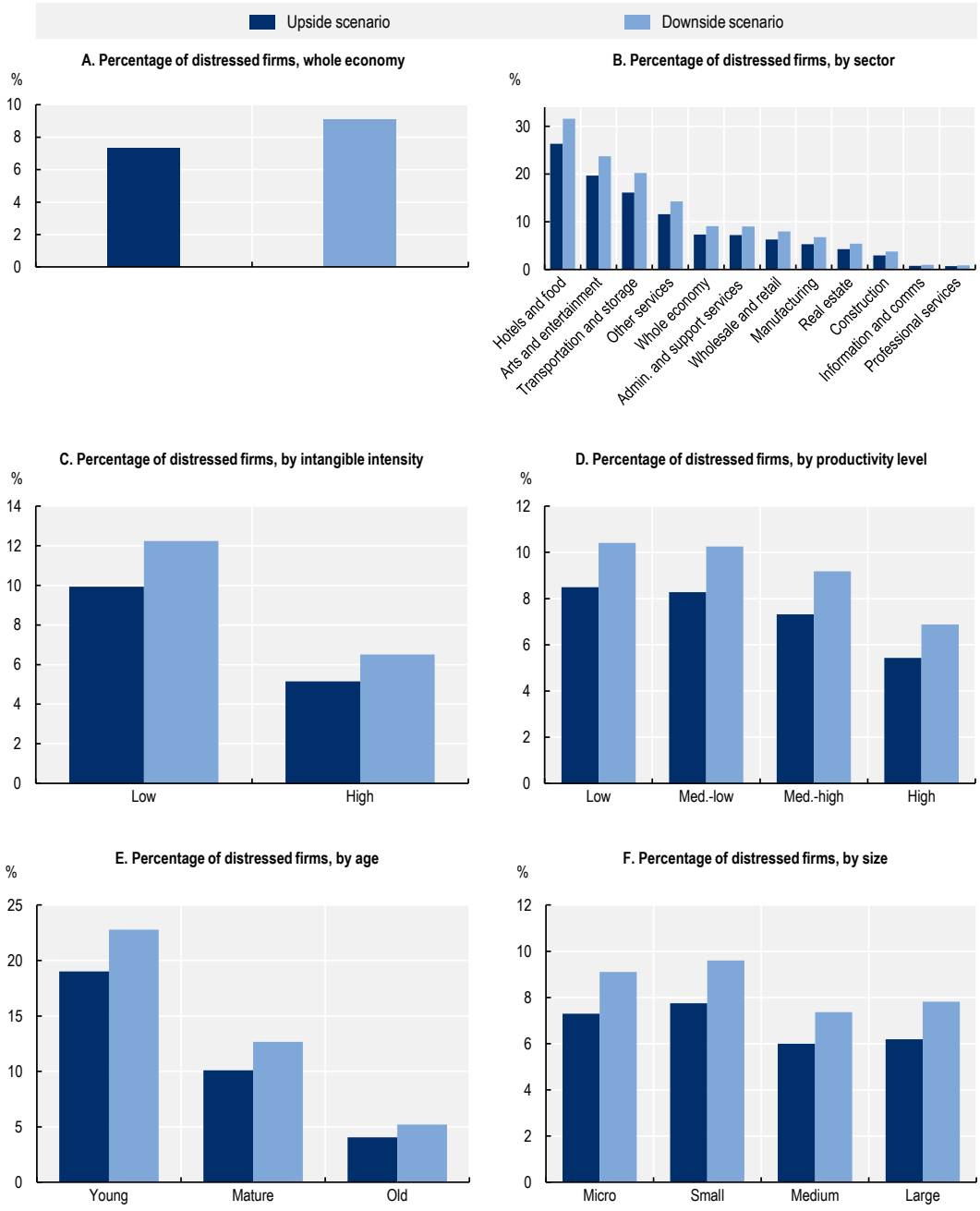
To guide a balanced policy strategy and gauge the economic risk it must address, OECD work (Demmou et al., 2021[18]) quantitatively evaluates the impact of the pandemic on firms' long-term viability (see also Box 4.2 for complementary research with these data). The economic shock is modelled as a change in firms' operating profits, resulting from the sharp reversal in sales and from firms' limited ability to fully adjust their operating expenses. After calculating the decline in profits and taking job support schemes implemented during the first phase of the crisis into consideration, the model allows the authors to predict: 1) the share of distressed firms (i.e. firms whose net equity is predicted to be negative), which are at high risk of being insolvent, and the share of firms not able to cover interest expenses; and 2) the increase in firms' leverage ratios caused by the crisis. To proxy the magnitude of the sectoral drop in sales, the analysis relies on the first-round demand and supply shocks computed at a detailed sectoral level (del Rio-Chanona et al., 2020[19]). With respect to the duration of the shock, the model presents two alternative scenarios. An "upside" scenario foresees a sharp drop in activity lasting two months (equivalent to the average duration of the confinement period in Q2 2020), followed by progressive but not complete recovery in the remaining part of 2020. A "downside" scenario initially overlaps with the 'upside' scenario, but then models a slower recovery due to more widespread further outbreaks of the virus accompanied by stricter mobility restrictions.

The model foresees that, following a sharp reduction in profits, about 7% (9%) of otherwise viable firms would become distressed in the upside (downside) scenario. However, these percentages are heterogeneous across sectors and firm types, as shown in Figure 4.6. Firms in industries that use intangible assets (such as intellectual property, data, or software) intensively are significantly impacted but better positioned to bridge the health crisis in the short term, while the hospitality, entertainment, and transport sectors are the most severely hit.[3] In addition, older, more productive and larger companies are relatively better positioned to face the shock compared to their younger, less productive and smaller counterparts, which are likely to have fewer cash reserves and face greater financial constraints.

This fall in equity leads directly to an increase in firms' leverage ratios, with the median firm predicted to see an increase of 6.7 percentage points in the ratio of total liabilities to total assets in the upside scenario, and of 8.0 percentage points in the downside scenario. In turn, this increase in financial leverage ratios is expected to lead to a decrease in the investment ratio of the median firm by approximately 2.0 percentage points (Figure 4.7). In the post-lockdown period, the preservation of the corporate landscape still warrants high priority. Yet, policy makers need to strike a balance between the risk of phasing out support too early (thereby leading to liquidation of viable firms and thus breaking productive worker-firm matches) and providing across-the-board support for too long (favouring the persistence of unviable firms and slowing down the reallocation process).

Similarly, analysis of the link between financial contractions and employment suggests that maintaining financial liquidity is an essential aspect of economic resilience (Calvino and Verlhac, forthcoming[20]). This research, using micro-aggregated data from the DynEmp project (see Box 4.3), examines the link between firm financial conditions and the employment contraction observed in many countries during the 2008 GFC. At the country level, financial vulnerabilities – reflected in rapid growth in real estate prices, credit-to-GDP gaps, corporate credit growth and increases in banks loans to deposit ratios – are associated with larger contractions in aggregate employment. In addition, the impact falls disproportionately on sectors that are more exposed to financial disruptions due to higher liquidity needs, and which therefore display significantly larger increases in job destruction, resulting primarily from the employment adjustments of incumbent firms.

Figure 4.6. Predicted share of financially distressed firms, by firm characteristics

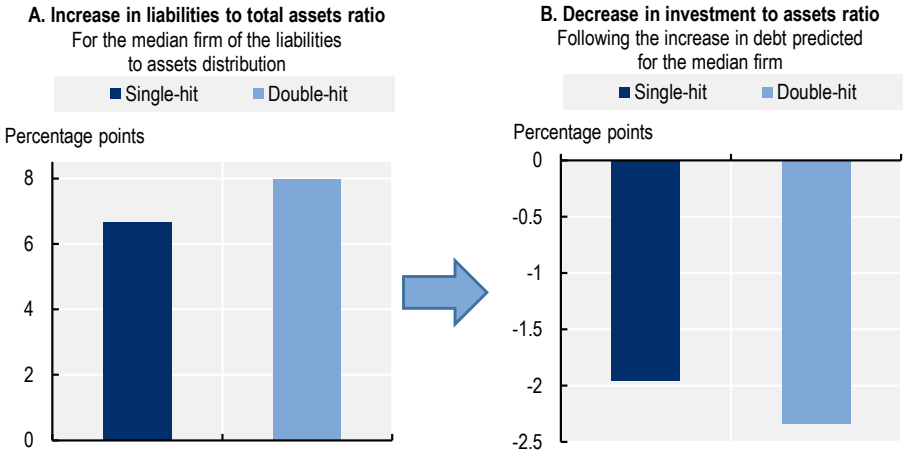


Note: The figure shows the percentage of distressed firms in the upside (dark blue bars) and downside (light blue bars) scenarios: for the whole economy (panel A); by one-digit NACE Rev.2 sectoral classification (panel B); by sectoral intangible intensity, where intangible intensity is measured following Demmou, Stefanescu and Arquie (2019[21]) as the median ratio (across firms within industries) of intangible over total assets (panel C); by productivity levels, defined according to quartiles within each (two-digit NACE Rev.2) industry of multi-factor productivity computed according to Wooldridge's (2009[22]) value added based methodology (panel D); by firm age, where age is defined as the difference between 2018 and the year of incorporation of the company and young firms are those with fewer than five years, mature firms those from five to ten years and old those more than ten years (panel E); by firm size, where micro enterprises are those with fewer than ten persons employed, small enterprises those with 10 to 49 employees, medium enterprises those with 50 to 249 employees and large enterprises those with 250 or more persons employed (panel F). Firms are defined as distressed if their book value of equity is predicted to be negative one year after the implementation of confinement measures. Note that the sample is restricted ex-ante to firms having both positive profits and book value of equity in the 2018 reference year. For the sake of exposition, the y-axis scale varies among panels.

Source: Demmou, Calligaris, Franco, Dlugosch, Adalet McGowan and Sakha (2021[18]), "Insolvency and debt overhang following the COVID-19 outbreak: Assessment of risks and policy responses", https://doi.org/10.1787/747a8226-en.

StatLink https://doi.org/10.1787/888934261308

Figure 4.7. Increase in firms' leverage and consequent decrease in investment rate



Note: The figure shows: the percentage point increase in the liabilities to total assets ratio for the median firm of the leverage distribution following the COVID-19 outbreak (panel A). Panel B depicts what would be the increase in the investment to fixed assets ratios under the hypothetical increase in the debt over total asset ratios shown in panel A for the median firm.
Source: Demmou, Calligaris, Franco, Dlugosch, Adalet McGowan and Sakha (2021[18]), "Insolvency and debt overhang following the COVID-19 outbreak: Assessment of risks and policy responses", https://doi.org/10.1787/747a8226-en.
StatLink https://doi.org/10.1787/888934261327

Business dynamics

As established in the previous section, the predicted share of financially distressed firms is higher among small, and notably young, firms. Small and young firms are often more financially constrained (especially in their ability to access external finance), do not yet have strong market positions, and may not be equipped with financial cushions to allow them to survive a prolonged period of reduced activity or revenue (OECD, 2020[23]; Bartik et al., 2020[24]). This suggests that the firms usually contributing substantially to economic dynamism are also more vulnerable to the crisis. Indeed, while under normal circumstances young firms are an important source of innovation, employment and productivity growth (Calvino, Criscuolo and Menon, 2015[25]), they have also been shown to be particularly sensitive to policy settings and economic shocks (Adelino, Ma and Robinson, 2014[26]; Calvino, Criscuolo and Menon, 2016[14]).

As elaborated on in Chapter 5, small firms also tend to have lower uptake of digital technologies that have helped support activity through periods of constrained activity (see Chapter 5, Figure 5.9 and Figure 5.12) and may therefore have been slower or less effective in shifting towards remote work or low-contact delivery of goods and services when COVID-19 restrictions were put in place. Small and young firms are therefore likely to suffer most from the crisis, while they are also overrepresented in the group of low productivity firms (Berlingieri et al., 2020[27]). Young businesses also tend to have lower mark-ups, and hence lower revenue-based productivity, even when their technical efficiency is at or above that of more established firms (Demmou et al., 2021[18]). This reflects their weaker market position, and also further translates into lower financial cushions. Some of these young firms would, under normal circumstances, evolve to contribute to future productivity growth (Berlingieri et al., 2020[27]) and their higher exposure to economic disruptions, combined in some cases with a "lost generation" of young firms, may induce scarring effects on aggregate productivity and employment.

This vulnerability of young and small firms may be a particular concern in countries and sectors where they represent a higher share of the business population, calling for specific attention from policy makers in order to preserve their potential to contribute to economic growth.

In all countries, policy interventions are also needed to address structural challenges, and promote experimentation and dynamism, in order to support a strong recovery that can overcome any long-term macroeconomic weaknesses in the business sector. Indeed, the COVID-19 crisis may further amplify long-term pre-existing trends, such as declining dynamism and increasing industry concentration; a concern reinforced by the heterogeneous effects of the crisis depending on firm age, size and productivity. The pre-crisis period had been characterised by increasing productivity gaps between leaders and laggards, declining entry rates and job reallocation, and increasing industry concentration (Bajgar et al., 2019[28]). Recent OECD work (Berlingieri et al., 2020[27]; Calvino, Criscuolo and Verlhac, 2020[29]) suggests that these structural trends may be grounded to some extent in a lack of capabilities and incentives for younger, smaller and less productive firms to experiment, innovate, and adopt new technologies. The severe economic shock these firms have faced may have further undermined their ability to adapt to new market conditions, experiment and compete with leaders. Therefore, despite the emergence of new business opportunities, it still remains key to address pre-crisis structural weaknesses such as the lack of skills and absorptive capacity, financial constraints or framework conditions favouring incumbents, even in countries experiencing faster rebounds in business registrations.

To offer a longer-term perspective on declining business dynamism, indicators from an OECD-led database (DynEmp3) (see Box 4.3) are exploited to provide additional evidence on the structure of the business population (more specifically, the size and age distribution of firms). These structural indicators (measured in 2014-15, the latest available years) complement the evidence on short-term dynamics related to the crisis presented above. They provide insights on long-term characteristics and trends in business dynamics that shape the resilience of the economy in the medium and long run. This analysis is relevant to inform policies aimed at tackling both pre-existing structural weaknesses, and the legacy of the COVID-19 crisis, to ensure an inclusive recovery and build long-term resilience.

Box 4.3. The DynEmp project: Measuring business dynamics, start-ups and job creation

The DynEmp project is a distributed micro-data project supporting the analysis of business dynamics, start-ups and job creation across a large number of OECD countries and partner economies. It is led by the OECD Directorate for Science, Technology and Innovation (DSTI) with the essential contribution of country delegates and national experts from OECD countries and partner economies.

The distributed micro-data approach adopted in the DynEmp project is based on a common statistical code developed by the OECD DynEmp team. It is run in a decentralised manner by national experts from statistical agencies, academia, ministries or other public institutions, who have access to national micro-level data, which is generally from business registers (Desnoyers-James, Calligaris and Calvino, 2019[30]). The micro-aggregated data generated by the centrally designed but locally executed program codes are then sent back for comparative cross-country analysis to the OECD.

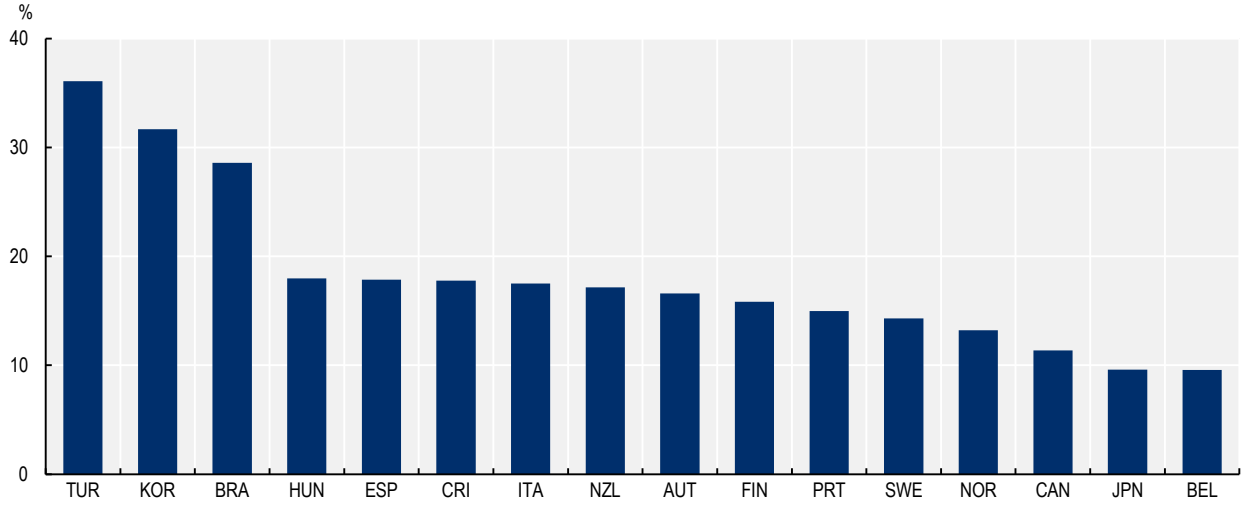
This methodology allows the DynEmp project to provide novel insights on business and employment dynamics based on highly representative and harmonised data suitable for country specific and cross-country analyses. Data presented in this chapter are based on the third wave of data collection, DynEmp3, featuring a more sophisticated statistical routine, and covering 18 OECD countries or partner economies over a period ranging between 1998 and 2015, depending on countries.[4]

The DynEmp website (OECD, 2021[31]) provides indicators related to business and employment dynamics, as well as additional readings on the topic.

Aggregate firm age and firm size structure

Figure 4.8 and Figure 4.10 provide a cross-country assessment of the importance of young and small firms respectively, based on data from the OECD's DynEmp3 database. Two countries – Turkey and Brazil – stand out as having a particularly high share of employment in young firms, and also rank high in terms of the share of employment in small firms.[5] Several countries that were heavily affected by the initial wave of the pandemic, including Spain and Italy, are also among those with high shares of small and young firms that tend to be more vulnerable to the initial economic downturns, thereby exacerbating the initial disruptions and potentially making the recovery more challenging.

Figure 4.8. Percentage of employment in young firms, by country

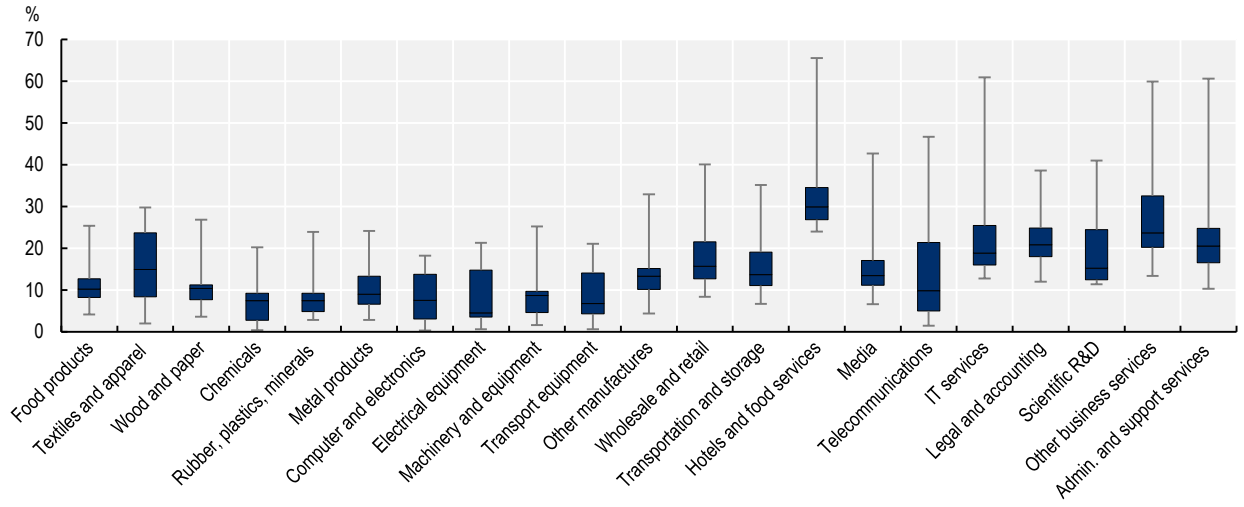


Note: Young firms are less than six years old. Numbers refer to 2015 except for Belgium, Japan, New Zealand and Norway (2014). Data for Japan are based on manufacturing only. Data for Austria, Japan and Korea are based on establishments rather than firms. Numbers are calculated as employment-weighted averages of industries (SNA A38 classification).
Source: OECD calculations based on OECD (2021[31]), *DynEmp3 Database*, http://oe.cd/dynemp.
StatLink https://doi.org/10.1787/888934261346

From an industry perspective, one of the most heavily affected industries, Hotels and food services, stands out as having a particularly high share of young firms, as shown in Figure 4.9. What is more, the industry is among those with the lowest potential to telework (see Chapter 3). Other industries with high shares of young firms, such as IT services, Scientific Research and Development (R&D) and Other business services, are relatively more able to shift to remote work, but may be more financially vulnerable as well as constrained in their ability to finance necessary future investments, due to the low level of tangible assets to offer as collateral, as discussed in Chapter 3.

Besides age, size is another important dimension of a firm's resilience to the COVID-19 crisis. In some cases, small firms may be more resilient than large firms because they can be more flexible; they may be better able to quickly re-orient production in response to changes in demand or to adapt their production methods to meet requirements for physical distancing of employees. However, on average, small firms tend to have disproportionately smaller liquidity reserves, less access to external finance, and are less likely to have a developed IT infrastructure that would allow them to easily move to telework (see also Chapter 5). Finally, small firms frequently produce in a single location and have a less diversified customer base. Therefore, if they are affected by lockdowns, such firms are more likely to have the entirety of their business operations put on hold (OECD, 2020[23]).

Figure 4.9. Percentage of employment in young firms, by industry

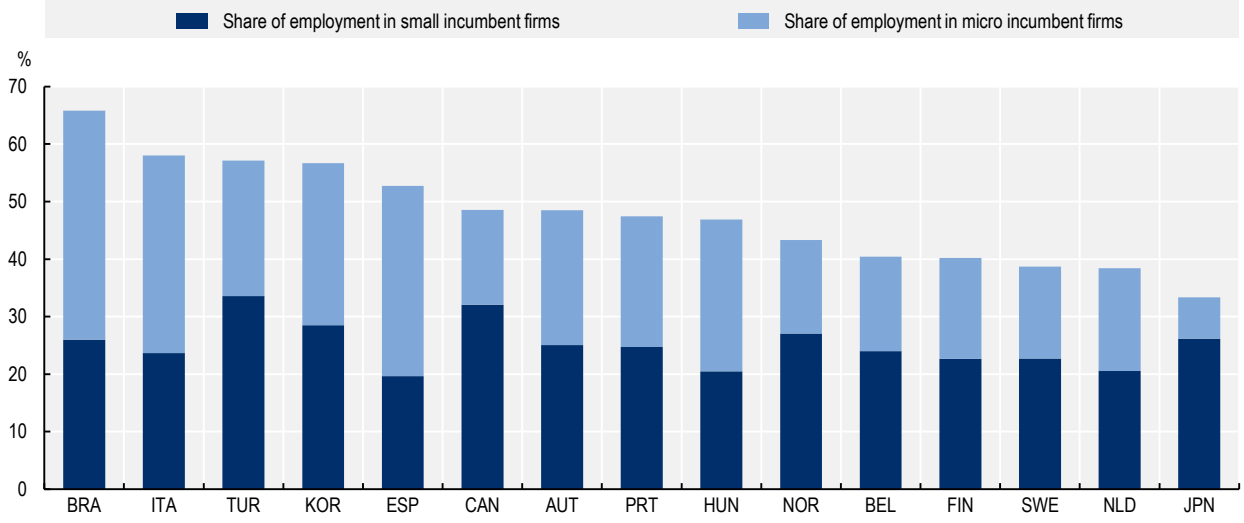


Note: Young firms are less than six years old. Numbers refer to 2015 except for Belgium, Japan, New Zealand and Norway (2014). Countries included are Austria, Belgium, Brazil, Canada, Costa Rica, Finland, Hungary, Italy, Japan, New Zealand, Norway, Spain, Sweden and Turkey. Data for Japan are based on manufacturing only. Data for Austria, Japan and Korea are based on establishments rather than firms.
Source: OECD calculations based on OECD (2021[31]), *DynEmp3 Database*, http://oe.cd/dynemp.

StatLink https://doi.org/10.1787/888934261365

Employment shares in small firms vary substantially across countries and industries, as shown in Figure 4.10. At the country level, Brazil, Italy, Spain and Hungary have a particularly high share of micro firms (fewer than ten employees). When adding in small firms (up to 50 employees), Turkey and Korea join the group of countries with a relatively high share of small, potentially vulnerable firms.[6]

Figure 4.10. Employment in small and micro incumbent firms as a percentage of total employment in incumbent firms, by country



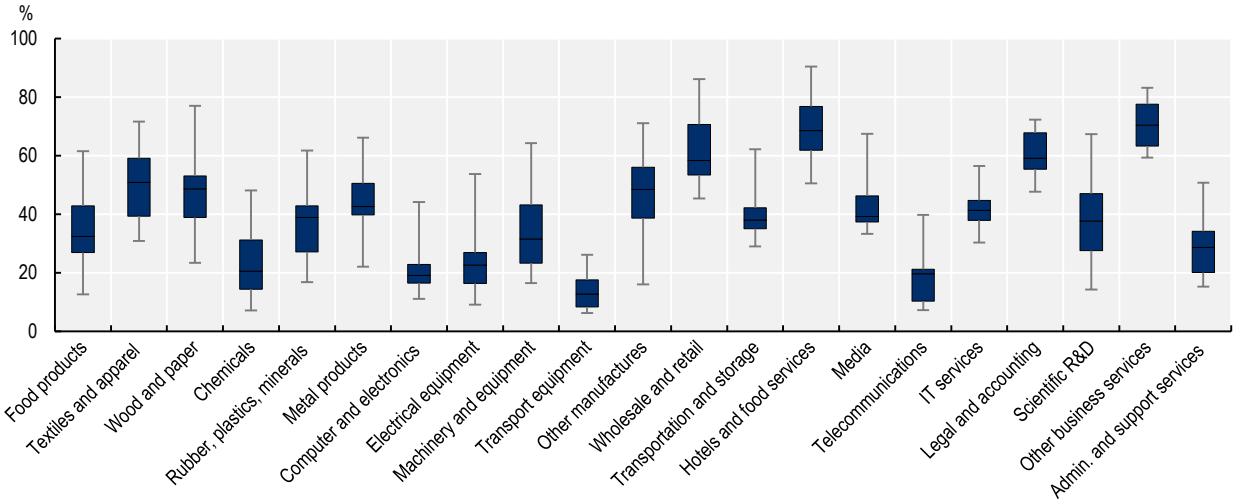
Note: Small firms are defined as having 10 to 49 employees, micro firms are those with fewer than ten employees. Numbers refer to 2015 except for Belgium, Japan, New Zealand and Norway (2014). Data for Japan are based on manufacturing only. Data for Austria, Japan and Korea are based on establishments rather than firms. Numbers are calculated as employment-weighted averages of industries (SNA A38 classification).
Source: OECD calculations based on OECD (2021[31]) *DynEmp3 Database*, http://oe.cd/dynemp.

StatLink https://doi.org/10.1787/888934261384

From an industry perspective, Hotels and food services have the highest share of small firms across countries, with Other business services, Legal and accounting, and Wholesale and retail also comprised of relatively smaller firms compared to other industries. While business services industries have the advantage of a relatively high telework potential, Hotels and food services and many parts of Wholesale and retail trade have been subjected to lengthy or repeated closures, and suffer from a combination of vulnerabilities (as discussed in more detail in Chapter 6) including low telework potential, high dependence on face-to-face contact and, in the case of Hotels and food services, a heavy reliance on travel and tourism.

Among the groups of countries with high shares of small and young firms (Figure 4.8 and Figure 4.10), tourism accounts for a major part of employment in Spain, and also plays an important role in Italy, Hungary and Turkey (see Chapter 6). These countries therefore stand out as particularly vulnerable, in terms of their firm and industry structure. Italy and Spain were also most heavily affected in the early stages of the pandemic after mandating particularly strict and long lockdowns, exacerbating their unfavourable position. Korea provides a contrasting example. While it also has a high share of small and young establishments across sectors, it has managed to keep the virus at bay with much less severe restrictions on economic activity. The intensive use of digital technologies to effectively implement a test-trace-treat policy to contain the pandemic has been key to this positive outcome (Pak, 2021[32]).

Figure 4.11. Employment in small incumbent firms as a percentage of employment in incumbent firms, by industry



Note: Small firms with fewer than 50 employees. This includes micro firms. Numbers refer to 2015 except for Belgium, Japan, New Zealand and Norway (2014). Countries included are Austria, Belgium, Brazil, Canada, Costa Rica, Finland, Hungary, Italy, Japan (manufacturing only), Korea, New Zealand, Norway, Spain, Sweden and Turkey. Data for Austria, Japan and Korea are based on establishments rather than firms.
Source: OECD calculations based on OECD (2021[31]) *DynEmp3 Database*, http://oe.cd/dynemp.

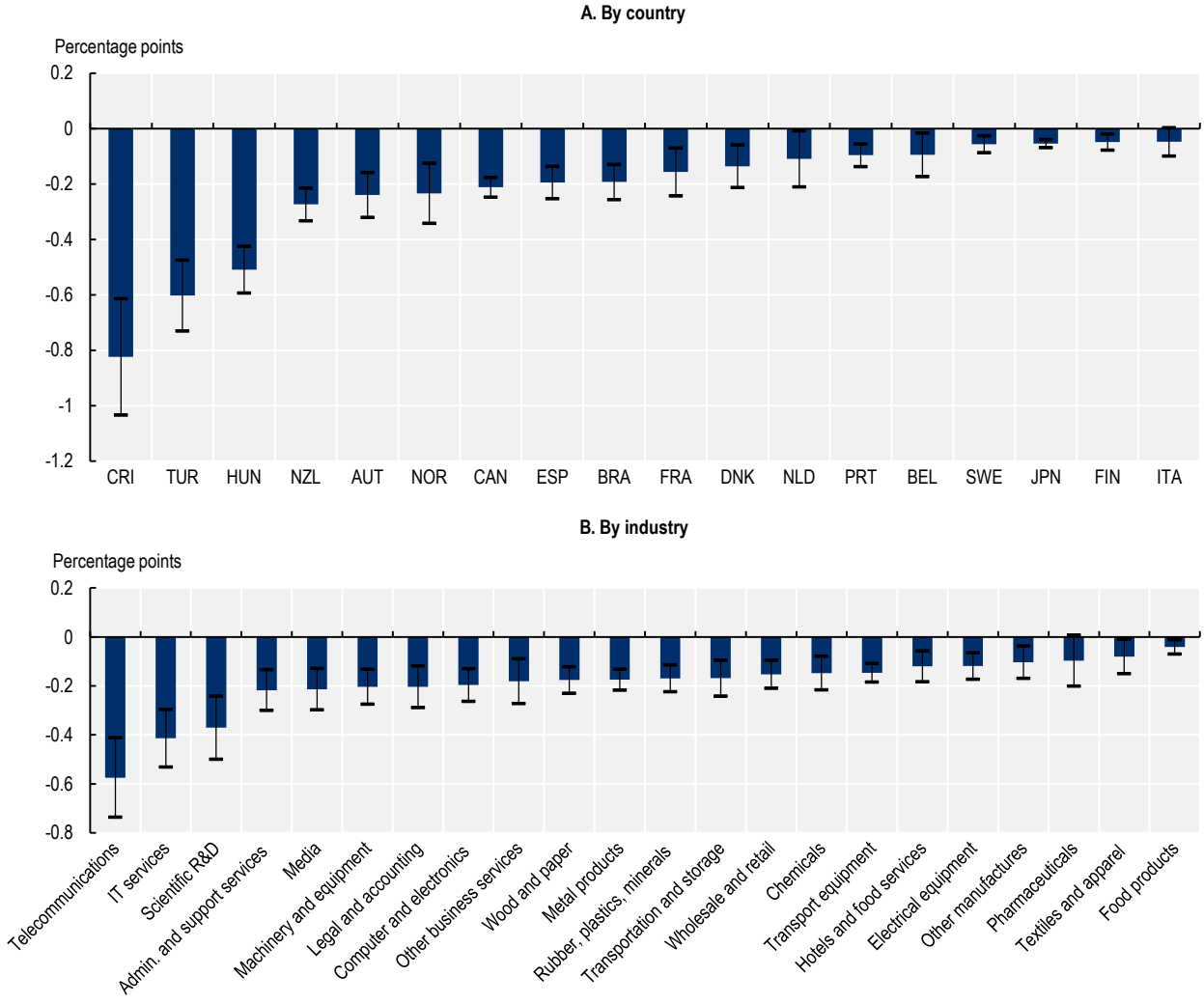
StatLink https://doi.org/10.1787/888934261403

From a static perspective, a higher share of young firms may be associated with a firm population that is more vulnerable to the short-term effects of the crisis, which should also be taken into account during the recovery, when firm support policies and restrictions on bankruptcies phase out. However, a high share of young firms may also be indicative of an overall more dynamic business environment, with possibly greater potential for experimentation and for developing new business models. Such an environment is crucial for economic recovery, including for employment as displaced workers may look to move into new firms and activities. Policies should continue to ensure and improve the underlying conditions which support business dynamism, notably the entry and growth of new firms.

COVID-19 and long-term declines in business dynamism

Besides the implied short-term vulnerabilities, the disproportionate adverse effect of the crisis on young firms and small and medium enterprises (SMEs), as well as on new business creation, may also be a concern for long-term business dynamism, as well as broader economic outcomes, including employment and productivity growth. The crisis may have impaired the ability of more vulnerable firms to experiment, innovate, compete and ultimately contribute to the process of creative destruction, while reinforcing the advantage of leaders who are better equipped to face shocks. In addition, the COVID-19 crisis occurs in a context of long-term declines in business dynamism, which reflects the existence of barriers already faced by firms prior to the crisis, that are key to future economic growth.

Figure 4.12. Average declines in entry rates across countries and sectors



Note: This figure reports, for each country (panel A) and industry (panel B), average yearly within-country-sector changes in entry rates, based on the trend coefficient of regressions within country-sector, for available years over the period 2000-15.
Source: Calvino, Criscuolo and Verlhac (2020[29]), "Declining business dynamism: Structural and policy determinants", https://doi.org/10.1787/77b92072-en based on OECD (2021[31]) *DynEmp3 Database*, http://oe.cd/dynemp.

StatLink https://doi.org/10.1787/888934261422

As documented in recent OECD work (Calvino, Criscuolo and Verlhac, 2020[29]), entry rates and job reallocation rates declined prior to the pandemic, by 3 and 5 percentage points, respectively, over the 2000-15 period.

By contrast, exit rates remained rather stable over the same period, implying declines also in net entry rates. Panel A of Figure 4.12 shows that declines have been pervasive, and that all countries and industries displayed some signs of weakening business dynamism prior to the crisis – evidenced in declining entry rates. Further results show that declines in job reallocation rates have also been pervasive across countries and industries. However, countries differ in the magnitude of the decline, as illustrated in panel A of Figure 4.12, with Costa Rica, Turkey and Hungary displaying the largest drops of more than 0.4 percentage points every year – accumulating to substantial long-term declines over time –, and Finland, Japan and Sweden the lowest, with less than 0.1 percentage points yearly declines (Calvino, Criscuolo and Verlhac, 2020[29]).

Panel B of Figure 4.12 further uncovers relevant differences across sectors, with Telecommunications, IT services and Scientific R&D clearly showing the strongest declines, while Pharmaceuticals, Food products, and Textiles and apparel experiencing the mildest.

Exploiting cross-country and cross-sector differences in the magnitude of declines, Calvino, Criscuolo and Verlhac (2020[29]) provide evidence that drops in entry rates and job reallocation rates are related to structural factors. Declines may, to some extent, reflect a process of consolidation related to the industry life cycle of initially more dynamic industries. However, industry concentration and productivity dispersion between leaders and laggards also play a significant role in accelerating the speed of decline in business dynamism, even after accounting for sector maturity. Winner-takes-most dynamics and barriers to technology diffusion are important drivers of the declines across countries, and the underlying mechanisms are reinforced by the digital transformation and the corresponding rising importance of intangible assets.

The digital transformation has indeed contributed to increasing divergences and gaps between firms (Andrews, Criscuolo and Gal, 2016[33]; Gal et al., 2019[34]; Berlingieri et al., 2020[27]; Corrado et al., forthcoming[35]). Some firms – typically those that are larger and more productive – may benefit more from digitalisation, as they are able to innovate, adopt new technologies and exploit complementarities with intangible assets. By contrast, other firms – young firms and SMEs in particular – may face barriers to the adoption of technology and to the accumulation of intangibles, as well as significant challenges when competing with leaders. Hurdles include a lack of absorptive capacity and incentives (for instance, related to financial constraints), a lack of skills, or regulations favouring more established firms.

Overall, this may prevent potential entrants or laggard firms from taking advantage of existing knowledge or learning from the best, and could discourage business formation, thereby reducing reallocation. Higher concentration of sectors may also be associated with discouragement effects, barriers to entry and more stable job flows possibly linked to lower levels of creative destruction and competition. Larger gaps in productivity and in share of sales between frontier firms and followers in an industry may indeed reduce the chances of laggards to catch up with leaders, potentially reducing incentives for experimentation and innovation.

In this context, the economic crisis associated with COVID-19 is an additional threat to business dynamism in the long term. In some countries, the shock to business creation and the risk of a missing generation of new firms may amplify the effects of the long term decline in entry rates, which has been pervasive across countries and sectors prior to the crisis. The crisis may also have strengthened underlying mechanisms that have been identified as possible drivers of the decline in business dynamism. These concerns relate in particular to possible effects of the crisis on industry concentration and barriers to technology and knowledge diffusion. Long-term effects of the crisis on market structure – notably market shares and margins – are still uncertain. In some cases, the entry of new firms may spur competition and energise markets through innovation. However, established leader firms may have weathered the crisis better, and strengthened their market power. In addition, despite the support provided through emergency policy measures, widespread financial vulnerability and a possible debt overhang could reduce investment, especially in assets that are key for firm performance but more difficult to finance, such as intangible assets.

Therefore, while the crisis may have spurred the adoption of new technologies and the uptake of new work practises such as teleworking (as discussed next in Chapter 5), it may also undermine investment in

complementary assets (training, databases, management) that allow firms to reap the full benefits from technology adoption and organisational changes. These risks are not evenly distributed across firms, and the disproportionate effect of the crisis on young firms, SMEs, and those that are less digital- and intangible-intensive, implies that firms struggling to keep up with the frontier before the crisis also are more likely to suffer the most from long-term consequences of the economic disruptions related to the COVID-19 outbreak.

Emergency measures may have helped prevent a damaging wave of firm failures. However, the possible interaction between the impacts of the COVID-19 crisis and pre-crisis structural trends warrants policy interventions that address both simultaneously. Addressing structural drivers of long-term declines in business dynamism may also allow for better exploitation of business opportunities that emerge during or after the pandemic. In addition to the phasing out of emergency measures discussed in the previous section, appropriate structural policies are presented at the end of this chapter, following a discussion of additional challenges related to pre-crisis corporate financial vulnerability, in the next section.

Corporate financial vulnerability

Firms differ in their vulnerability to the financial shocks associated with the crisis along a number of dimensions, including industry, size and age. There are also substantial important differences across countries in terms of the level of pre-crisis aggregate corporate debt, and the extent to which governments and financial sectors may be prepared to bridge the funding gaps experienced through the crisis.

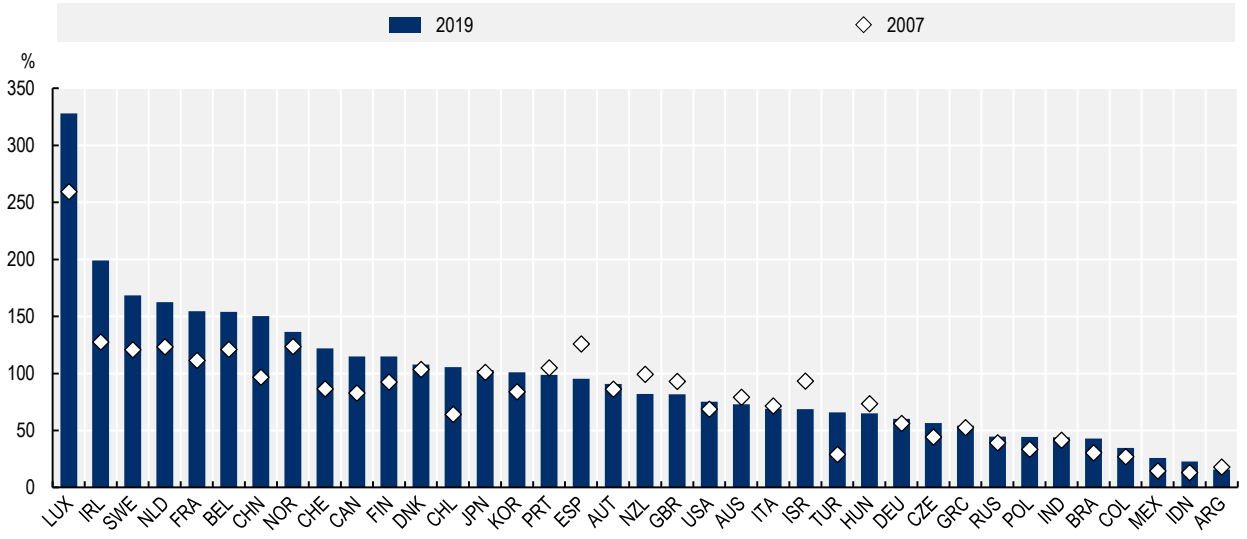
Looking across countries, Figure 4.13 and Figure 4.14 provide an initial indication of level of debt held by non-financial firms. Concerns about high levels of corporate debt, particularly in the form of corporate bonds, had emerged in the pre-COVID-19 period (OECD, 2017[36]; Çelik, Demirtaş and Isaksson, 2019[37]). This increase in debt amplified financial pressures during the COVID-19 outbreak (Aramonte and Avalos, 2020[38]), with highly indebted firms predicted to see stronger impacts on leverage ratios and future investment (Demmou et al., 2021[18]). High corporate debt prior to the crisis could therefore be considered as an aggravating factor for the risk of debt overhang. Credit to private non-financial corporations provides an aggregate measure of firms' indebtedness and their reliance on credit. High levels of credit-to-GDP at the onset of the COVID-19 crisis may indicate a higher aggregate risk of insolvency in the face of decreasing revenues that can spill over to exposed creditors.[7]

Figure 4.13 shows that corporate credit-to-GDP ratios have increased significantly in some countries since the 2008 financial crisis, leading to high levels of debt-to-GDP (above 150% in Belgium, China, France, Ireland, Luxembourg, the Netherlands and Sweden). As well as affecting the survival and performance of the indebted firms themselves (also discussed below with respect to the cost of debt servicing), this risk can spill over to exposed creditors and reduce willingness to lend, even to financially sound firms.

The debt service ratio provides further insight into firms' ability to pay their debt with revenues. It is defined as the ratio of interest payments plus amortisations to income, and indicates the debt burden of the corporate sector. The debt service ratio reflects the aggregate vulnerability of the corporate sector in the event of a drop in revenues, and is also considered an early warning indicator for systemic banking crisis (see for example Drehmann and Juselius (2014[39])).

Countries with high debt service ratios in non-financial corporate sectors have generally experienced significant increases in this ratio since 2007, and consequently entered the COVID-19 crisis with higher risks (Figure 4.14). In Belgium, Italy, the United States and Sweden, firms' debt service took up almost 50% of their income in 2019. In Spain and Denmark, the debt service ratio is even higher, at 55% and 60% respectively. Conversely, other countries have experienced significant improvements in the aggregate debt service ratio, including Norway, which displays one of the lowest values in the sample, down from the highest value in 2007.

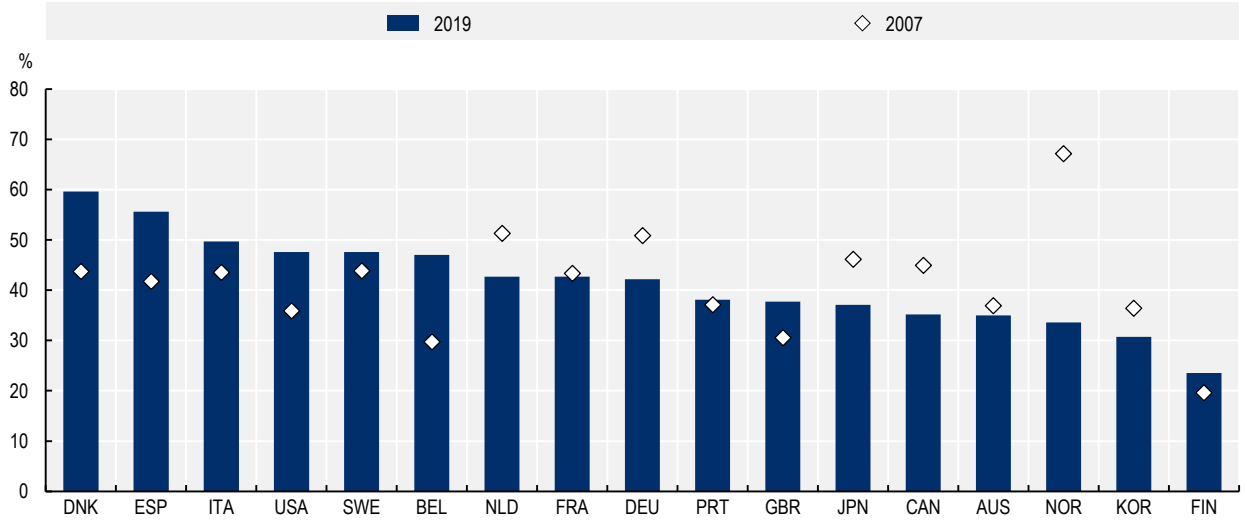
Figure 4.13. Total credit to private non-financial corporations as a percentage of GDP (2019 vs. 2007)



Note: Total credit to private non-financial corporations as percentage of GDP, for the years 2007 and 2019.
Source: Bank for International Settlements (2020[40]), *BIS total credit statistics* (database), https://www.bis.org/statistics/totcredit.htm (accessed in July 2020).

StatLink https://doi.org/10.1787/888934261441

Figure 4.14. Debt service ratios of non-financial corporations (2019 vs. 2007)



Note: The figure displays the debt service ratios (DSR) of the non-financial corporations sector for 2007 and 2019. The DSR measures the share of income used to service debt.
Source: Bank for International Settlements (2020[41]), *BIS debt service ratios statistics* (database), https://www.bis.org/statistics/dsr.htm (accessed in July 2020).

StatLink https://doi.org/10.1787/888934261460

When considering appropriate policy responses that strike a balance between health and economic priorities and the extent of support to offer to firms and households that have been affected by the pandemic, governments face a number of constraints. Countries that went into the crisis with healthy economic conditions and low debt levels are in a better position to support firms and workers through prolonged periods of restrictions on activity, and against the short-term shocks induced by the crisis.[8]

Levels of unemployment before the crisis are an important indicator of the state of the labour market in a country, and of business cycle conditions. Differences across countries also reflect structural characteristics of the labour market. A well-functioning labour market is likely to also adapt better during the crisis, and allow a more efficient recovery. Importantly, it also implies a lower burden on state budgets before the crisis, as fewer workers are dependent on benefits. With some exceptions, government debt levels are strongly correlated with pre-crisis unemployment rates, implying challenging trade-offs for governments in meeting current financing and support needs.

Several of the countries that have been through strict lockdowns and suffered substantial reductions in economic activity, including France, Italy and Spain (Figure 2.3 to Figure 2.5), also had relatively high levels of unemployment and government debt prior to the crisis, suggesting structural factors that might also hinder the reallocation of resources during the recovery phase. Specific policies enabling the formation of the necessary skills for a green and digital recovery may also be particularly effective in supporting a more inclusive recovery by aiding the labour market inclusion of disadvantaged workers, such as young labour market entrants.

Conclusions and policy implications

The COVID-19 crisis has had a huge impact on firms, and has brought with it substantial challenges, especially for new and small businesses. The effects of the crisis on business dynamics may be long-lasting, particularly for countries that tend to have a more vulnerable business structure. Going forward, government policies will be a decisive factor in the strength and success of recovery.

Over the initial months of the crisis, governments around the world have stepped in with strong measures to support firms and workers through periods of economic lockdown and reduced activity.[9] As confirmed by early data, these measures have thus far prevented a wave of corporate bankruptcies (Figure 4.4) and reduced impacts on employment (OECD, 2020[42]). As countries move beyond lockdowns and broad emergency support measures, more specific policies to support recovery and to encourage a productivity-enhancing reallocation of resources will be required – not least because state budgets are limited and some countries are already facing discussions on the sustainability of new debt, and the ability to provide support through further rounds of lockdowns.

Maintaining the current stock of firms should not be taken as the sole goal of policy support. In the post-pandemic period, the balance of support provided to firms becomes more complex. Policy makers must strike a balance between phasing out support too soon, thereby risking a wave of failures of otherwise viable firms, and maintaining support for too long, creating incentives to keep firms afloat that will not be viable in the post-COVID-19 economy (and preventing the reallocation of resources to more productive opportunities).

The progressive withdrawal of direct financial support should be accompanied by broad-based policies to increase resilience and improve the business models of existing firms while promoting active reallocation of resources across firms. A sustainable and inclusive recovery relies on both existing and new firms being able to recognise and take advantage of new opportunities. To this end, policies to support healthy business dynamics remain a key aspect of the recovery effort. In particular, promoting experimentation, for instance through lowering barriers to entrepreneurship and to firm growth, is key for a vibrant business environment, as economies enter into the recovery period and need to tackle long-term challenges.

Recent OECD research (Calvino, Criscuolo and Verlhac, 2020[29]) suggests key policy areas that may help to support firm entry, entrepreneurship and creative destruction. These include reducing barriers to entry and red tape through simplifying administrative processes and reducing the cost and complexity of product market regulations, and ensuring that bank credit or other sources of finance are available on reasonable terms for young and small firms rather than just for larger incumbents.

Similarly, governments can play a role in enabling innovation in smaller and younger firms through more direct government financing of R&D, rather than solely through tax credits, which, depending on their design and their carry-forward provisions, might not be able to support innovation spending in cash-stripped or profit-losing firms. This implies a need to look at alternative methods of financial support, such as equity and quasi-equity (especially for SMEs) injections, and allowance for corporate equity and debt-equity swaps, which may play a longer-term role in recapitalising firms while minimising the negative impacts of debt overhang (Demmou et al., 2021[18]). Measures to support debt restructuring, such as granting priority over unsecured existing creditors for new financing, and promoting pre-insolvency frameworks, may also help to reduce default and enable distressed firms to invest during the recovery.

Ensuring efficient bankruptcy procedures and contract enforcement will help free up resources and speed up the process of reallocation. Labour market policies that enable experimentation and job mobility – for example, by ensuring access to benefits and health insurance for individuals with atypical career paths – can also help to enable entrepreneurship while limiting hardship associated with job loss during the crisis (OECD, 2020[43]). These factors have been shown to be important for managing the pervasive decline in business dynamism observed over recent decades, and have become even more critical in the wake of the COVID-19 crisis.

As elaborated on in more detail in the next chapter, the COVID-19 pandemic and its associated restrictions on mobility and interaction have led to a rapid increase in the uptake of digital and remote work technologies. While these technologies have the potential to improve productivity and reduce entry costs for firms, developments in recent decades have shown that digital-, skill-, and intangibles-intensive industries have also experienced a more rapid increase in concentration and productivity dispersion, and a more substantial decrease in business dynamism (Berlingieri et al., 2020[27]; Bajgar et al., 2019[28]; Calvino, Criscuolo and Verlhac, 2020[29]; Corrado et al., forthcoming[35]). The ability of firms to access and benefit from new technology developments may therefore become even more critical post-COVID-19. The next chapter considers the adoption of key remote and digital technologies, focusing on long-term investments such as infrastructure and upskilling. Complementing these, short-term actions to support technology uptake – for example, through targeted financial supports – may also help firms to adjust to the changes required by COVID-19.

Both the crisis itself and the dynamics of recovery have the potential for adverse effects on market structure and concentration. Concentration can have implications for various economic phenomena, such as product market competition, but also for the potential of monopsonies in inputs and labour markets on the contractual terms for suppliers and workers (OECD, 2008[44]). This in turn can affect innovation and productivity growth, and wage inequality across workers, firms and regions. Recent OECD work has highlighted the importance of policies that ensure a sufficient level of competition to avoid negative consequences, such as those challenging exploitative pricing behaviours, reviewing merger activity, and evaluating the potential to decrease entry costs (OECD, 2020[45]). These need to be complemented by a careful analysis of the potentially anti-competitive effects of support policies, keeping in mind the post-crisis concerns about concentration and competition.

In recent years, empirical evidence has pointed towards a trend of increased industry concentration both in the United States and in Europe, as discussed in Bajgar et al. (2019[28]). The COVID-19 crisis may further accelerate this trend through asymmetric impacts on firms of different size, age and productivity. These asymmetric impacts are potentially further exacerbated by differing propensities to digitalise, as discussed in more detail in Chapter 5. It is therefore crucial to ensure equal access to public support funds and measures, to avoid further reinforcing pre-existing divides.

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Notes

[1] Data are from OECD (2021[31]). New and young firms also display positive net job creation rates: their yearly net job creation is around 2.5% of total employment (Criscuolo, Gal and Menon, 2014[46]). Older firms usually display negative net job creation rates.

[2] Annex D summarises early policy measures put in place to support firms and workers in the early stages of the crisis, particularly over the period of initial lockdowns.

[3] In the short term, intangible assets may be a factor of resilience (e.g. lower reliance on physical capital during lockdowns, better management and skills, stronger customer base, higher ability to telework). However, intangibles are difficult to finance. Therefore, in the long term, firms in sectors that rely more on intangibles may face higher financial constraints.

[4] At the time of writing, a new wave of data collection is ongoing for the OECD's DynEmp project to extend country coverage and update data to cover a more recent period.

[5] While shown in the graph, Korean results are based on establishment (plant) level data, rather than enterprise (firm) level, so are not fully comparable – nevertheless, results indicate that Korea has more young establishments than Japan and Austria, for which data also relies on plant-level data.

[6] In Korea this may partly reflect the use of establishment level, rather than enterprise level data, if multi-establishment firms are a significant part of the economy.

[7] Alongside bank credit, trade credit is a further source of vulnerability for firms. Trade debts may be an even stronger concern for policy makers as they have the potential to spread the negative liquidity shock throughout the economy and the policy toolbox for addressing this type of financial shock is more limited than for bank debts.

[8] Brazil, for example, is facing fiscal constraints on the continuation of its social support programmes for mitigating the short-term impacts of the crisis on the poor (The Economist, 2020[47]).

[9] Annex D provides a summary of labour market and tax policies which have been enacted to support firms over this period.

5 Supporting productivity through digital technologies

Digital technologies have been a key element of economic resilience during the COVID-19 crisis. This chapter focuses on several types of digital technologies that help firms and workers stay productive through the pandemic, and beyond. It first examines the adoption of telework, and discusses several enabling factors for its uptake, including pre-crisis experience with remote work, availability and quality of communications infrastructure, and the digital skillset of the population. The chapter then highlights other digital technologies and tools that became crucial in the pandemic, such as those related to e-commerce or cloud computing. It also discusses digital divides along several dimensions, looking at how they can potentially be exacerbated through the rapid uptake of digital technologies, including increasing gaps between leading and laggard firms, urban and rural populations, and the varying digital skill levels of workers.

Key findings

- **The pandemic contributed to rapid growth in digitalisation and information and communication technology (ICT) use**. The COVID-19 crisis has been a catalyst for the adoption of digital technologies, leading many countries to increase the use of digital tools such as telework up to nearly their estimated potential.
- **Digital technologies hold the key to resilience during the crisis and beyond**. Telework, and other digital technologies such as e-commerce, were crucial factors in firms' and workers' ability to maintain production during the crisis. Factors enabling the use of such technology, such as high-capacity communications infrastructure, digital skills and data security, are crucial to building resilient economies and firms. Governments should ensure that long-term policies, for the recovery period and beyond, foster and embrace the adoption of digital technology to ensure its benefits are spread widely.
- **Governments must address digital divides in the long term**. While the rapid digital uptake has been key to staying productive and connected for many, it can also exacerbate pre-existing divides in digital skills and use. These divides exist across populations (e.g. between rural and urban areas), workers (e.g. those with differing digital skill levels), and firms (e.g. small and large firms). Addressing these growing gaps is crucial in ensuring a strong and inclusive recovery, and in combatting inequalities over the long term.

Introduction

Digital technologies have been crucial in enabling people to communicate, work, shop, learn, entertain themselves and even stay physically active from their homes throughout the COVID-19 pandemic. Digital tools for remote work have been particularly important during the crisis, as they allowed firms and workers – especially those in non-essential industries – to continue operating in the face of lockdowns and social distancing restrictions. Digital technologies can help to reduce physical contact over prolonged time periods, as "living with the virus" has become the new normal.

In many ways, the COVID-19 crisis has accelerated already existing digitalisation trends, while at the same time fostering new uses of digital technologies and the creation of new digitally-enabled business models. The need to reduce physical contact and mobility led workers, firms and consumers to adopt digital technologies much faster and to a much larger extent than they would have otherwise, as recent evidence shows (OECD, 2021[1]; OECD, 2020[2]; OECD, 2020[3]; Riom and Valero, 2020[4]). OECD countries have seen a tremendous increase in Internet traffic in 2020, with average Internet bandwidth growing by 58% between December 2019 and December 2020.[1] For some countries the growth was dramatic; for example, Chile and Mexico experienced bandwidth growth of 160% and 135%, respectively, over the same period.

This development has been paralleled by a surge in telework. While levels of telework uptake before the crisis had remained well below their estimated potential, they reached unprecedented new heights through the pandemic across countries (OECD, forthcoming[5]). Recent data for Italy shows that, during the crisis, this gap between actual and potential extent of teleworking narrowed substantially – with telework even temporarily reaching its full estimated potential during the first lockdown (OECD, 2020[3]). Telework has the capacity to increase the resilience of economies in case of future health crises or other shocks restricting mobility, but more widespread telework also promises broader potential benefits for countries and workers, including higher productivity, better work-life balance, and a reduction of carbon emissions.

From a firm perspective, the ability to shift to remote working depends on a number of factors in addition to the types of tasks on the job (varying to a great degree across industries, as discussed in Chapter 3), such as the availability of high-quality communication infrastructure (i.e. broadband), the skills of workers and managers, and prior experience with, or trust in, digital solutions and tools. These factors are relevant not only to the adoption of telework-based working models, but are also crucial for the efficient adoption of other digital technologies, such as cloud computing, online sales, and even artificial intelligence (AI). How they vary at the country level, and how they relate to observed levels of telework, is explored in the following sections.

As the economy recovers, digitally-enabled changes to business functioning may also help reduce carbon emissions and mitigate climate change. Relevant changes include shifts in work modes (such as increased teleworking and teleconferencing), as well as changes to business models (e.g. the rise of e-commerce). Expanding telework by removing barriers to uptake and encouraging companies and workers to adopt new, digital modes of working and interacting can aid in achieving environmental objectives while also building resilience.

During the crisis, the observed increase in the speed and breadth of the adoption of digital technologies has nevertheless revealed the potential to widen digital divides (i.e. differences in the use and benefits that accrue to digital-savvy parts of the population as compared to those less able to leverage the possibilities offered by the digital transformation). This divide concerns a range of outcomes, as digital capabilities are no longer only relevant for workplace or leisure choices, but have become invaluable for managing daily life and staying healthy during the pandemic. This is a concern particularly for older population groups, who typically exhibit relatively lower engagement and skills related to the effective and safe use of digital tools (OECD, 2020[3]; 2020[6]), and have also been among those most at-risk from the health crisis. With many new digital solutions likely to remain in use at least to some extent after the crisis, bridging the digital divide becomes all the more urgent and is likely to remain high on the policy agenda for an inclusive, green and speedy recovery.

Moreover, as many of the societal and economic changes that have been triggered or accelerated by the COVID-19 crisis will likely persist, addressing the needs and challenges related to a widespread diffusion and use of digital technologies will remain important when the health crisis abates (OECD, 2020[6]). Indications that the shift to digital tools represents a permanent change in preferences can be found in several areas. For example, a recent survey finds that changes in online shopping behaviour are likely to last beyond the pandemic (UNCTAD; NetCommSuisse, 2020[7]). Levels of telework are also likely to remain well above pre-crisis levels permanently. Due to prolonged remote working during the crisis, worker and employer preferences appear to have shifted in favour of more frequent telework: workers who experienced telework during the crisis report a clear preference for continuing to do so at least a few days per week (Eurofound, 2020[8]). Recent evidence supports the notion that workers, as well as managers, now consider ideal levels of telework to be much higher than pre-crisis levels, and that the crisis stimulated investments in associated tangible and intangible capital, suggesting that some of the stigma previously associated with telework has broken down (OECD, forthcoming[5]; Bloom, Mizen and Taneja, 2021[9]). In addition, even when the use of remote tools will no longer be a necessity due to the crisis, digital readiness will remain important not only for participation in the labour market but also in many aspects of everyday life. This includes purchasing goods and services; taking part in recreational activities; finding and accessing services such as health care and e-government services; and even interacting with AI technology (Nachtigall and Squicciarini, forthcoming[10]).

The rapid spread of digital technologies will require not only high levels of digital skills, but also sound cognitive and socio-emotional skills for the wider population to navigate change and thrive in the digital era. These skills not only allow individuals to reap the benefits of the digital transformation, but at the same time foster growth and productivity while preventing pre-existing gaps – across several dimensions – from widening. As analysed in more detail in Chapter 7, workers who have better digital skills appear to be in a better position to keep working through the health crisis, and are likely to be less impacted by the ensuing economic recession. This highlights the importance of having the required skills for succeeding in the digital age, but it also shows the potential for widening digital divides, which might create new disparities. The

potential for increased polarisation also exists along a number of dimensions that already exhibit gaps in digital technology access and uptake. Evaluating the impact of policies on these divides, and investing in communications infrastructure and digital skills for those lagging behind, will be crucial to prevent a deepening of pre-existing gaps (OECD, 2020[11]). Pre-existing divergences in adoption may be exacerbated not only between people, but also between firms. Indeed, not all businesses develop, adopt or use digital technologies in the same way, nor do they benefit equally from the digital transformation, as documented in a series of work in the OECD's Going Digital project (Andrews, Criscuolo and Gal, 2016[12]; Gal et al., 2019[13]; Sorbe et al., 2019[14]).

The first part of this chapter is devoted to the analysis of telework, which has been crucial not only to sustain production and employment while maintaining social distancing restrictions, but might also remain the "new normal" after the health crisis. At the country level, there are factors that can limit or accommodate remote work. How these interact with industry (discussed in detail in Chapter 3) and firm characteristics affecting telework uptake are part of the analysis in the first part of this chapter.

The second part of this chapter focuses on other types of digital technologies, which have contributed to upholding not only production, but also supply. Digital modes of performing transactions, such as online sales, have played a major role in retail, but also in other industries which shifted to e-commerce during the crisis (OECD, 2020[2]). The section then discusses more advanced digital technologies that are relevant to firms across industries, such as cloud computing. This section also provides an outlook of potential consequences of the accelerated and uneven uptake of these technologies, focusing on divides between firms in different industries.

A third part of this chapter discusses how the various changes brought about by the crisis can affect productivity, focusing in particular on changes related to digital technologies. Despite the many adverse effects of restrictions on economic activity, some positive developments have emerged, and new opportunities for businesses have arisen that have the potential to translate into long-term productivity gains. The last component of this part of the chapter discusses how pre-existing digital divides should be addressed, to avoid adverse consequences through increased concentration that potentially diminish the productivity-enhancing effects of the accelerated digital transformation.

Adoption of telework

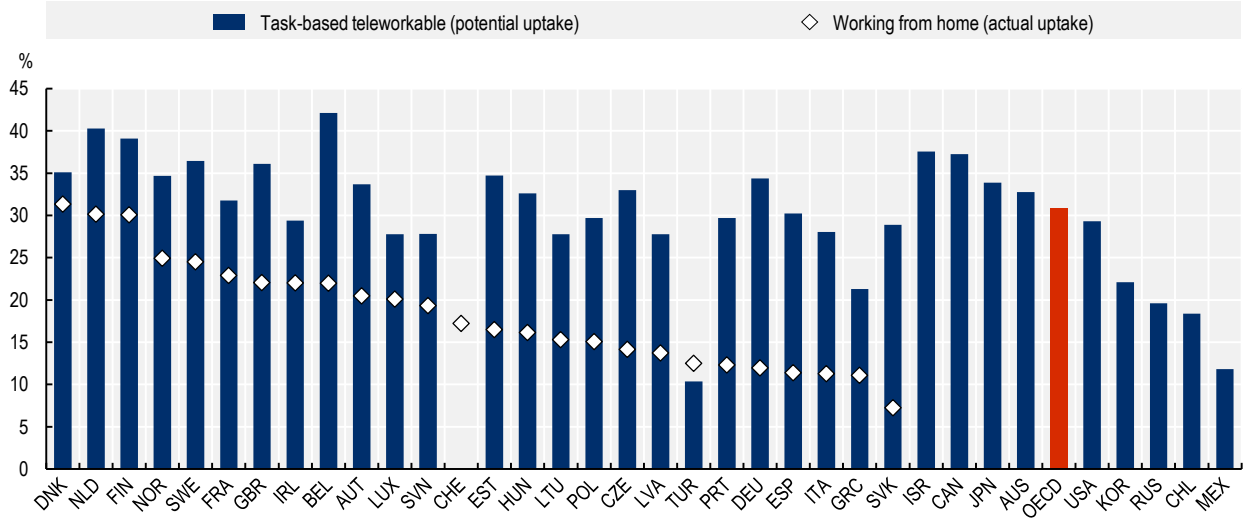
Pre-crisis experience with working from home

Experience with telework prior to the crisis is an important determinant and indicator of how easily and successfully it could be adopted in the pandemic to ensure social distancing at work by limiting staff presence. Besides the different task-related factors determining the potential for telework within and across industries discussed in Chapter 3, actual telework adoption is also shaped by a range of country-level factors.[2] These can be of a technical nature (e.g. the availability of broadband infrastructure), or more "soft" factors such as social norms (e.g. a culture of physical presence in the office; the use of output-based management styles instead of input-based styles, such as assessing performance based on hours worked; or trust between managers and workers). Societal acceptance and public support for flexible work arrangements also play a role (e.g. policies implemented in Finland allowing employees to choose their working hours[3]).

Figure 5.1 presents data on the pre-crisis prevalence of telework alongside a measure of telework potential, by country (Espinoza and Reznikova, 2020[15]). Experience with telework before COVID-19 varied substantially across countries. While it was particularly high in the Nordic countries and the Netherlands, with 25% to 30% of the workforce reporting regular telework already in 2015, it was relatively low in several southern (Greece, Italy, Spain, and Portugal) and eastern (the Slovak Republic, Latvia) European countries, which had adoption rates of 10% to 15%.

The high rates of telework experience in the Nordic countries and the Netherlands prior to the crisis nearly matched estimated telework potential. A few additional countries (Belgium, Canada, England and Israel) also score high in terms of task-based telework potential. Overall, estimates for telework potential generally range between 20% and 40%, with a few outliers at the lower end (Turkey, Mexico). Many countries that had lower pre-crisis telework adoption rates appear to fall well below their assessed potential (e.g. the Slovak Republic, Latvia, Germany and Spain). Some possible reasons for limited telework uptake are discussed in the following sections.

Figure 5.1. Pre-crisis adoption of telework, by country



Note: Working from home indicator: data refer to 2015 and telework is defined as working from home at least several times a month. Task-based telework ability indicator: data collected between 2011 and 2017, data for the United Kingdom refer to England. Average refers to the unweighted average across the OECD reported countries.

Sources: OECD calculations based on Eurofound (2017[16]), *European Working Conditions Survey, 2015* (data collection), http://doi.org/10.5255/UKDA-SN-8098-4 for working from home; Espinoza, R. and L. Reznikova (2020[15]), "Who can log in? The importance of skills for the feasibility of teleworking arrangements across OECD countries", https://dx.doi.org/10.1787/3f115a10-en for task-based telework ability.

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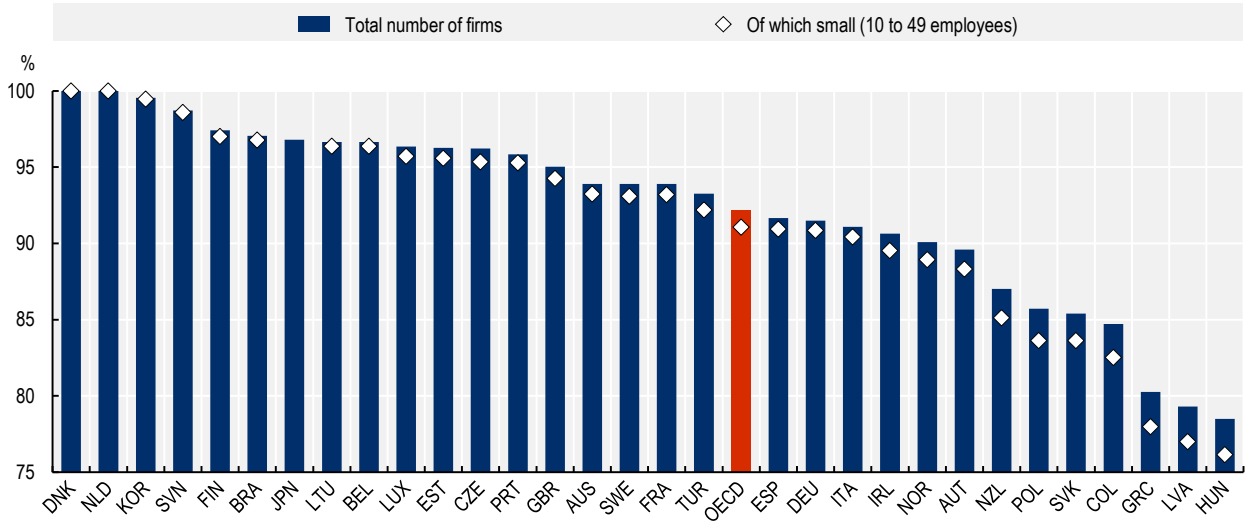
Broadband infrastructure as a necessary condition for connectivity and remote working

In addition to the task- and skills-related reasons that explain why workers and firms in some countries are able to adopt telework more easily, communication infrastructure is an important limiting factor, as working remotely requires that both firms and employees can rely on adequate (i.e. fast and reliable) broadband connections. In addition, economic activities in a remote setting may require symmetrical download and upload broadband speeds for applications such as virtual meetings. Previous evidence shows that the availability of high-speed broadband is also an enabling factor for a number of further digital technologies used by firms, such as back- and front-office management systems (Andrews, Nicoletti and Timiliotis, 2018[17]).

Data from firm surveys in OECD countries show that while – in the vast majority of countries – virtually all firms seemed to have access to broadband in the years preceding the crisis (Figure 5.2), high-speed connectivity is not as pervasive (Figure 5.3). In Denmark and the Netherlands, all enterprises with at least ten employees reported to have a broadband connection with a minimum advertised speed of 256 kilobits per second (Kbps). Greece, Latvia and Hungary are among the countries with relatively lower access rates, with about 78% to 80% of enterprises having broadband connections at 256 Kbps – the minimum advertised speed (Figure 5.2). The gap in broadband access by firm size is also largest in these countries.

Figure 5.2. Enterprises with a broadband connection, as a percentage of enterprises in each employment size class



Note: Businesses employing at least ten employees. Broadband connections refers to fixed line broadband services (i.e. of 256 kilobits per second advertised speed or more) subscriptions purchased by households or businesses. Fixed broadband comprises DSL, cable, fibre-to-the-home (FTTH), fibre-to-the-building (FTTB), satellite, terrestrial fixed wireless and other fixed-wired technologies. For Japan and Korea, data refer to both fixed and mobile broadband. Data refer to 2019 except for Colombia, Japan and Korea (2018), New Zealand 2017/18, Australia 2016/17. For Brazil, broadband is defined by type of connection rather than download speed. Average refers to the unweighted average across the OECD reported countries.

Source: OECD (2021[18]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 29 January 2021).

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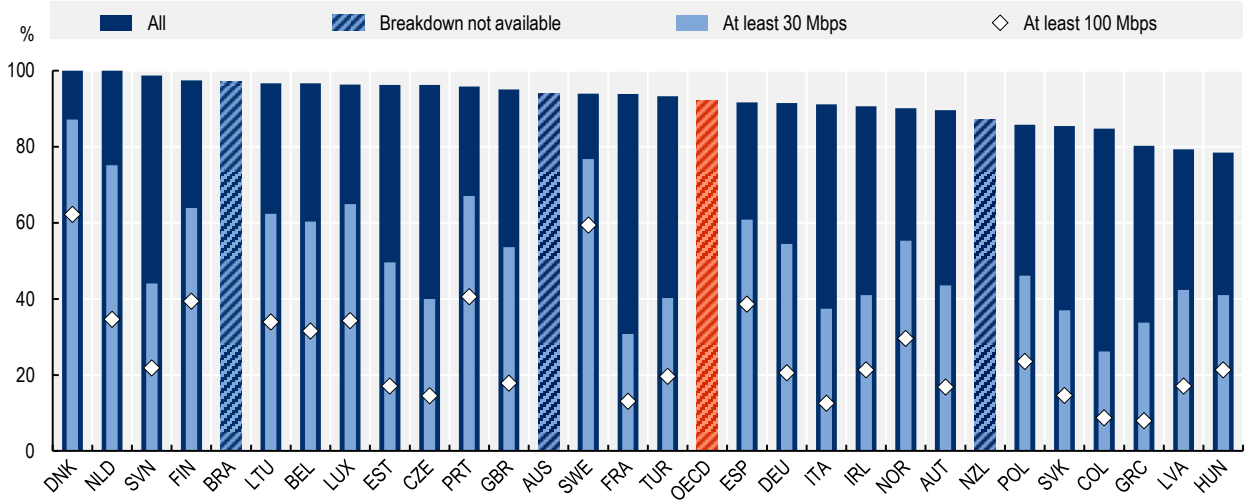
Figure 5.3. Enterprises with broadband connections, by speed tiers



Note: Businesses employing at least ten employees. Broadband includes fixed connections with an advertised download rate of at least 256 Mbps, except Brazil for which broadband is defined by type of connection rather than download speed. Data refer to 2019 except for Australia 2016/17, Colombia 2018 and New Zealand 2017/18. Average refers to the unweighted average across the OECD reported countries.

Source: OECD (2021[18]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 29 January 2021).

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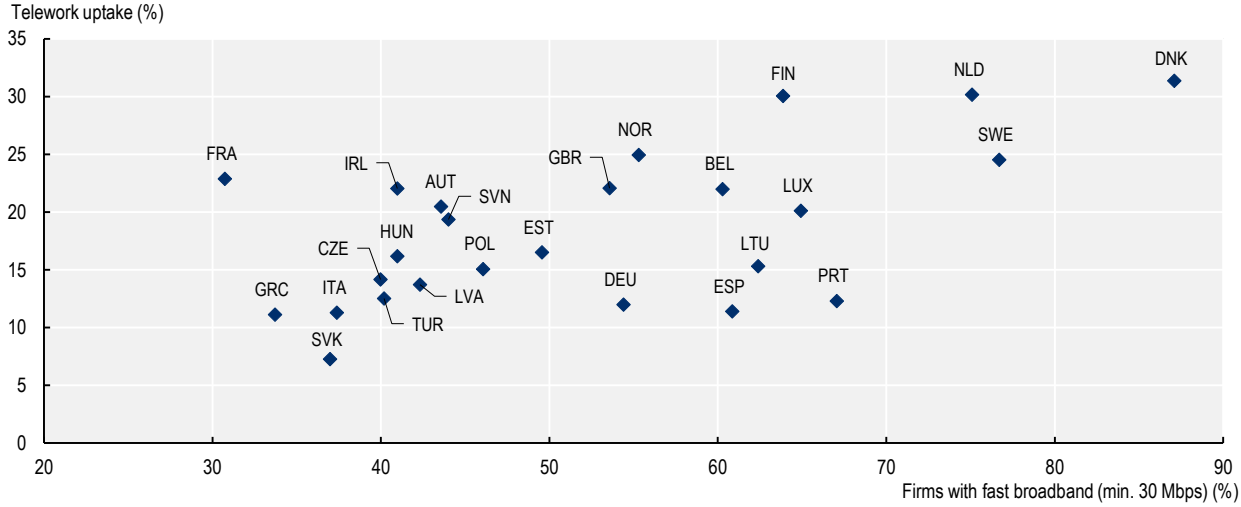
However, while in most countries the majority of companies have broadband access, there are large differences in the speed of the connection provided (Figure 5.3). In Slovenia, the Czech Republic, France, Estonia and Turkey, the overall share of businesses with a broadband connection is above the OECD average, but more than half of these enterprises have relatively low advertised speed connections (speeds of less than 30 megabits per second [Mbps]), which can make efficient teleworking difficult when workers need to connect to firm systems. This contrasts with Denmark and Sweden, where 60% of firms have high-speed connections of 100 Mbps or more.

Figure 5.4 displays the correlation between observed levels of telework and firms' uptake of broadband across countries. There is a clear relationship between the two variables (with some outliers at lower levels of telework). In particular, actual levels of telework uptake seem to remain below the technical possibilities afforded by firms' communications infrastructure in Portugal, Spain, Germany and Lithuania.

Figure 5.4. Telework uptake and firm infrastructure for fast broadband speed



Note: Firms with at least 30 Mbps advertised download speed broadband connection, data for 2019. Refer to Figure 5.3 for more context of broadband speeds. The 2020 definition and data on firms' broadband connections (with the new definition focusing on fixed line connections) confirms the observed patterns. It should be noted that, as such, several countries have substantially higher levels of connectedness; for example France shifted to more than 70%.

Sources: Eurofound (2017[16]), *European Working Conditions Survey, 2015* (data collection), http://doi.org/10.5255/UKDA-SN-8098-4 for telework uptake (for more details, see Chapter 3); OECD (2021[18]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 21 January 2021) for broadband infrastructure and speed.

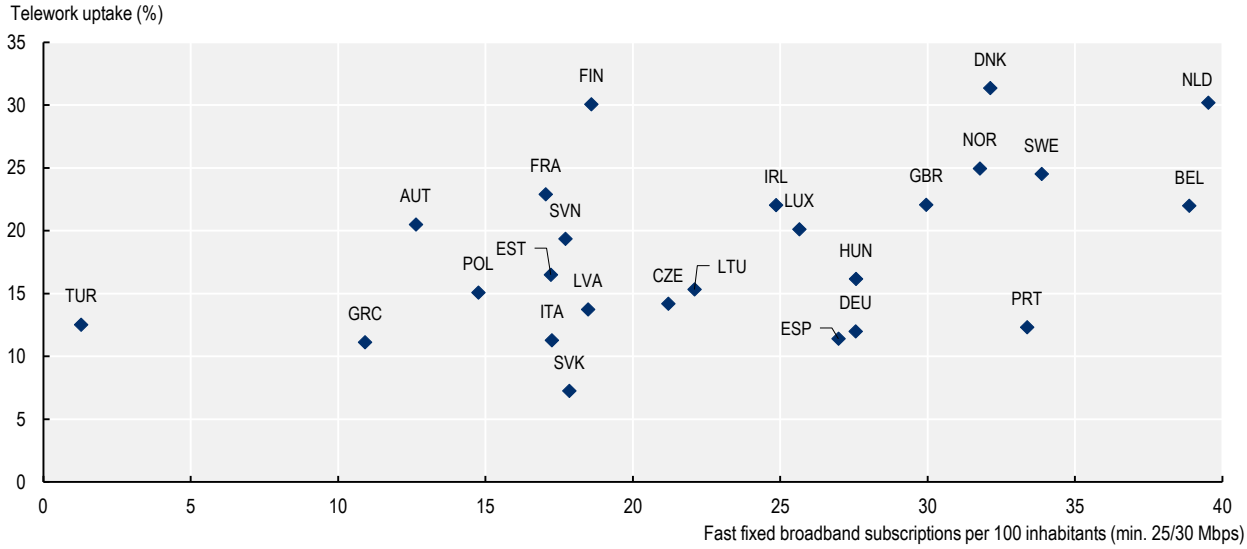
StatLink https://doi.org/10.1787/888934261536

It is clear from Figure 5.4 that a lack of high-quality connectivity represents a key limiting factor to the adoption of telework. However, other factors may play a role as well. Looking at how telework varies across countries with a similar level of broadband adoption by firms in terms of average connection speed can provide some indication for the potential of increasing telework update by tackling other "soft" factors. For instance, Spain exhibits relatively low levels of telework compared to Belgium or Finland, despite similar firm access to fast broadband. This suggests that, to the extent that differences cannot be fully explained in terms of industrial structure, Spain may be able to increase firm telework uptake by addressing factors such as management practices or social norms.

Home Internet connections play a complementary role to those of firms in allowing employees to telework. Figure 5.5 plots levels of telework against the share of the population having subscribed to fast broadband (minimum 25/30 Mbps). The positive relationship confirms the importance of fast broadband as a precondition for telework uptake, on both the firm and worker side, with a similar set of countries that, despite having a high share of fast broadband uptake in the population, display below-average levels of telework (Portugal, Spain and Germany).[4] That home and firm connections yield a very similar picture is somewhat unsurprising,

given that many employees live close to their physical workplaces, and as such the infrastructure and broadband speed available to both them and their firm is likely to be similar. However, if levels of telework remain high after the pandemic, discrepancies in firm and home Internet connections may arise if workers engaging in permanent telework choose to live further from their workplace, including in rural regions. To reap the full benefits of telework, broadband infrastructure expansions or upgrades might therefore be required.

Figure 5.5. Telework uptake and home infrastructure for fast broadband speed



Note: Fast fixed broadband subscriptions per 100 inhabitants (minimum 25/30 Mbps), based on December 2019 speed tiers. Australia: Data reported for December 2018 and onwards is being collected by a new entity using a different methodology. Figures reported from December 2018 comprise a series break and are incomparable with previous data for any broadband measures. Australia reports to the OECD. Speed tier data are only for services purchased over the National Broadband Network (NBN), which comprise the majority of fixed broadband services in operation. There is no public data available for the speed of non-NBN services. Mexico and Switzerland: Data are preliminary. New Zealand: Speed tiers are for 2018 instead of 2019. Poland: Data are OECD temporary estimates.
Sources: Eurofound (2017[16]), *European Working Conditions Survey, 2015* (data collection), http://doi.org/10.5255/UKDA-SN-8098-4 for telework uptake (for more details, see Chapter 3); OECD (2021[19]), *Broadband Portal* (database), www.oecd.org/sti/broadband/oecdbroadbandportal.htm (accessed on 29 April 2021) for broadband infrastructure.

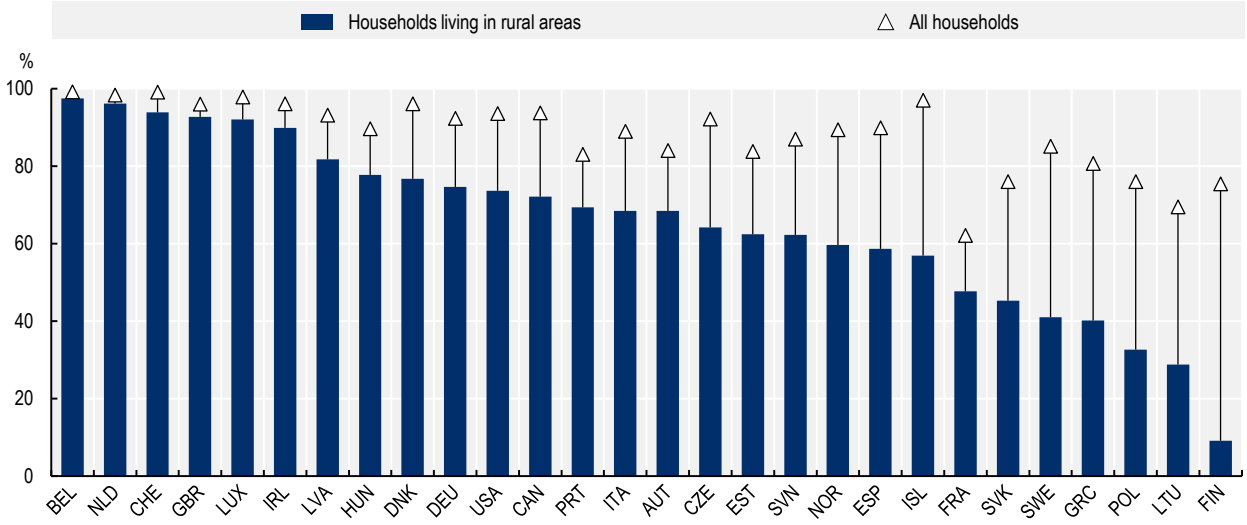
StatLink https://doi.org/10.1787/888934261555

While average broadband download speeds can be a proxy for broadband performance in urban areas, where most economic activity is centred, there is also important within-country variation in broadband network quality, with rural areas having much slower connections (OECD, 2019[20]). This represents a key barrier for households in rural areas to effectively telework, and make use of other data-intensive digital technologies.[5]

Figure 5.6 shows that high-speed broadband coverage in rural areas still remains a major challenge for many countries. For example, in Europe in 2019, only 59% of rural households were located in areas with coverage of fixed broadband with an advertised minimum speed of 30 Mbps compared to 86% of households in other areas.[6] Indeed, this gap is rather large in several of the countries that appear to be downward outliers in Figure 5.4. Despite high average speeds, Lithuania and Spain both display relatively large gaps between the coverage of high-speed fixed broadband for households living in rural areas compared to all households and there is a discernible gap also in Germany, Finland and Sweden.[7]

A more permanent uptake of telework can also contribute to reducing greenhouse gas emissions that are associated with commuting, beyond the crisis. However, more permanent teleworking arrangements will only be feasible if high-speed Internet access is widely available. In the recovery period, investment should be steered towards upgrading communications infrastructure, such as universal broadband Internet, and enabling technologies that ensure that communication networks can cope with a sustained increase in traffic from teleworking and teleconferencing.

Figure 5.6. Share of households with coverage of fixed broadband with minimum 30 Mbps, in rural areas and all area



Note: Households in rural and total areas where fixed broadband with a contracted speed of 30 Mbps or more is available, as a percentage of households in each category. Data refer to 2019. For European countries, rural areas are those with a population density less than 100 per square kilometre. For Canada, rural areas are those with a population density less than 400 per square kilometre. For the United States, rural areas are those with a population density less than 1 000 per square mile or 386 people per square kilometre. For European countries, fixed broadband coverage of NGA technologies (VDSL, FTTP and DOCSIS 3.0) capable of delivering at least 30 Mbps download was used. For the United States, coverage of fixed terrestrial broadband capable of delivering 25 Mbps download and 3 Mbps upload services was used.
Sources: Data from CRTC (2019[21]), *Communications Monitoring Report, 2019* (Canada), https://crtc.gc.ca/pubs/cmr2019-en.pdf; European Commission (2020[22]), *Study on Broadband Coverage in Europe 2019* (European Union), https://digital-strategy.ec.europa.eu/en/library/broadband-coverage-europe-2019 and FCC (2019[23]), *2019 Broadband Deployment Report 12* (United States), https://docs.fcc.gov/public/attachments/FCC-19-44A1.pdf.
StatLink https://doi.org/10.1787/888934261574

Targeted investments in communications infrastructure should therefore be part of any green recovery package, in order to achieve persistent behavioural changes and permanent reductions in emissions (provided measures are also taken to reduce the environmental footprint of digital technologies). Such investments may need to be accompanied by new policies and regulations that facilitate and encourage behavioural changes over the longer term. Regulations could include flexible working arrangements or the right to work from home when feasible, as debated for example in Germany (Reuters, 2020[24]).

Digital skills of the population

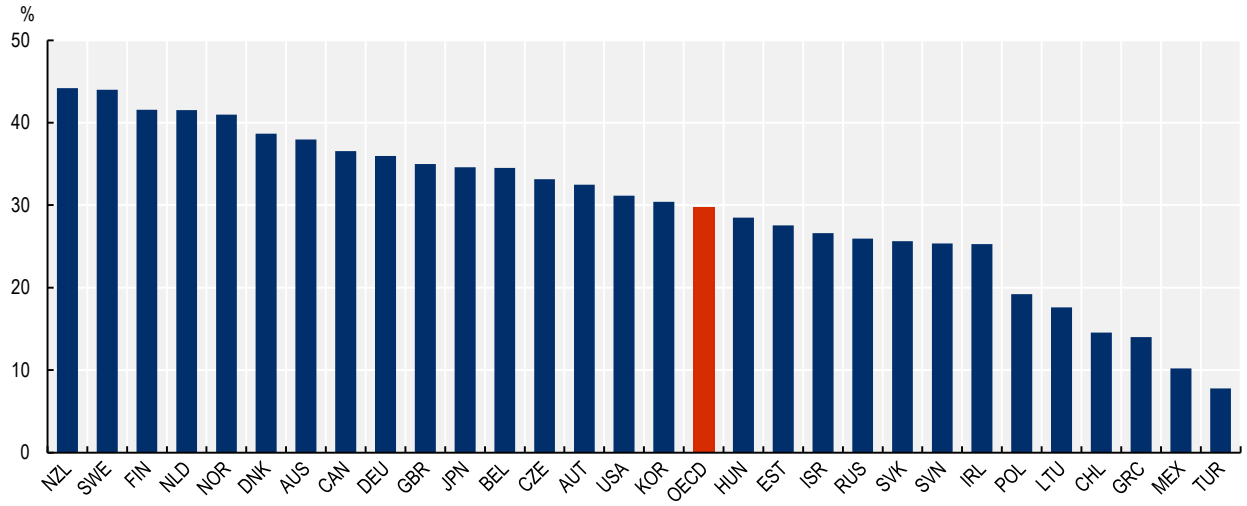
Workers' proficiency in digital environments is another key factor to succeed in the digital transformation. Indeed, worker skills affect both the likelihood that firms adopt digital technologies, and the effectiveness and efficiency of their use. With COVID-19, working remotely has become the norm for many jobs. Everything else equal, it is expected that a digital-ready workforce is more likely to telework efficiently, thereby contributing to supply-side resilience.

The Programme for the International Assessment of Adult Competencies (PIAAC) offers harmonised measures of digital readiness that are comparable across countries. These come from standardised computer-based assessments of the ability of adults to use ICT tools and applications to assess, process, evaluate and analyse information in a goal-oriented way.

Using PIAAC data, Figure 5.7 shows that workers' digital readiness varies substantially across countries, with over 40% of adults in New Zealand and Sweden positioned in the two highest proficiency levels for problem solving in digital-rich environments, compared to around 30% of adults on average across OECD

countries. Higher values indicate a higher proportion of the population that could be expected to work productively in the face of a sudden shift to telework.

Figure 5.7. Percentage of adults at highest levels of proficiency in digital environments



Note: Percentage of adults with high scores in PIAAC's problem solving in technology-rich environments. Problem solving in technology-rich environments is defined as using digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks; it measures both problem-solving and basic computer literacy skills (i.e. the capacity to use ICT tools and applications). Time period: 2012-13 (Round 1); 2014-15 (Round 2); 2017 (Round 3). Country coverage: Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation, the Slovak Republic, Spain, Sweden, the United Kingdom (England) (Round 1); Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Slovenia, Turkey (Round 2); Hungary, Mexico, the United States (Round 3). The sample for the Russian Federation does not include the population of the Moscow municipal area. Average refers to the unweighted average across the reported OECD countries.
Source: OECD calculations based on OECD (2019[25]), *Skills Matter: Additional Results from the Survey of Adult Skills*, https://doi.org/10.1787/1f029d8f-en.
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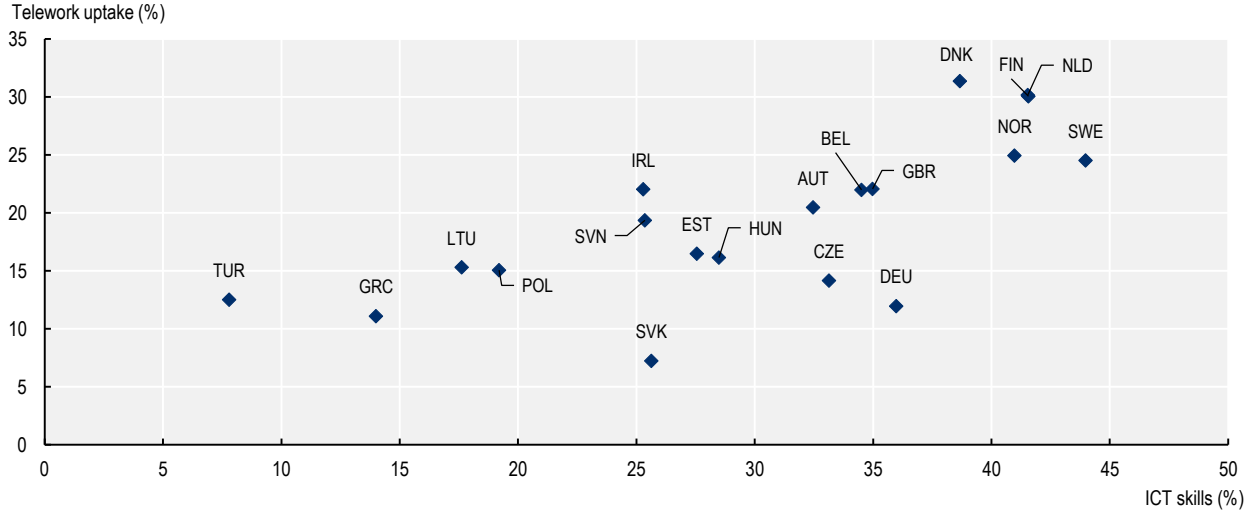
Figure 5.8. Telework uptake and ICT skills



Note: The ICT skills indicator corresponds to the "proficiency in digital environments" of Figure 5.7; see figure notes for details on the data.
Sources: Eurofound (2017[16]), *European Working Conditions Survey, 2015* (data collection), http://doi.org/10.5255/UKDA-SN-8098-4 for telework uptake (for more details on this topic, see Chapter 3); OECD (2019[25]), *Skills Matter: Additional Results from the Survey of Adult Skills*, https://doi.org/10.1787/1f029d8f-en for ICT skills.
StatLink https://doi.org/10.1787/888934261612

Figure 5.8 shows that countries whose workforce possesses higher levels of digital skills are also more likely to exhibit high levels of telework uptake. A few countries display lower levels of telework uptake than their level of digital skills would suggest – notably, Germany and the Slovak Republic fall short of their potential in terms of workers' skills. In the Slovak Republic, communications infrastructure might be a limiting factor for higher telework uptake (Figure 5.2). In Germany, industry structure is likely to be a large explanatory factor, with manufacturing – typically having lower telework potential – playing a comparatively large role in the country. Social norms for being present in the office could also contribute.

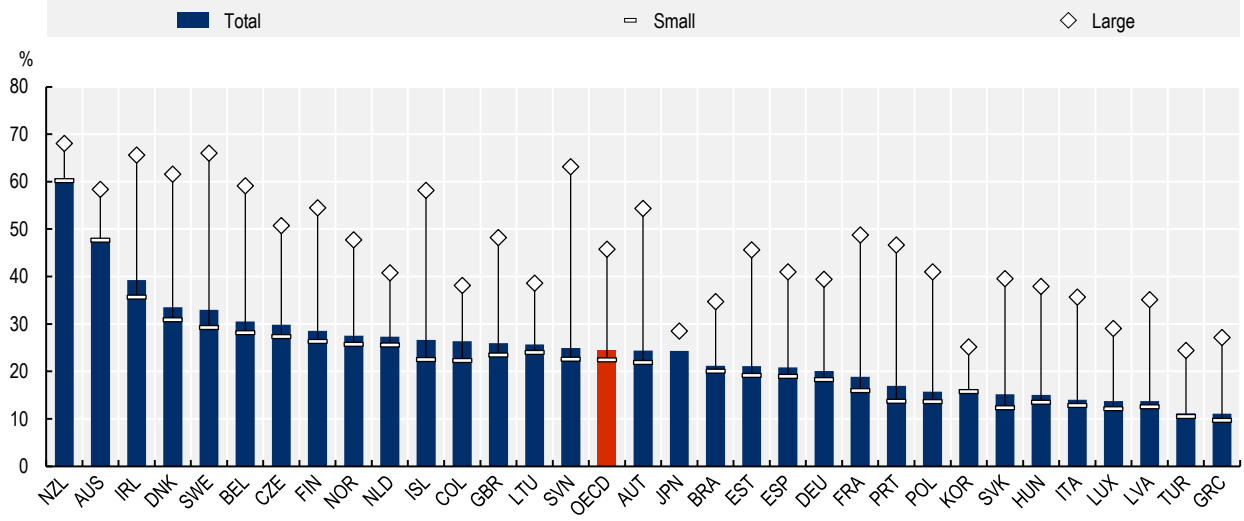
E-commerce and the pre-existing use of digital tools

E-commerce has been of paramount importance during lockdowns, to help satisfy demand and to sustain economic activity and employment. As brick-and-mortar establishments have been forced to close their doors, consumers have moved rapidly towards online purchasing, greatly impacting the retail sector (see also Box 5.1). As discussed in Chapter 3, there is important variation between industries in the ability to switch to remote modes of sales. This industry variation, which is to a large extent determined by the type of product supplied (with services industries involving direct face-to-face interactions that are difficult to provided remotely), needs to be complemented by a within-industry perspective, where there is evidence of a massive shift towards remote sales in several industries where the types of products or services allow for it. Recent OECD work (OECD, 2020[2]) finds that the COVID-19 crisis has led to online modes of transactions of products which were previously rarely sold online, such as groceries.

Share of firms with online sales

In 2019, on average about 25% of firms in OECD countries participated in e-commerce transactions, with a much higher share in New Zealand and Australia (Figure 5.9).

Figure 5.9. Enterprises engaged in sales via e-commerce by firm size, as a percentage of enterprises in each employment size class



Note: Percentage of businesses (with at least ten employees) receiving orders over computer networks. Small businesses are defined as having 10 to 49 employees, large businesses are those with 250 employees or more. For Japan, data refer to businesses with 100 or more employees instead of ten or more, large firms have 300 or more employees. Data refer to 2019 except for Australia (2016/17), New Zealand (2017/18), Colombia, Iceland, Japan and Korea (2018). Agriculture (except in Australia, Chile and New Zealand) and public administration are excluded. Average refers to the unweighted average across the OECD reported countries.

Source: OECD (2021[18]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 29 January 2021).

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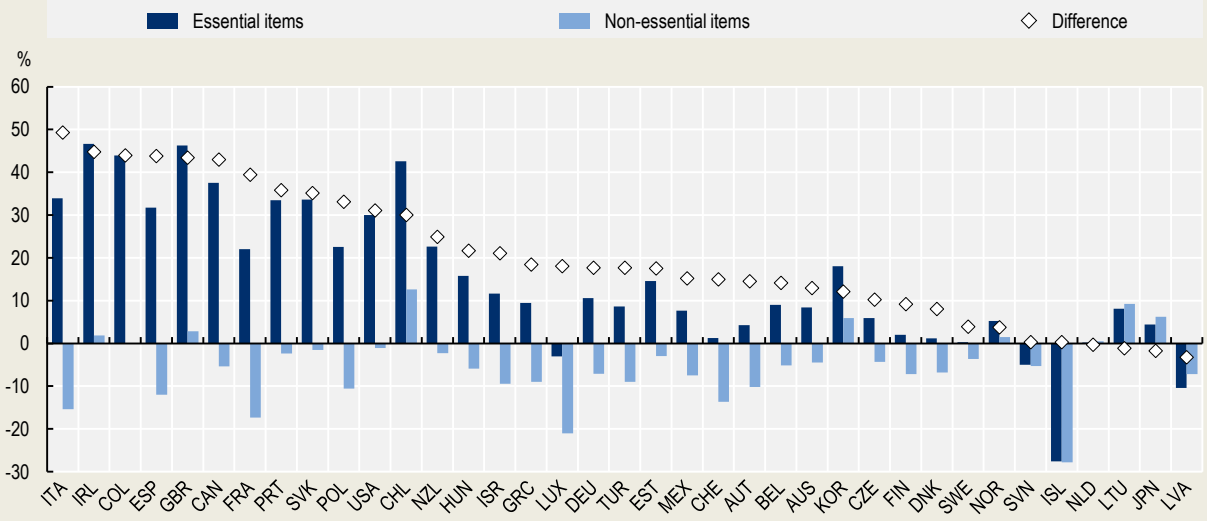
Box 5.1. COVID-19 and the retail sector: Impact and policy responses

COVID-19 mitigation measures dramatically disrupted the retail sector, with a heterogeneous impact across firms depending on the combined effect of three key business characteristics:

- Essential vs. non-essential goods: demand diverged across these two retail categories, particularly in countries most affected by the pandemic (Figure 5.10).
- Online vs. brick-and-mortar: mitigation measures mostly affect physical stores, and may accelerate the ongoing shift to online retailing.
- Liquidity position: retail is characterised by a large variation in businesses' access to liquidity buffers and external finance.

Figure 5.10. Change in demand for essential versus non-essential retail goods



Note: This graph reports the unweighted average growth in Google searches for essential and non-essential retail item categories (normalised by the overall volume of searches) between April 2019 and April 2020. Essential item categories include "Consumer electronics", "Grocery and food retailers" and "Pharmacy"; non-essential categories include "Luxury goods", "Home appliances", "Home furnishings", "Luggage and travel accessories", "Apparel" and "Gifts and special event items".

Source: OECD (2020[26]), "COVID-19 and the retail sector: impact and policy responses", https://doi.org/10.1787/371d7599-en.

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Governments can shield retail from the effects of the crisis, and enhance the sector's resilience by:

- ensuring that liquidity assistance schemes are accessible to retail firms, irrespective of their size
- helping essential retailers deal with labour supply disruptions, in particular by smoothing demand-supply matching for retail jobs and providing guidance on health and safety standards
- supporting retail firms to implement social distancing measures
- ensuring competition in the sector during and in the aftermath of the crisis
- promoting the diversification of firms' sales channels, in particular by helping small brick-and-mortar retailers go online.

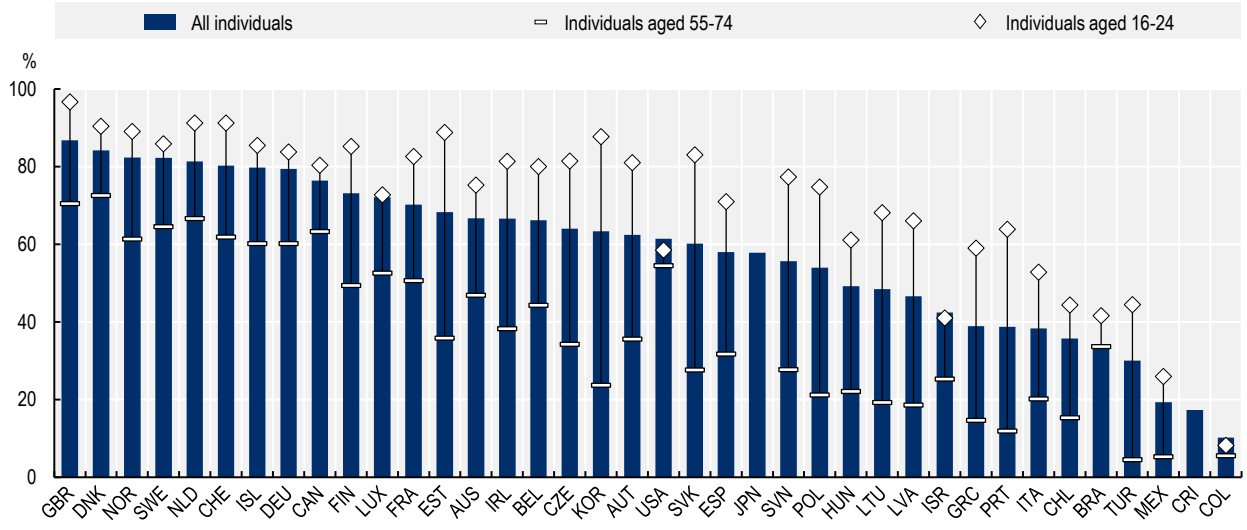
Source: OECD (2020[26]), "COVID-19 and the retail sector: impact and policy responses", https://doi.org/10.1787/371d7599-en.

However, not all businesses are equally likely to buy and sell online. In many countries, there is a large gap between large and small enterprises, especially in Slovenia, Sweden, Denmark, France, Portugal, Austria and Belgium. Firms operating in Construction, Professional, Scientific and technical activities, and Administrative and support services are also significantly less engaged in e-commerce than in other sectors, reflecting the bespoke nature of many products in these industries. Box 5.1 details some of the changes in demand for e-commerce in the retail sector as a result of the pandemic, and additional insights into e-commerce in times of COVID-19 can be found in OECD (2020[2]).

Share of population making online purchases

Uptake of e-commerce has steadily increased over the past decade. The COVID-19 crisis has seemingly accelerated this trend, with changes in consumption patterns that may persist in the long term. In parallel to the increase of the share of firms selling online, the number of individuals shopping on the Internet has risen as well, including through the use of online platforms (OECD, 2021[27]). The role of such platforms has increased to a greater extent in countries where lockdown measures were stricter, according to analysis from the OECD COVID Policy Tracker (Bulman and Koirala, 2020[28]). This uptake has mitigated the fall in consumer spending brought on by distancing measures and in-person retail shutdowns, thereby contributing also to the resilience of these economies in the future. In addition, platform use can positively affect the productivity of firms as it enables a better matching of supply and demand, and by allowing businesses to outsource certain tasks to the platforms (e.g. marketing, logistics) (Bailin Rivares et al., 2019[29]).[8] Online platforms that facilitate a more efficient interaction with suppliers and customers have also become relatively more important for the emergence of new businesses, as well as for the survival of existing ones (e.g. the rise in food delivery by restaurants).

Figure 5.11. Share of population using e-commerce by age, as a percentage of individuals in each group



Note: Share of individuals who have purchased online over the last 12 months, as a percentage of Internet users in each age group. Data refer to 2019, except for Canada, Colombia, Costa Rica and Japan (2018); Chile and Israel (2017); and Australia (2016/17). For Australia and Israel, the recall period is three months.

Source: OECD (2021[1]), "ICT Access and Usage by Households and Individuals", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/b9823565-en (accessed on 29 January 2021).

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In 2019, more than 80% of adults in the United Kingdom, Denmark, Norway, Sweden, the Netherlands and Switzerland made online purchases (Figure 5.11). In contrast, online shopping did not appear to be as widespread in Latin America, Turkey, Italy, Portugal and Greece. Uptake further appeared to differ by age, with young adults being more than twice as likely as older adults to have made a purchase online, in many

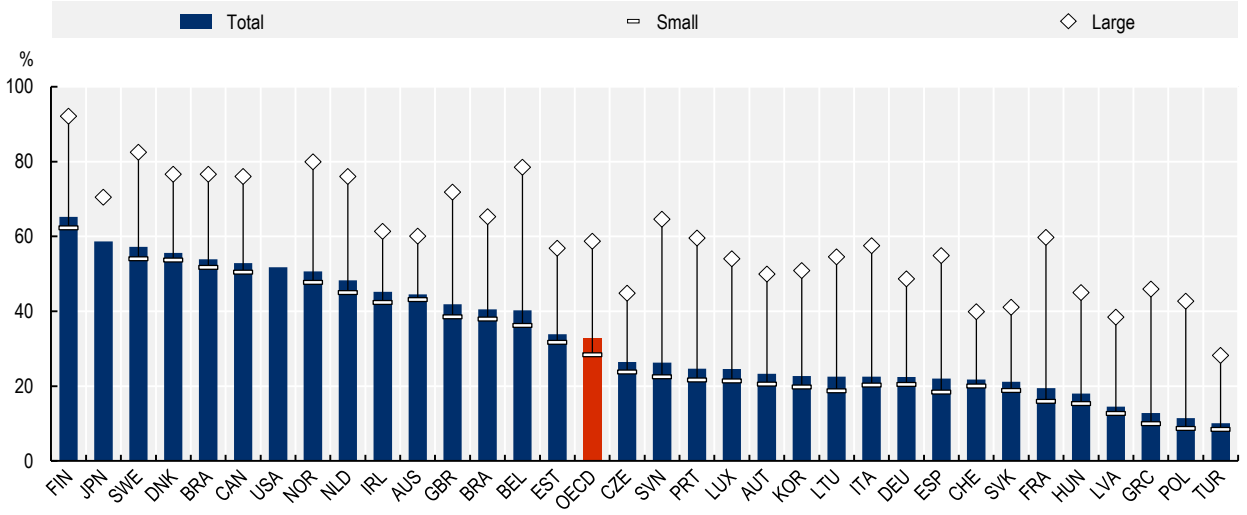
eastern and southern countries in Europe. Differences in uptake across ages are less pronounced in countries with higher overall uptake, which also tend to be countries with higher levels of digital skills in the population as a whole (Figure 5.7). While the overall share of population making online purchases has increased over time in all OECD countries, the absolute size of gaps in terms of age and income has increased in many countries over the last seven years.

Uptake of cloud computing

By definition, cloud services can be used from anywhere, allowing employees to work on the same projects remotely and simultaneously. This technology can therefore play a key role at a time when the uptake of telework is crucial for sustaining economic activity.[9] As is the case for most digital technologies, an important precondition for the use of cloud computing is a high-speed broadband connection, which is required to allow large data flows between data centres and users (Andrews, Nicoletti and Timiliotis, 2018[17]). Given that high-quality communications infrastructure is indispensable for the use of all digital technologies (including those that are complementary to cloud computing, such as back- and front-office management systems), infrastructure upgrades can in turn enhance the overall resilience of companies that use cloud computing, by assisting their response to unexpected shocks such as disruptions in their supply chains or changes in consumer preferences.

By 2017, more than half of enterprises with at least ten employees had adopted cloud computing in the Nordic countries, Japan, Brazil, Canada and the United States (Figure 5.12). Even though cloud computing may be an opportunity for small and medium-sized enterprises to reduce IT costs, on average only one third of enterprises with fewer than 50 employees used this technology, compared to 59% of large firms in the OECD. The gap between small and large businesses is highest in Belgium, France and Slovenia. The overall adoption rates of cloud computing were lowest in Turkey, even for large businesses. Data on the use of cloud computing by private (rather than business) Internet users (OECD, 2020[3]) lead to a fairly similar ranking of countries, with average use being highest in northern Europe (over 64% in the Nordic countries, and around 53% or more in the United Kingdom, the Netherlands, and Ireland) and lowest in Turkey and Poland (around 26%) and Mexico (20%).

Figure 5.12. Enterprises using cloud computing, by firm size, as a percentage of enterprises in each employment size class



Note: Percentage of all businesses employing at least ten employees using cloud computing. Small businesses are defined as having 10 to 49 employees, large businesses are those with 250 employees or more. Data refer to 2018 except for Australia (2016/17), Brazil (2019), Canada, Switzerland and the United States (2017). Average refers to the unweighted average across the OECD reported countries.
Source: OECD (2021[18]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 29 January 2021).

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Recent research shows that cloud services are a particularly efficient option for small and young firms, because they allow the use of storage infrastructure technology without the large investment that in-house infrastructure would require (DeStefano, Kneller and Timmis, 2014[30]). Policies incentivising the adoption of cloud computing could therefore especially benefit young and smaller firms and help them move to remote work. Better understanding the policy incentives for cloud uptake is therefore important. OECD research focusing on Germany and the United Kingdom (Andres et al., 2020[31]) shows that capital incentive policies targeting investments in physical capital have the unintended consequence of reducing the probability of cloud adoption.

Besides knowing whether or not firms are using cloud services, it is crucial to understand how they are using this technology. Recent analyses on cloud use by Italian firms show that around 30% of those that assert they are using a cloud service are in fact only using it to substitute for mailboxes or office suits (Manaresi and Calvino, forthcoming[32]). More disruptive usage of cloud services, such as data storage and analytics, is positively linked to the availability of broadband connection, suggesting that investing in infrastructure may ultimately boost both cloud adoption and its effective use.

Productivity during COVID-19 and beyond

Implications of the COVID-19 crisis for productivity

The many changes brought about by the COVID-19 pandemic have had, and continue to have, various implications for productivity. While some of these changes and consequent drops in productivity are likely to be temporary – and disappear once the pandemic is over and the restrictions on contact and mobility are lifted – others are more long-term or here to stay.

There were some clear negative initial impacts of the crisis on economic activity and productivity. Analyses on UK data show that aggregate total factor productivity fell by up to 5% in the last quarter of 2020 (Bloom et al., 2020[33]). Besides the direct restrictions on activity, changes in consumer behaviour (for instance, precautionary or wait-and-see purchase delays by consumers) have added an additional challenge in the short term. Importantly, interactions among firms and among workers – which are key for knowledge spillovers and to boost productivity – remained reduced for prolonged periods of time, with potential longer-term effects in terms of suppressed productivity through missed opportunities and innovations. Productivity can also remain below its potential if firm financial shortages (discussed in more detail in Chapter 4) translate into longer-term financing constraints, hindering the realisation of productivity-enhancing investments. The massive spike in uncertainty – larger than the one associated with the global financial crisis of 2008-09[10] – exacerbates the concerns on limited or delayed investments, and the negative effects on productivity. Further long-term challenges with an initial drag on productivity relate to the need to re-train or upskill workers whose jobs have become redundant through the pandemic and the induced shifts in consumer preferences, automation, or digitalisation (more on this topic is discussed in Chapter 7).

During the recovery phase, alongside the phasing out of government emergency support measures, a wave of business closures may have negative effects on aggregate productivity if productive firms go out of business. What is more, while government support measures have helped prevent widespread bankruptcies in most countries (as shown in more detail in Chapter 4), they may have also helped sustain unviable firms, keeping them solvent them through the crisis and into the recovery period, thereby dragging down average productivity as well.

Against this negative backdrop, there have also been positive developments, many of which are likely to be long lasting – in particular those related to digital technology uptake. The pandemic has induced shifts towards digitalisation, which have been particularly relevant in sectors that have traditionally low productivity (e.g. non-market services), or that have been more reluctant to digitalise. In turn, in the medium and long run, this has the potential to boost productivity in these sectors, with likely positive effects on aggregate productivity.

The economic crisis has also more broadly uncovered and created new business opportunities. Some of these have catered to needs that are specific to the pandemic, but many have also responded to what will likely be longer-term changes in consumer and firm behaviour and demand. Some of these changes may alter the modus operandi of entire industries, inducing persistent shifts in societal norms and consumer habits or needs, which represent valuable business opportunities for start-ups, and chances for radical and disruptive innovation. More specifically, and discussed for example in the sections on telework and e-commerce in this chapter, the COVID-19 outbreak is likely to induce persistent demand for remote work and modes of supply of products and services. If accompanied by the right policies, widespread telework can by itself entail productivity gains (see more detail in Box 5.2).

A further productivity-enhancing impact of the COVID-19 crisis could be its cleansing effect, associated with a reallocation of resources to more efficient uses. The strength of this effect will, of course, depend on whether less productive firms will exit the market in the medium run, and can be enhanced by ensuring that new firms can enter, and radical innovators and more productive firms are able to invest and thrive in the longer run.

Beyond the aggregate effects, the COVID-19 pandemic has had very heterogeneous effects across industries (as discussed in Chapter 3) and firms, many of which relate specifically to pre-existing digital divides, as discussed in detail in the following section. Digital-ready firms have significant advantages, as they are more prepared to cope with the shifts induced by the COVID-19 pandemic. Among them, frontier firms are generally better equipped, given their technological advantages and managerial practices. Large firms have additional advantages along other dimensions, with potential adverse consequences on concentration, as discussed in Chapter 4.

Box 5.2. What may happen to productivity if widespread telework becomes the "new normal"?

The COVID-19 crisis may catalyse a wider use of telework beyond the pandemic, with more widespread telework becoming the "new normal". Evidence on telework *before* or *during* the crisis shows that while telework can raise productivity, this is dependent on circumstances, thus highlighting the role of complementary factors. These factors can be at the firm and worker level, across a spectrum of areas, including management, skills, communications infrastructure and an appropriate working environment at home (Bloom, Mizen and Taneja, 2021[9]; Morikawa, 2021[34]; Bloom et al., 2014[35]; Institut Sapiens, 2021[36]). How this unprecedented shift in working models will affect firm performance *after* the crisis therefore remains to be seen.

Existing evidence on telework before the crisis offers interesting insights into the mechanisms through which telework can improve or harm productivity in the longer term. Several lessons stand out:

Telework has the potential to raise or harm firm productivity through several, countervailing channels (Figure 5.13).

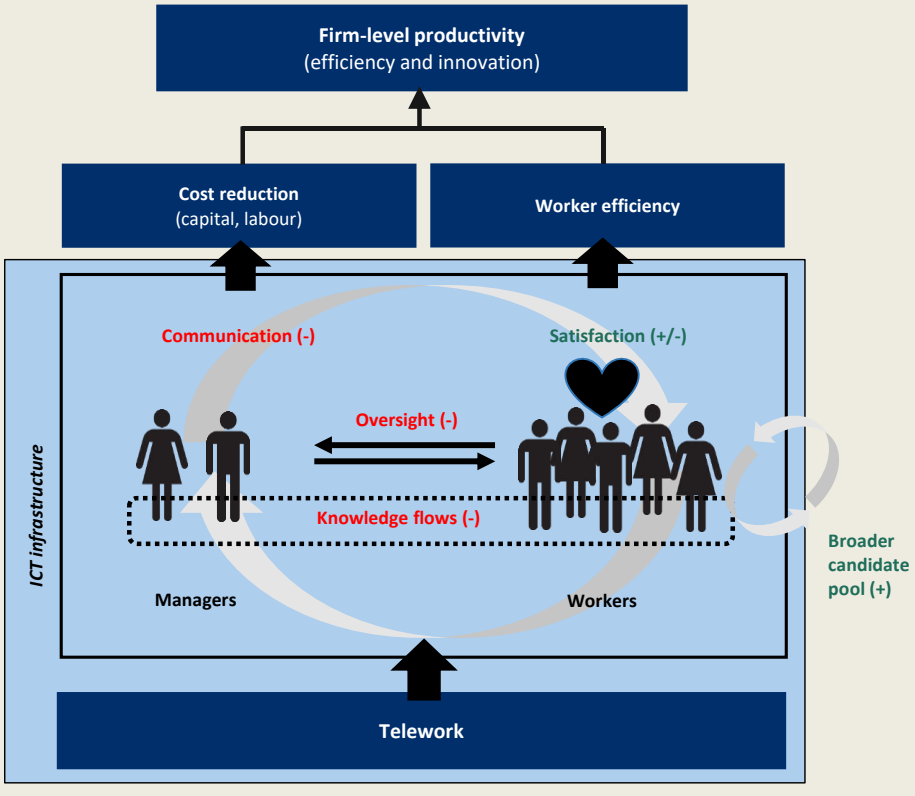
- Firms may be able to reduce costs (e.g. through reduced need for office space), but fewer face-to-face interactions in the workplace can impair communication, limit managerial oversight and reduce knowledge flows. To the extent that workers face fewer distractions and feel more content about their work, their efficiency may increase, but telework can also lower their satisfaction.
- Worker satisfaction is key to improve productivity. To realise gains, telework has to improve worker satisfaction and efficiency enough to offset the negative effects (e.g. from fewer face-to-face interactions). Thus, genuine efficiency gains are possible if workers and firms alike benefit from telework.

- This means that there is an ideal level of telework – with too much or too little resulting in less desirable effects on productivity. Efficiency *gains* are driven by satisfaction, which may increase most at low – but suffer at very high – levels of telework, and rely on workers having some ability to choose whether and how much to telework. Efficiency *losses* arise because fewer opportunities for face-to-face interactions imply fewer opportunities for informal information sharing, co-ordination, and so on. This implies an inversely U-shaped relationship between telework and efficiency with a "sweet spot" at intermediate levels of telework.

These lessons are corroborated by ongoing analysis conducted by the OECD Global Forum on Productivity in co-operation with business associations (Business at OECD [BIAC]) and trade unions (the Trade Union Advisory Committee of the OECD [TUAC]). Preliminary survey results confirm that managers and worker representatives generally expect regular telework to become the norm for most employees post COVID-19, with most respondents regarding intermediate levels of telework (two to three days per week) as ideal. Results also confirm that higher productivity is among the main expected benefits of more widespread telework, while highlighting the need for synchronisation of telework schedules among workers, and for telework to remain voluntary.

This area of research therefore suggests that policies can raise productivity and benefit workers by: 1) promoting an optimal level of voluntary telework; 2) facilitating the dissemination of managerial best practices in support of telework arrangements; 3) providing fast, reliable, and secure communications infrastructure; and 4) assuring an appropriate working environment at home.

Figure 5.13. Countervailing channels for telework affecting productivity



Source: OECD (2020[37]), "Productivity gains from teleworking in the post COVID-19 era: How can public policies make it happen?", https://doi.org/10.1787/a5d52e99-en.

Pre-existing divides across sectors and firms

Prior to the COVID-19 shock, the digital transformation had spread unevenly across countries, sectors, and firms. Economic agents in different countries have adopted digital technologies at a different pace, with prominent cross-country differences in adoption found in cloud computing, online sales and online purchases (OECD, 2019[20]), as discussed in the previous sections of this chapter. Diffusion of digital technologies also varies widely between sectors of economic activity, as also shown by a recent OECD taxonomy that classifies sectors according to their digital intensity, taking into account different facets of digital transformation (Calvino et al., 2018[38]). Business dynamism – in particular, firm entry – has also declined more strongly in digital and intangible-intensive sectors, reflecting differences in the extent to which new firms are able to adopt and benefit from digital technologies and invest in complementary intangible assets (Calvino and Criscuolo, 2019[39]; Calvino, Criscuolo and Verlhac, 2020[40]). Chapter 4 of this volume provides a broader coverage of the topic in the context of business dynamism.

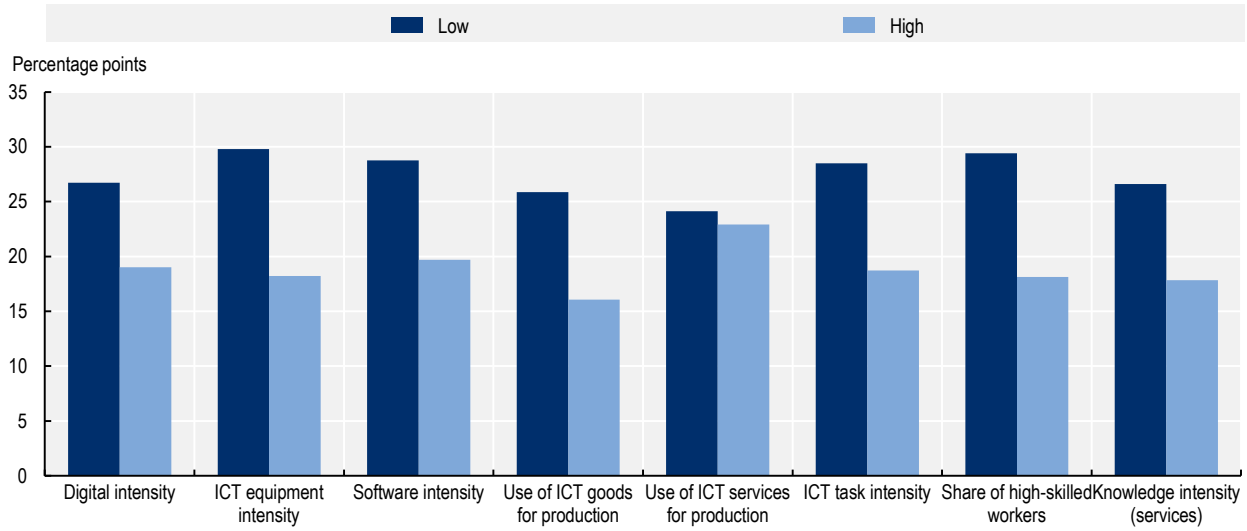
Difficulties faced by young, small, and less productive firms in adopting and effectively using new and digital technologies can been traced back to the rising importance of complementary intangible assets that entail economies of scale and network effects that generate winner-takes-most dynamics (Corrado et al., forthcoming[41]).[11] The COVID-19 shock has the potential to exacerbate these patterns, favouring market leaders who had already embraced the digital transformation more, and may therefore be better able to cushion and withstand the impact of the shock, or even use the COVID-19 pandemic to their advantage, thus improving their performance and competitiveness.

Importantly, there is evidence of an increasing digital gap between firms within sectors. This reflects and reinforces a growing divide between firms at the global productivity frontier in each industry, which continually improve performance, and the rest, which lag behind (Andrews, Criscuolo and Gal, 2016[12]). Evidence of the tight relationship between digitalisation and the divide between frontier and laggard firms is presented in Figure 5.14. The figure plots estimates of the speed at which firms in the bottom of the productivity distribution move towards the productivity frontier, relative to that of firms belonging to the middle of the distribution. This differential speed of "catch-up" towards the frontier is related to different industry characteristics. The figure shows that in more digital- and knowledge-intensive sectors, laggard firms catch up with the frontier at a relatively slower pace, thus indicating barriers to technology and knowledge diffusion (Berlingieri et al., 2020[42]; Calvino et al., 2018[38]).[12] Similar patterns emerge when considering intangible assets, such as skills and organisational capital, which are crucial complements to digital technologies and may also widen the divide between frontier (intangible-rich) and laggard firms. Ongoing OECD analysis (Corrado et al., forthcoming[41]) shows that these intangibles contribute also to productivity divergences across countries and sectors.

The COVID-19 shock may exacerbate productivity gaps and further increase industry concentration. Because the most productive firms were better able to develop, adopt and use digital technologies well before the pandemic struck, they are likely to suffer relatively less from the disruptions caused by containment measures. Their pre-existing digitally-intensive functioning allows them to shift more easily towards business models that utilise digital technologies such as e-sales, e-purchases, cloud storage and teleworking.

Moreover, the availability of complementary knowledge-based assets – such as skills and organisational capital – allows the large and productive firms that already use digital technologies more effectively to advance faster, further widening the gap between more productive firms and laggards. This may in turn shape aggregate competition and market concentration dynamics. Increases in industry concentration and mark-ups have been higher in sectors relying on intangibles complementary to ICT technologies (Bajgar, Criscuolo and Timmis, forthcoming[43]; Calligaris, Criscuolo and Marcolin, 2018[44]). Declines in business entry and job reallocation have also been more prominent in digital-intensive sectors, driven by winner-takes-most dynamics and barriers to technology diffusion (Calvino, Criscuolo and Verlhac, 2020[40]).

Figure 5.14. Estimated differences in labour productivity catch-up in industries with different ICT-related characteristics



Note: The figure shows the estimated difference in labour productivity (LP) growth, due to the catch-up effect, between firms at the average level of LP gap in the percentile (0-10) group and firms at the average LP gap in the percentile (10-40) group, in industries with low vs. high values of the indicators considered. The time period covered is 2000-12 and the countries included are Australia, Belgium, Canada, Denmark, Finland, France, Hungary, Ireland, Italy, Norway, Portugal, Sweden and Switzerland. See the original source for further details.

Source: Berlingieri et al. (2020[42]), "Laggard firms, technology diffusion and its structural and policy determinants", https://doi.org/10.1787/281bd7a9-en.

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Improving digital skills also has implications for inequality and inclusiveness, as discussed in Chapter 7. Digital skills have been crucial for workers to get through the crisis, not only in terms of continuing to work, but also for participation in other aspects of life. Re- and up-skilling of workers is also important in view of the recovery period, where trends in automation, affecting primarily workers in the middle of the skill distribution, are likely to be accelerated in view of increased resilience to social distancing through automation. Increasing digital uptake of firms should therefore go hand in hand with improving digital skills of the population, in order not to exacerbate pre-existing divides across workers.

Moving towards more inclusive economies and avoiding a widening of the productivity divide, further decreases in firm entry and increased market concentration requires policy makers to foster and support the digital transformation of the whole population of businesses. The key features of the policy mix suggested for this purpose are listed in the following section.

Conclusions and policy implications

The COVID-19 pandemic demonstrates the crucial role of digital technologies for economic resilience. The ability of firms and workers to quickly shift to telework is particularly important in light of social distancing restrictions. The unprecedented scale of telework during the crisis may further catalyse a permanent shift in working modes, with widespread telework becoming the "new normal" after the crisis as well.[13]

Teleworking allowed firms to maintain activity and production during the crisis, and may have a broad range of positive long-term outcomes, such as improving productivity and work-life balance, while reducing regional inequalities and lowering greenhouse gas emissions from commuting. However, there are large differences between firms and workers in their ability to telework and reap these benefits. Some of these differences can be addressed by policies removing barriers to uptake, such as a lack of appropriate communications infrastructure, or skill upgrading. However, other reasons for differences in uptake, such as inherent task-

related explanations, will persist. Ensuring well-being gains also for workers who are not able to benefit from the increased flexibility associated with telework should therefore also remain on the policy agenda.

The gap in digital technology use between the "best" firms and "the rest" may be exacerbated at a time when shifts to digital modes of production are becoming more and more important. Thus, stimulating technology and knowledge diffusion, and ensuring that the benefits of the digital transformation can be shared across firms and workers, should remain key priorities for policymakers for a swift recovery in the aftermath of the COVID crisis. This is particularly relevant given the substantial resources that are going to be included in recovery packages implemented by governments worldwide.

Governments need to facilitate the use of telework with supportive legislation and regulation on digital security and other pertinent issues (e.g. on health and safety, or the right to telework and right to disconnect), as well as infrastructure investment and skills development. Ensuring inclusiveness would also entail enhancing access to digital tools and infrastructure in rural areas, and endowing all individuals with the skills to live, work and thrive in the digital era.

Communications infrastructure and access to broadband are crucial to improve economic resilience and allow firms and workers to benefit from telework and online production and commerce (DeStefano, Kneller and Timmis, 2014[30]). Measures to stimulate investment and competition in communications infrastructure (OECD, 2020[45]) and bridge the urban-rural connectivity divide (e.g. phasing out slower Internet connections by deploying fibre deeper into the broadband network of providers) can go a long way in this respect. The diffusion of improved ICT infrastructure within firms can also be accelerated through financial support for upgrades aimed at performing a number of functions online, including to implement teleworking (OECD, 2020[46]). Fostering digitally-enabled transactions of trade in goods and services by removing barriers can in itself act to accelerate the digital transformation – including the wider use of telework – by reducing access costs for digital networks and equipment (OECD, 2020[47]).

Ensuring the endowment of fundamental skills, such as numeracy, literacy and management, as well as specific (namely ICT) skills, in an equitable manner – across regions and population groups – is crucial to enhance firms' digital potential and reduce skills-based income inequality. Improving digital skills may help reduce the digital divide (discussed in more detail in Chapter 7), and allow more workers to telework. This can in turn increase efficiency and productivity, and improve job satisfaction. Investments in relevant skills among workers currently less able to telework will be important for the coming economic recovery, and future resilience. Because many workers who already possess skills necessary for telework (e.g. in knowledge-intensive services) are largely concentrated in urban areas, large gains may be obtained by up-skilling workers in rural areas. Promoting online education is particularly suited to provide training opportunities beyond the reach of large cities (Clancy, 2020[48]).

In addition to measures aimed at improving connectivity and skills, governments can take steps to encourage digital uptake by tackling legal and cultural hurdles to telework and ICT use, and mitigating any potential side effects such as cybercrime or data security concerns (OECD, 2020[49]). Such measures may include updating the legal and regulatory framework, to allow workers to telework or work under flexible conditions.

To assist in reversing the long-term decline of productivity growth, and to support sustainability and inclusiveness, government recovery packages should include measures aimed at supporting the digital transformation of the business sector beyond telework and e-commerce. The analysis in this chapter has highlighted significant differences in the uptake and use of broader digital technologies, across countries, sectors and types of firms. In this context, policy should boost digital technology diffusion at the firm level to ensure an inclusive digital transformation, with benefits spread across firms and workers.

Key policy levers act on both the demand and the supply of technology and knowledge. Firm demand can be fostered by increasing firms' awareness of new technologies, as well as knowledge about their use and the benefits of adopting them. Tools to achieve this include dedicated instruments (e.g. online information platforms), business advisory support, and initiatives to encourage knowledge sharing network creation

(including through participating in global value chains, thereby connecting with other firms and fostering technology transfer). Policies aimed at reducing barriers to diffusion and developing firms' absorptive capacity and ability to use new technology effectively are also important. This can be done by focusing on skill endowment and upgrade, including through fostering mobility, and providing access to finance for training and investment in research and development (R&D) – especially at a time in which firms are in a fragile financial position. Policies that improve the overall business climate can also increase the demand for technology, as they allow potential adopters to grow and thrive. These include policies aimed at increasing competition and those that improve the efficiency of resource allocation (e.g. by improving insolvency regimes).

Policies aimed at supporting the development of technology and knowledge by leading firms and innovators are complementary to measures focused on technological diffusion. A dynamic and innovative ecosystem is crucial in order to make technological breakthroughs more widely applicable and affordable, so that radical innovations diffuse through the market. Supply-side policies should support both incremental and science-based innovation through strong public research systems and tight science-industry linkages, and should encourage experimentation.

Fostering technology diffusion and experimentation, in particular of digital technologies, not only boosts long-term productivity and economic growth, it but can also help transform the business sector to become more resilient. Measures to enhance digital technologies and use, as well as supporting factors such as skills and infrastructure, would thus bring double dividends for policy makers, as they would also foster other desirable outcomes such as business dynamism and inclusiveness, and can bring environmental improvements by reducing greenhouse gas emissions. The crisis provides a unique window of opportunity to implement a wide range of policies that can simultaneously tackle long-term challenges and support an enduring and inclusive period of economic growth.

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Notes

[1] Growth as measured by Internet Exchange Points. See OECD (2021[50]).

[2] For a review of telework uptake across several countries by firms and workers *during* the COVID-19 pandemic, see OECD (forthcoming[5]). For a discussion how telework capacities differ within countries, see OECD (2020[51]).

[3] For more on this policy, see www.weforum.org/agenda/2019/08/finland-s-doing-something-cool-with-flexible-working/.

[4] Note that the data on fast broadband presented in Figure 5.5 and Figure 5.4 both refer to actual uptake by individuals and firms, and hence depend not only on the availability of communication infrastructure, but also on the demand for broadband services by individuals and firms. Both indicators are therefore likely to understate the technical possibilities of what communications infrastructure could provide if uptake was universal.

[5] Note that further correlation analysis (not shown) on 2019 data does not find an additional positive relationship of telework uptake with the share of fibre connections (allowing very fast upload and download speeds) in total fixed broadband, going beyond the positive relationship with fast broadband connections depicted in Figure 5.5.

[6] Coverage is an indicator provided by broadband suppliers, and refers to the number of fixed broadband subscriptions with contracted speed faster than 25/30 Mbps per 100 inhabitants.

[7] Note that the gaps are not population weighted, so that the absolute number of households affected are relatively low in sparsely populated countries such as Finland. In these countries, mobile connections are likely to also play a more important role for people to stay connected (OECD, 2019[52]).

[8] However, these productivity gains are conditional on the market of platforms being contestable, to avoid the risk that certain large players become dominant and lower innovation efforts.

[9] While the analysis here focuses only on cloud services, there are other technologies, such as digital platforms, that enable firms and workers to store, access, and collaborate on data and projects. It is, however, unlikely that firms using these more sophisticated platforms are not also able to use cloud technologies.

[10] Major uncertainties related to productivity include: the duration and effectiveness of social distancing; market lockdowns; whether “temporary” government interventions and policies will persist; the extent to which pandemic-induced shifts in consumer spending patterns will persist; and the impact on business survival, new business formation, R&D, and human capital investment. The uncertainty is exacerbated by the lack of close historic parallels to the current crisis.

[11] Note that some older, large firms may also face difficulties in adoption due to outdated IT systems, or because they are stuck in old business models and lack managerial capabilities (OECD, 2020[37]).

[12] Similarly, previous work looking at the gains from sector-level digital adoption at various segments of the productivity distribution found that it is mostly the most productive firms that benefit (Gal et al., 2019[13]).

[13] Reflecting the growing importance of connectivity, which has been demonstrated more clearly than ever by the COVID-19 crisis, see also an amended OECD *Recommendation of the Council on Broadband Connectivity*, https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0322.

6 Industrial and international connectedness

This chapter outlines some of the ways in which countries and industries were affected by the COVID-19 pandemic via their connections to each other, and how restrictions on mobility and activity propagated the resulting economic shocks through economies across the globe. The chapter begins by describing the ways in which containment measures across the world can affect global value chains (GVCs), and identifies industries and countries that are particularly vulnerable to GVC risks. It then outlines how the types of demand, and destinations of products and services, can influence how different industries are affected by a shock like the COVID-19 crisis over the medium term. This chapter then describes how the restrictions on domestic and international mobility, and the resulting near-standstill of air passenger travel, directly affected two of the industries relying most heavily on mobility: aviation and tourism.

Key findings

- **The COVID-19 pandemic, and the economic shock it induced, spread across the globe through the interconnectedness of economies and societies, and demonstrated more clearly than ever the need to tackle global challenges through collaborative effort. International co-operation is key to building economic resilience in an interconnected world, including for the recovery period and to prepare for future crises**. Restrictions on the movement of people and the production and transport of goods triggered changes to demand for products and services, aggravating bottlenecks in supply chains. Differences in containment measures and a lack of co-operation between countries magnified the negative impacts of restrictions. In the future, governments should prepare better and align policy responses, to create a more robust and resilient economy in the face of shocks.
- **Robust supply chains and risk diversification are key to navigating shocks like the COVID-19 crisis**. While the pandemic has refuelled an old debate about the risks associated with global value chains (GVCs) – which are reliant on international connections and transport – the firms and economies that display the highest levels of resilience to shocks through international connectedness are those with agile and diverse links. While it may be tempting for governments to try to reduce certain risks of international connectedness by incentivising the on-shoring of value chains, this would result in a loss of efficiency without improving resilience.
- **The collapse of air transport had wide-reaching effects, despite the relatively small size of the sector**. Not only did tourism rates plummet globally, resulting in huge employment losses in the sector, but numerous other industries were affected because air transport enables other economic activities through the movement of people and goods. One silver lining of the reduction in air transport was a substantial drop in greenhouse gas emissions, although this is not expected to have a permanent influence on climate change unless policies are put in place to capitalise on the behavioural changes of the pandemic.

Introduction

The COVID-19 crisis has affected production, consumption, and mobility in unprecedented ways around the world. Lockdowns prohibiting all but essential economic activity (see Chapter 3 for more details on which industries are considered essential) led to disruptions in the production of intermediate inputs and lowered demand for final products, which in turn reduced supply and demand for inputs produced globally (OECD, 2020[1]). The confinement measures put in place in many countries, and travel restrictions in both origin and destination countries, caused international passenger travel to virtually come to a halt in early 2020. Besides directly affecting the aviation and tourism sectors, the collapse in international travel reduced cargo capacity in passenger flights, creating bottlenecks in the transportation of air freight. The disruptions in transport, combined with lockdowns impacting industrial production and sudden drops and surges in demand, have also led to broader concerns about the resilience of highly complex supply chains to shocks such as a global pandemic, as discussed in other OECD work (OECD, 2020[2]; 2020[1]; 2020[3]; 2020[4]).[1]

This chapter begins by discussing indirect ways that this connectedness impacts economies. It focuses on connections between firms, through GVCs. The COVID-19 pandemic has demonstrated how a large-scale shock can propagate through economic interconnectedness across the globe (OECD, 2021[5]). How deeply countries are integrated in GVCs will have implications for the degree to which production is impacted by the measures put in place to control the pandemic in other countries. This is true for both backward participation in GVCs (i.e. how industries and the firms within them rely on intermediate inputs produced in other countries) as well as forward participation (i.e. how much of a firm's or industry's output goes to other countries, where

it is used as an intermediate input before being exported further). While risks due to backward participation are mainly due to lockdowns and disruptions in transport, affecting the availability of inputs from upstream industries, forward participation also depends on a foreign demand component (i.e. the extent to which foreign demand for certain products changes due to shifts in preferences as well as overall recessionary trends). The analysis on GVCs in this chapter aims to help identify industries and countries most exposed to potential disruptions in production through GVCs. It can thereby help governments identify which areas might benefit the most from efforts for increasing resilience through co-operation (both with the private sector and with other countries), diversification, and transparency. These can be effective policy tools to mitigate GVC risks (OECD, 2020[1]; Arriola et al., 2020[6]) without endangering the benefits of GVCs, and help to address demand surges, including in essential medical goods and the production of vaccines (OECD, 2021[5]; 2021[7]; 2020[4]).

Focusing more directly on demand, the subsequent section of this chapter discusses the structure of aggregate demand (i.e. whether demand stems from households, public spending, private investment, or exports of intermediate or final goods). As different components of demand react differently to the crisis, the composition of aggregate demand will matter for how the overall economy is affected, with heterogeneities arising in timing as well as severity of impacts.

Given the important sectoral impact of the pandemic through international connectedness, this chapter continues with an overview of the impact on aviation and tourism, two of the industries that rely most directly on mobility and are therefore most directly affected by the disruptions in international travel. It sheds light on the degree to which these industries were impacted by the COVID-19 crisis, as well as their relative importance by country, and also highlights some positive environmental effects from reduced greenhouse gas emissions related to the large drop in the number of passenger flights.

Global value chain exposure and centrality

The COVID-19 crisis has refuelled an old debate about the risks associated with internationally fragmented production and GVCs, which by their nature are connected to, and reliant on, business and industrial functioning across multiple countries. A shock like the one caused by the COVID-19 pandemic can be a source of additional vulnerability in GVCs, exacerbated by disruptions in international trade due to lockdowns and mobility restrictions.

Fortunately, the impacts of the crisis on GVCs during the first wave seem to have been less severe than initial fears warranted. In the beginning of the pandemic, disruptions specific to the People's Republic of China (hereafter "China") – the epicentre of the initial outbreak, and the world's largest manufacturing hub (see also Figure 6.3), including of some essential medical supplies, such as surgical masks – caused major concerns. However most of these abated after the lockdown in China ended and production was ramped up (OECD, 2020[3]; 2020[4]). Early evidence on global supply chains for food products concludes that they were rather robust during the first wave of the pandemic (OECD, 2020[2]; 2021[8]), and that the disruptions that did arise were of both foreign and domestic origin (OECD, 2021[5]). Further analysis and simulations of different policy options finds that on-shoring and reducing GVC integration would not necessarily lead to more security from supply chain disruptions (OECD, 2020[1]), and in fact international trade and production networks have helped satisfy the demand surges that happened during the first wave of the pandemic. Indeed, GVCs have also helped provide access to essential goods that are key in tackling the health crisis, including vaccines (OECD, 2021[7]).

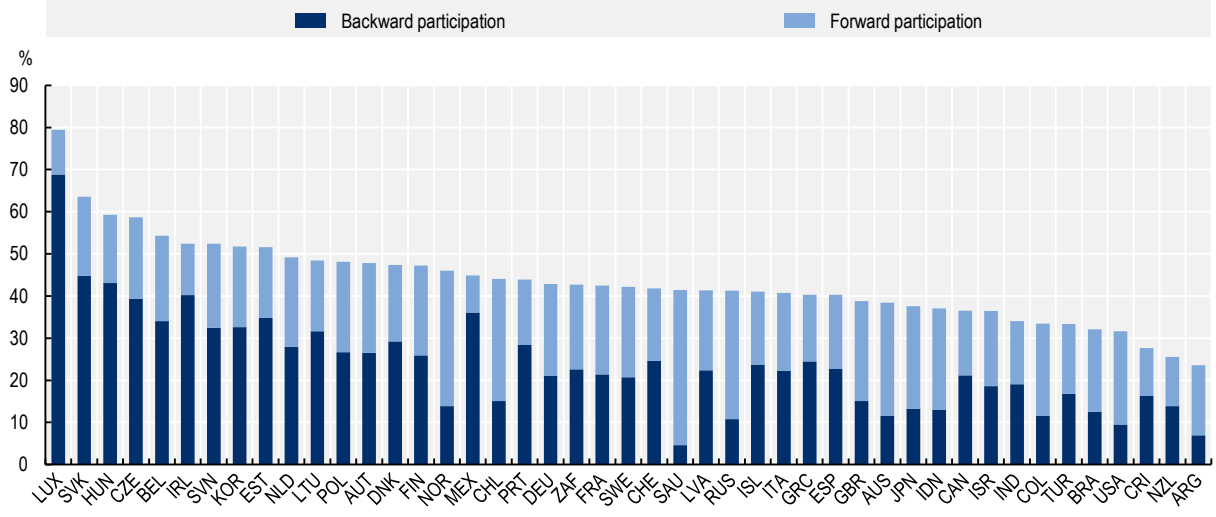
Both foreign and domestic value chains entail risks, and depending on the reliance on each, countries are exposed to these different risks to varying degrees. Diversified supply chains have helped economies mitigate initial shortages and satisfy increased demand for certain goods. Nevertheless, highly fragmented international production networks, in which the production process is sliced up into many separate steps, can be subject to disruptions due to differential timings of lockdowns between countries, which may be exacerbated by bottlenecks in transportation. Firms can experience disruptions in access to, and purchase

of, intermediate inputs from foreign suppliers if the latter are, or were, unable to produce or supply due to lockdowns or transport disruptions. As the health crisis may continue to unfold in further waves, affecting countries with different intensity and at different points in time (with new mutations of the virus representing an additional risk factor), these concerns remain.

Furthermore, production of goods in non-essential industries with long value chains, in which many production stages are involved, may be more vulnerable to GVC risks than are food supply chains, given that food production has been allowed to continue almost everywhere, despite lockdowns. In the short term, lockdowns may have been a concern especially for production in non-essential industries, which were forced to shut down or could continue only with reduced capacity in many countries. Over the medium term, however, most industries – essential or not – are likely to be affected in one way or another. This is partly because firms in essential industries rely on inputs from those classed as non-essential. It is also because the potential for asymmetric timing and intensity of lockdowns and interruptions in production grew larger as the health crisis continued and countries adopted different coping strategies. Longer-term impacts can also differ from initial disruptions because initial demands might have been partly satisfied through existing stocks – as was the case also in food supply chains (OECD, 2021[5]) –, by postponing certain purchases (e.g. of investment goods) or may not have even arisen if the specific downstream industry was under lockdown itself.

Figure 6.1 illustrates the degree of GVC participation in OECD and G20 countries. GVC participation is measured by the foreign content of domestic exports (backward linkages) and domestically produced inputs used in other countries' exports (forward linkages), as a share of total gross exports. Such measures can be considered as revealing *potential* vulnerability or resilience to different types of shocks; global or regional economic shocks may propagate through GVCs, but in the case of shocks originating domestically, they may also be a source of resilience. Countries such as Japan, the United States (US), Canada, Argentina, New Zealand or South Africa are relatively less integrated in GVCs and therefore subject to a lower risk of disruption due to the effects of lockdowns elsewhere or international travel restrictions. However, many small open economies such as those of Luxembourg, the Czech Republic, the Slovak Republic, Ireland and Korea are heavily integrated in regional or global value chains, and thus may be more exposed to lockdowns and supply and demand shocks in other countries.

Figure 6.1. GVC participation



Note: GVC participation index for 2015 based on OECD's Inter-Country Input-Output (ICIO) matrices (OECD, 2018[9]). The index combines the foreign content of exports (backward participation) and domestically produced inputs used in third countries' exports (forward participation), as a percentage of gross exports.

Source: OECD (2018[10]), *Trade in Value Added (TiVA) Database*, http://oe.cd/tiva (accessed in January 2021).

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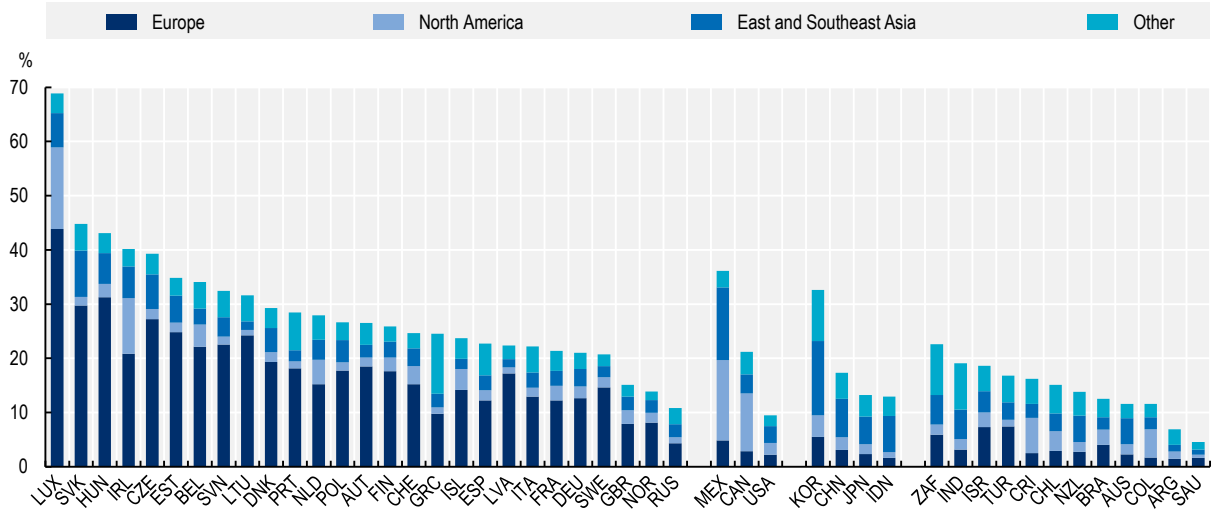
The vulnerability of GVCs through backward participation may be more immediate due to the asymmetric imposition of lockdowns across countries. Domestic restrictions on production affect domestic firms simultaneously, because most firms in the same country will be impacted by the same set of rules at the same time. For instance, the restriction-induced shutdown of a firm that produces intermediate inputs may simply coincide with the concurrent shutdown of a downstream domestic firm that uses those inputs, causing fewer issues in the value chain. Foreign linkages, however, may create difficulties when downstream firms are able to continue operating, but inputs from other countries are unavailable due to interruptions in production among suppliers. The Czech Republic, Hungary, Mexico and the Slovak Republic have particularly high degrees of backward participation related to manufacturing or processing industries, both in absolute and relative terms, and may face more difficulties in receiving inputs from foreign suppliers facing lockdowns over the short term.

Countries integrated in GVCs through forward participation, on the other hand, may face longer-term risks. Contractual obligations of downstream firms facing lockdowns may also lead to stockpiling, with postponement of new orders later on. That said, foreign demand can also offset drops in domestic demand; indeed, evidence on GVC disruptions during further waves of the pandemic points towards more, rather than less, longer-term resilience through forward GVC integration (Giglioli et al., 2021[11]). Norway, Saudi Arabia and the Russian Federation display the highest degrees of forward participation as major exporters of oil or gas.

Figure 6.2. Foreign value added content of gross exports, by region of value-added origin, 2015



Source: OECD (2018[10]), *Trade in Value Added (TiVA) Database*, http://oe.cd/tiva (accessed in February 2021).

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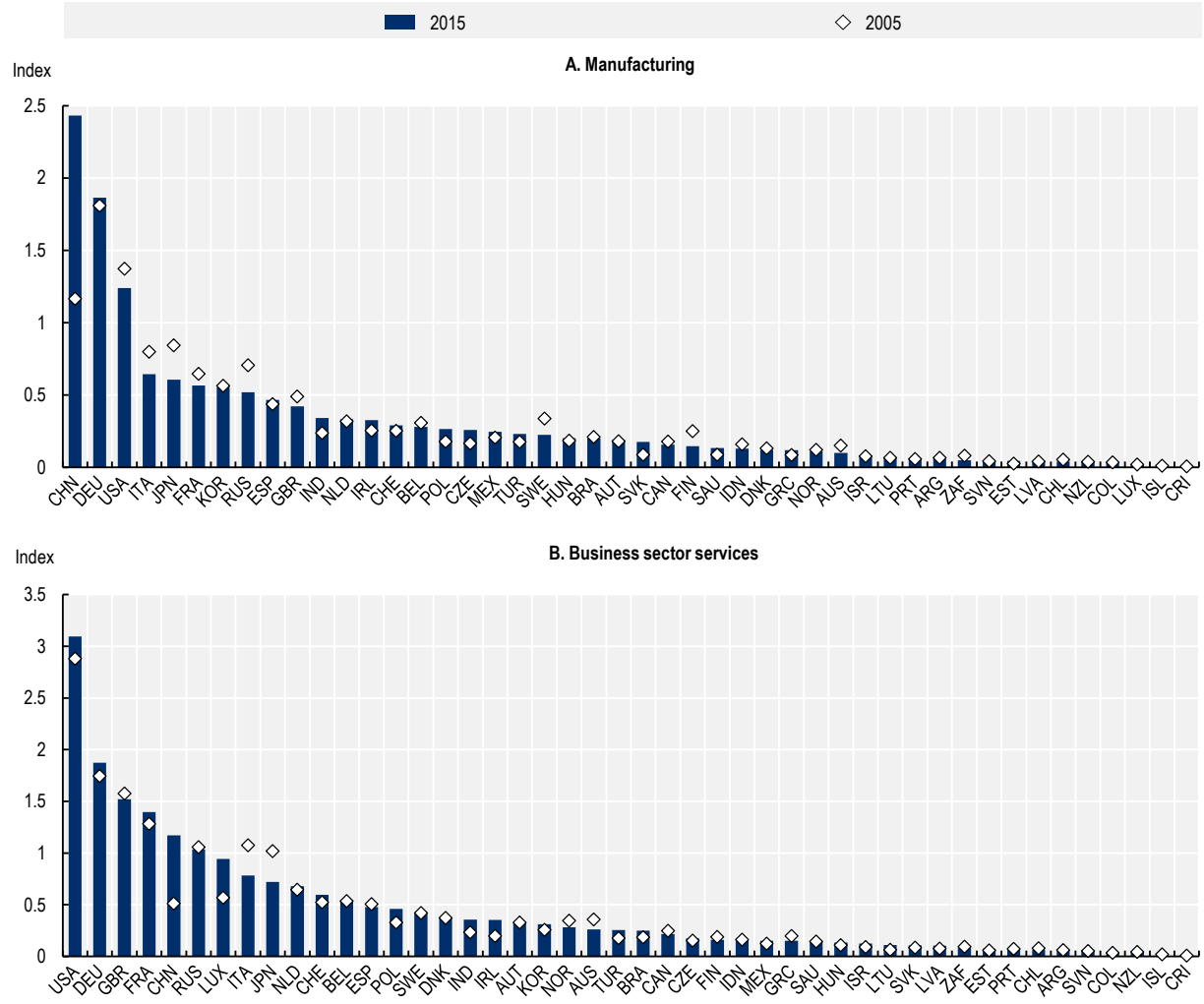
In addition to the overall degree of integration into GVCs, it is also relevant whether this integration is primarily regional (which is the case for most countries) or more spread across the globe. This is partly because transport disruptions are a bigger concern if few alternative modes of transport are available, which is more likely to be the case for extra-regional trade. However, more specific to the COVID-19 crisis, it is also because differential timings in infection waves and lockdowns, as well as the type of policy measures taken (e.g. full lockdowns, track-and-trace, zero-COVID strategies) are more similar within regions than across, and extra-regional trade is therefore more likely to be affected by lockdown measures and by tighter restrictions and controls. Lastly, switching suppliers within regions will be easier if there is a higher degree of harmonisation in standards and regulations in place, which is particularly relevant for countries with existing regional trade agreements or common markets, such as the European Union.

Figure 6.2 above shows the regional composition of backward linkages (i.e. the foreign value added content of gross exports, by the region of value added origin). As expected, most countries primarily source imports

from within their region, but there are a few countries that stand out. Within Europe, Ireland and Luxembourg are highly integrated in GVCs and source relatively more from outside of the European Union (particularly from North America) compared to other European countries; this partly reflects the relatively large presence of non-European multinationals and their related trading activities in these two countries. In the case of Luxembourg, this also reflects significant dealings in business and financial services (Cadestin et al., 2019[12]). For Greece, less than half of its foreign value added in exports comes from Europe, and the Netherlands also has a relatively more diverse backward linkages outside of Europe. While highly dependent on its North American neighbours for inputs, a high share of Mexico's foreign value added in its exports comes from East and Southeast Asia, reflecting close linkages with US multinational enterprises, and their value chains (Guilhoto et al., 2019[13]). Among Asian countries, Korea displays a relatively diversified input portfolio across regions, with notable shares also originating from regions outside of East and Southeast Asia.

Figure 6.3. Foreign centrality index, 2015 vs. 2005



Note: Foreign centrality is calculated as the output-weighted average of industry-country centrality indices, and is the average of forward and backward participation centrality measures. See Criscuolo and Timmis (2018[14]) for the methodology. Business sector services refer to sections G to N of ISIC Rev.4.

Source: OECD calculations based on OECD (2018[9]), *Inter-Country Input-Output (ICIO) Database*, http://oe.cd/icio (accessed in February 2021).

StatLink https://doi.org/10.1787/888934261764

Capturing a different aspect of international connectedness, the centrality index (shown in Figure 6.3) is an indicator of whether a country serves as a hub in value chains – that is, importing inputs from many countries that are themselves well connected to other countries, and also supplying these inputs to a large network downstream. It complements traditional GVC indicators – such as the participation index – by adding information on the complexity of networks and the connectivity and position of countries (Criscuolo and Timmis, 2018[14]). Countries that score high on the centrality index are connected (directly or indirectly) with many other countries, and are influential in the value chain. Centrality is a relative concept and can be measured backward (with suppliers) or forward (with customers), with total centrality being the average of the two. A high centrality indicates that a country is a hub in the value chain, whereas a low value means that a country is at the periphery, and not well connected to GVCs. Hubs generally arise – and grow – due to efficiency gains that result from geographical or technical advantages, and thus, they become channels of propagation.

Disruptions in high centrality countries might therefore have more far-reaching consequences than those in countries on the periphery. Notably, China stands out as the world's major manufacturing hub, followed by Germany and the United States. Again, this explains why the initial lockdowns in China caused concerns about the vulnerability of GVCs more generally. The centrality index can also be indicative of the ease at which a country might be able to diversify across several trading partners, relying on pre-existing trade relationships. Indeed, as discussed in more detail in the last section of this chapter, diversification and the identification of back-up options and alternative supply channels are among the main strategies suggested for improving resilience (OECD, 2021[5]), and exchanging best practices with hub countries might entail significant knowledge spillovers and learning opportunities.

Centrality in business services appear overall less concentrated, except for in the United States, which is clearly the leading hub. This may reflect the strong position of the United States in digital business services. The business services sectors, with some exceptions (e.g. Wholesale and retail and Transport services), were more resilient to the COVID crisis, due to their greater ability to engage in telework. In addition, digital, IT and telecommunication services were clearly among the sectors that benefitted from the COVID-19 crisis, and may have strengthened the US position as a hub.

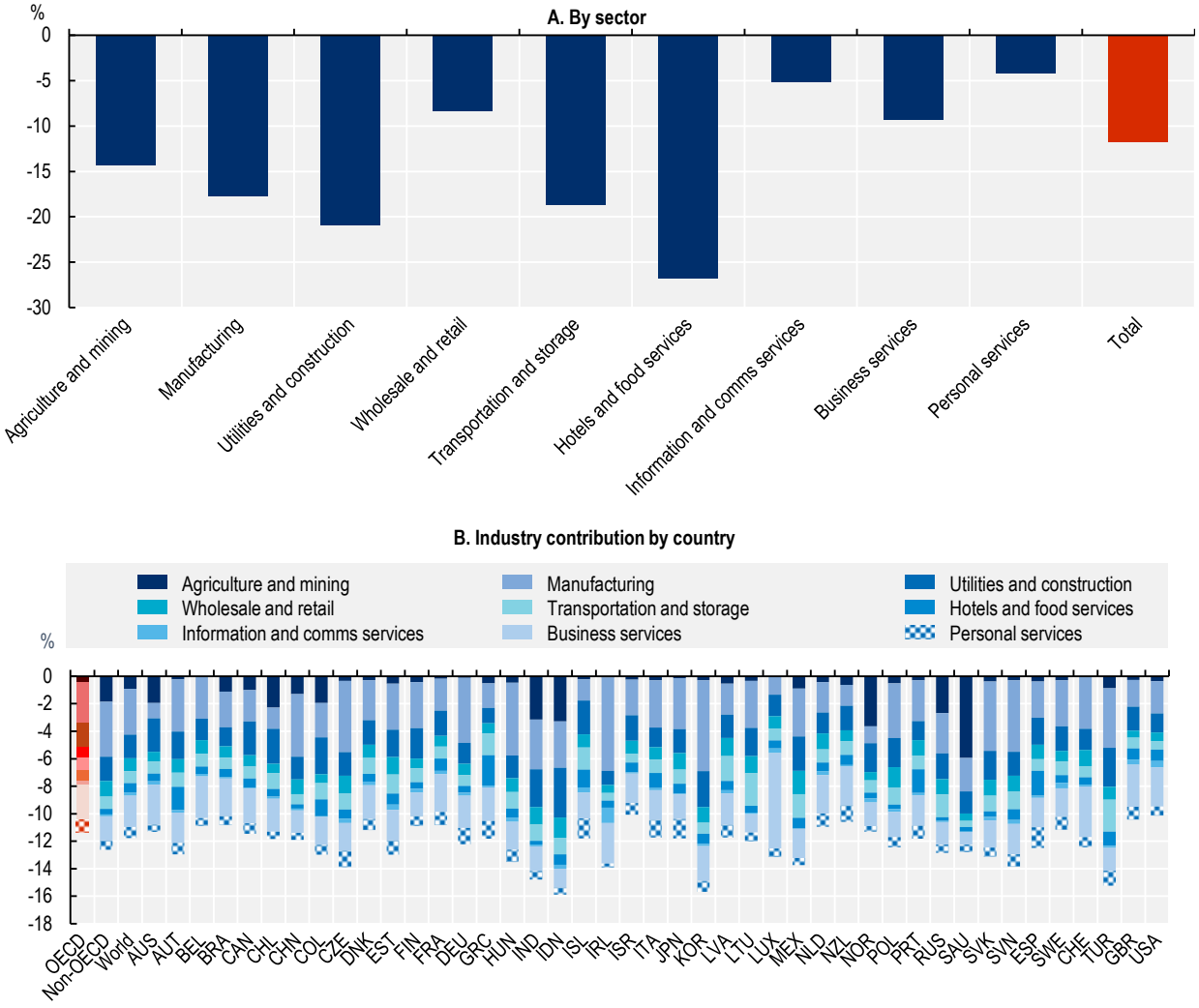
Industry composition and the structure of demand

As countries move beyond the immediate health crisis and into intermittent or definitive recovery periods, disruptions associated with lockdowns and travel bans can be expected to give way to longer-term demand impacts. While fiscal stimulus programs can help support domestic demand during the immediate recovery, fiscal space can become a limiting factor for some economies over the medium term, and broad fiscal policy support may have to be adjusted to more targeted measures (OECD, 2021[15]). In this regard, countries whose production and industry structure is more heavily weighted towards domestic consumption (both government and household consumption) and the production of final goods are likely to experience impacts that differ from those in countries that are more active in the production of investment goods (where final demand may remain low for some time) or exported intermediates.

Exploiting information from global input-output tables on countries' integration into GVCs, a scenario analysis models possible impacts on different components of the economy. The estimated effects on output, value added, final consumption, gross fixed capital formation and international trade are shown in Figure 6.4 below. The figure also illustrates the large impact of the COVID-19 crisis on domestic and overseas supply chains. Combining the latest OECD Inter-Country Input-Output (ICIO) tables (2018 edition) with recent monthly (or quarterly) statistics on final expenditures, simple scenario analyses can provide estimates of 2020 industry value added compared to "business-as-usual" (BAU). This helps demonstrate the large impact of COVID-19, taking into account international connectedness through GVCs. While the analysis presented below suggests that global total value added was 12% below BAU in the middle of 2020,[2] impacts across sectors vary, with Hotels and food services most affected with a drop of 27%, while Information services fell only

5%. Impacts also vary across OECD countries, from -16% (Korea) to -10% (Israel and the United States), reflecting countries' industrial structure as well as GVC linkages.[3]

Figure 6.4. Value added change from business-as-usual, Q2-Q3 2020

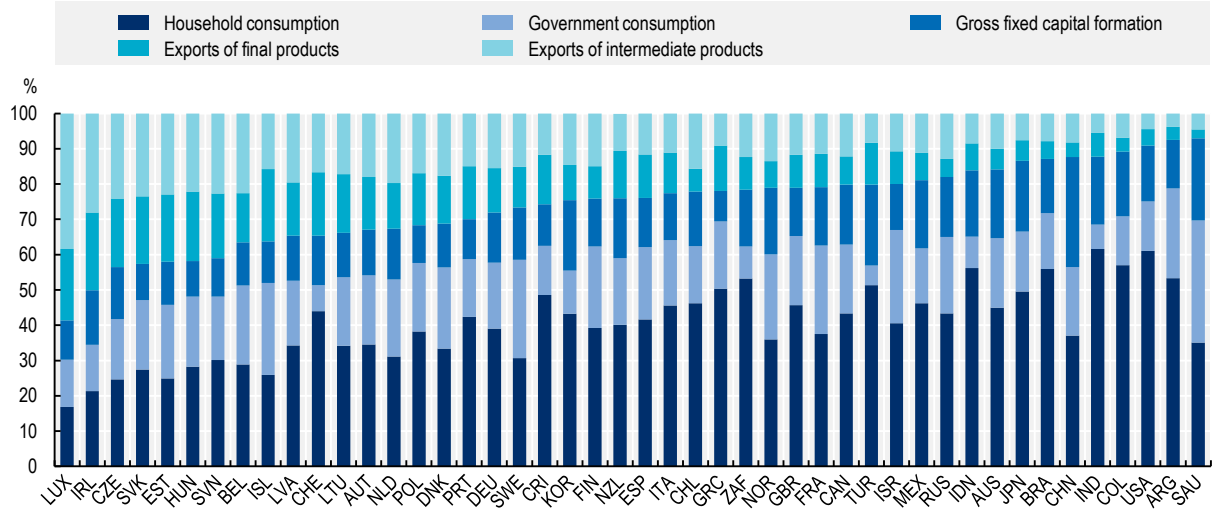


Note: Panel A shows the average impact on the 64 ICIO target countries, by sector. Panel B shows, for each country, the contribution of sectors to the total impact on the economy. Estimates of annual "business-as-usual" (BAU) were based on the 2020 projections of GDP in IMF's *World Economic Outlook* published in October 2019 (IMF, 2019[16]). For the global input-output structure for 2020, the input structures from the 2015 ICIO table (2018 edition) were projected under 2018 SNA constraints (output, value added, final consumption, gross fixed capital formation and international trade) and preliminary estimates of industry value added and output from the forthcoming update of the ICIO tables. Maintaining annual average production input structures, the simulation used recent monthly (or quarterly) final expenditure structures (not seasonally adjusted).
Source: OECD calculations based on OECD (2018[9]), *Inter-Country Input-Output (ICIO) Database*, http://oe.cd/icio (accessed in February 2021).
StatLink https://doi.org/10.1787/888934261783

G20 countries such as China and, to a lesser extent, Turkey and Saudi Arabia – which have a particularly high degree of employment directed towards investment goods – may see a more protracted drop in demand than other countries (Figure 6.5). However, this can be cushioned through high levels of government spending (as in in Saudi Arabia) or a large share of private consumption (as in Turkey). Meanwhile, some countries may experience lower demand in the medium term due to a large share of employment in the production of exported intermediates, which can also be mitigated through higher levels of government spending or private consumption, as mentioned. However, the effectiveness of the mitigating effects of private consumption

rests on the assumption that industries that are typically more resilient in "normal" recessions, such as domestic services, are operational. These include some industries that have been particularly hard hit by the COVID-19 crisis due to high levels of customer contact, as shown in Chapter 3. Whether domestic household consumption can cushion the possible reduction in investment demand over the longer term will therefore strongly depend on the evolution of the pandemic and the strategies of governments to control the health crisis. Generally, most governments have announced very generous public support packages to strengthen demand and counteract the recessionary effects of the crisis (OECD, 2021[15]). For example, the United States has traditionally low levels of government spending, yet announced one of the single largest fiscal packages in economic history with the aim of boosting household consumption and supporting employment through the recovery phase.

Figure 6.5. Composition of demand in terms of employment, by country



Note: Share of household consumption, exports of final and intermediate products, gross fixed capital formation ("investment") and government consumption in the final destination of employment for 2015.
Source: OECD calculations based on OECD (2018[9]), *Inter-Country Input-Output (ICIO) Database*, http://oe.cd/icio (accessed in February 2021).
StatLink https://doi.org/10.1787/888934261802

Air transport

Though aviation and air transport alone are relatively small pieces of most OECD countries' economies, they are heavily intertwined with several other sectors that depend highly on them both upstream and downstream. The restrictions on mobility, and the decrease in consolidated air freight due to a drop in passenger travel, therefore affected business in many other industries. According to the International Air Transport Association (IATA), passenger air transport – measured as revenue from passenger kilometres travelled – was down 90% year-on-year in April 2020, and was still down 75% in August. The collapse in economic activity and trade affected freight, which was almost 30% lower year-on-year in April, and still about 12% lower in August. Commercial air traffic has been slow to recover; in September 2020, the number of flights globally remained more than 40% lower than before the crisis (OECD, 2020[17]).

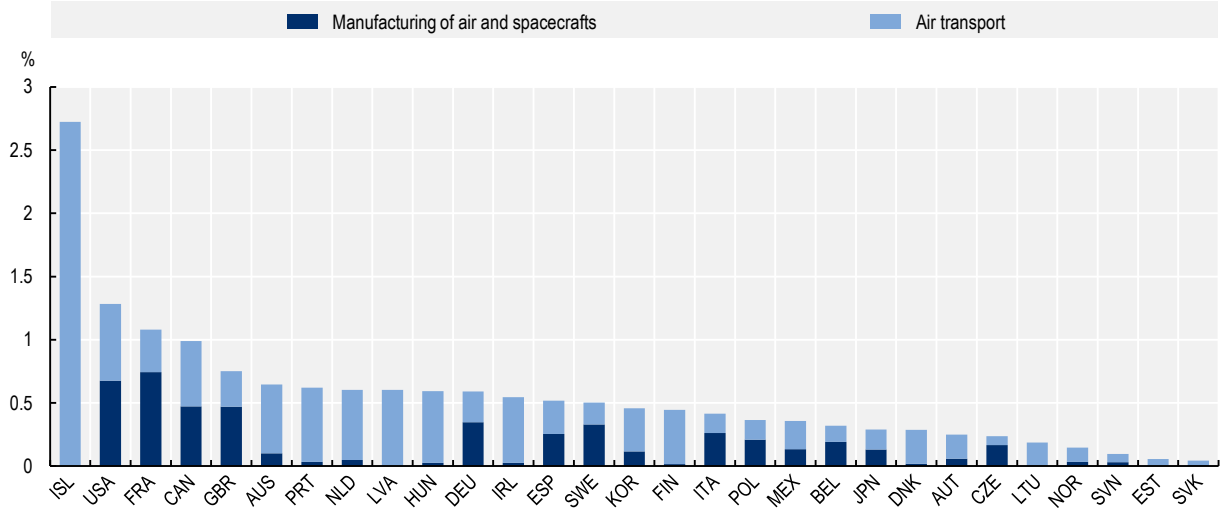
This massive reduction in air travel has affected not only people, but also the planet, through effects on associated carbon emissions. According to the International Energy Agency (IEA), global energy-related CO_2 emissions fell by 5.8% in 2020, compared to 2019 (IEA, 2021[18]), part of which is explained by the large reductions in greenhouse gas emissions from transportation. While many of these short-term effects are expected to revert after the recovery period, permanent behavioural changes could create longer-lasting

positive environmental outcomes. For example, as businesses realise that they can improve profitability and productivity by cutting down on business travel, this could translate into permanent emissions reductions from air transportation. Changes to international tourism could have the same effect (see below). It is important to keep in mind, however, that these behavioural changes, even if permanent, are unlikely to be large enough to significantly alter the climate problem. For example, air transportation, although growing fast before the crisis, accounted only for 2.5% of global greenhouse gas emissions in early 2020. To ensure that the recovery from the crisis is harnessed to speed up the low-carbon transition, additional policies will need to be put in place to encourage the development and rapid diffusion of low-carbon technologies (and digital technologies that enable them – see Chapter 5).

As discussed, the air transport sector (passenger and freight) represents only a small share of OECD countries' value added (around 0.3% on average, see Figure 6.6), but strong inter-industry linkages make it an important part of the economy, as demonstrated also by targeted government intervention in the sector (see Box A D.2 in Annex D). Air transport relies on several upstream sectors: support activities to air transportation (including the operation of airports); aircraft manufacturing; rental and leasing services; and refined petroleum manufacturing.

The air transport sector and airports are inherently intertwined, and aircraft manufacturers are highly dependent on demand from the air transport sector, directly or through leasing companies.[4] Air transport is also a key input for downstream sectors, as it enables several economic activities by way of trade in goods and especially in services through the movement of people. Beyond inter-industry linkages, air transport is characterised by both complementarity (e.g. through connecting transport routes) and substitutability (e.g. of passenger transport) with other modes of transport, such as high-speed rail, especially on short- and medium-haul routes.

Figure 6.6. Importance of the aviation industry, by country



Note: Industry share in total value added. Data for 2018, except for Australia, Canada, Ireland, Japan, Poland, Spain and the United Kingdom (2017). Air transport services corresponds to ISIC Rev.4 Division 51; Manufacture of air and spacecraft and related machinery refers to ISIC Rev. 4 Group 303. Group 303 does not include Manufacture of aircraft instrumentation and aeronautical instruments and manufacture of air navigation systems. Support activities to air transportation, including the operation of airports (Class 5223) not shown here because of limited data availability – for more details, see OECD (2020[17]). Data for Group 303 are not available for Iceland.
Source: OECD (2020[19]), *Structural Analysis (STAN) Database*, http://oe.cd/stan (accessed in January 2021).

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Tourism

As a direct consequence of the restrictions on movement and the resulting drops in passenger travel, tourism declined by around 60% to 80% in most countries in 2020 (OECD, 2020[3]). The decline is especially worrying because the sector is an important source of employment and job creation in many countries, providing a high volume of jobs for low skilled workers, but also a sizeable amount of higher skilled jobs. Importantly, tourism provides jobs not only in major cities but also in remote, rural and coastal areas, as well as other – often economically fragile – locations where alternative employment opportunities are limited over the short term. What is more, most firms in the tourism sector are small and medium-sized enterprises, which are at higher risk of short-term solvency problems (OECD, 2020[20]), as also outlined in Chapter 4.

Figure 6.7 displays the share of tourism in total employment across OECD countries in 2017, along with the share of domestic tourism in overall tourism expenditure. Spain and Iceland stand out as the most vulnerable countries in terms of their dependence on tourism, which accounts for 13% to 15% of total employment. Both countries also rely relatively heavily on international tourism, which is likely to recover more slowly than domestic tourism.

Figure 6.7. Share of tourism in total employment and share of domestic tourism expenditure

Note: Share of tourism in total employment: data for 2017, except for Portugal, the Slovak Republic and the United Kingdom (2016), Italy (2015), Argentina, India and Indonesia (2012). The share of domestic tourism expenditure on the right scale is the ratio between domestic and total internal tourism expenditure. Data for 2018, except for Australia, Austria, the Czech Republic, Denmark, Hungary, Iceland, Indonesia, Japan, Lithuania, Norway, Portugal, Slovenia, South Africa, the United Kingdom (2017), Finland (2016), Colombia, Germany, Italy, Poland, Spain (2015), and Estonia and Switzerland (2014).

Sources: OECD (2020[21]), "Key tourism indicators", *OECD Tourism Statistics* (database), https://doi.org/10.1787/e5d0c450-en (accessed on 1 July 2020) and OECD (2020[22]), "Internal tourism consumption", *OECD Tourism Statistics* (database), https://doi.org/10.1787/e1b30ded-en (accessed on 3 December 2020).

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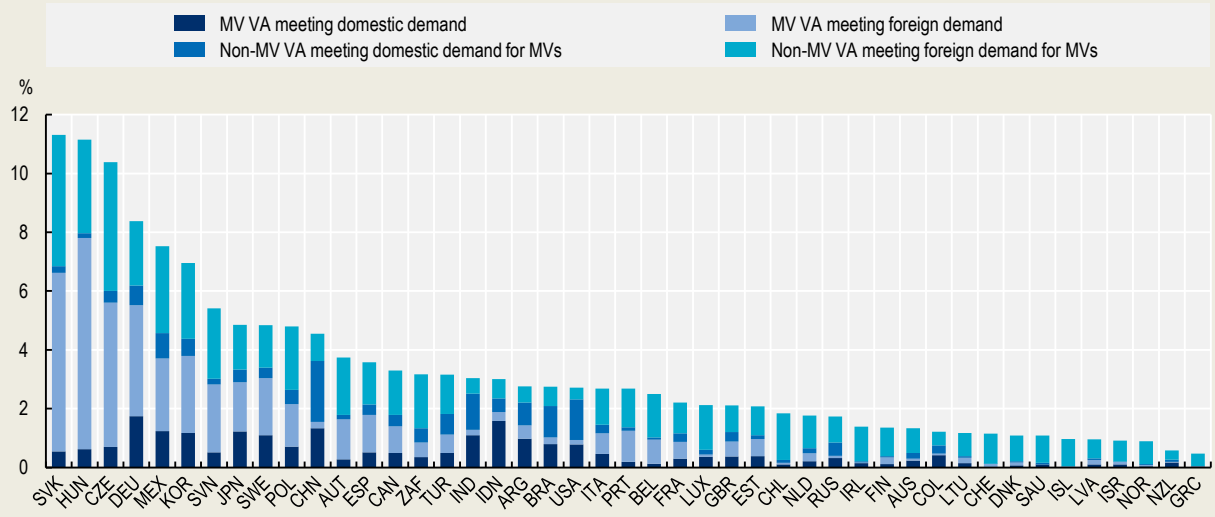
As evidenced above, the effects of the crisis had a direct disruptive impact on a number of sectors dependent on international connections, through restrictions on activity, changes in demand and behaviour, and reductions in mobility. Box 6.1 details the automotive industry as another example of a sector that faced challenges to its existing business model, and underwent transformation as a result of the pandemic.

Box 6.1. Impacts of the pandemic on the automotive sector

The automotive sector represents a very high share of some OECD countries' value added (and employment), whether generated directly by the production of motor vehicles or by other domestic industries supplying the necessary inputs (Figure 6.8). For the Czech Republic, Hungary and the Slovak Republic, with their links to German automotive manufacturers, the value added generated to meet demand represented over 10% of their total value added in 2015.

Figure 6.8. Share of domestic value added related to motor vehicles



Note: VA = value added; MV = motor vehicles. Data show the percentage share of domestic value added in total economy value added for the year 2015.
Source: OECD (2018[10]), *Trade in Value Added (TiVA) Database*, http://oe.cd/tiva (accessed in February 2021).
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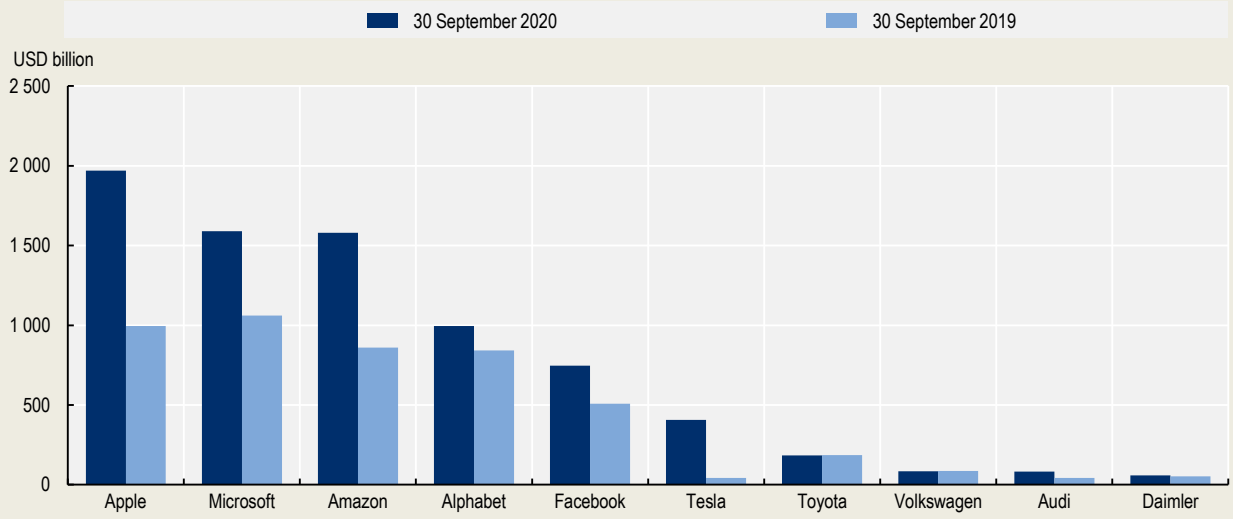
The crisis has caused both supply and demand drops, and created severe output loss in the automotive sector, despite agile demand-side policies by governments. According to the *Association des Constructeurs Automobiles Européens* (ACEA – European Automobile Manufacturers Association), new passenger car registrations in the EU market fell by 23.7% in 2020, compared to 2019. They started to show signs of recovery in March and April 2021, but not to pre-crisis levels. As a result, the COVID-19 crisis caused not only temporary factory closures in many countries, but also permanent layoffs for several firms, including Original Equipment Manufacturers (OEMs). In contrast, labour shortages are a major issue in some countries (e.g. Central and Eastern European countries) (Klein, Høj and Machlica, 2021[23])

The automotive sector has been experiencing a dramatic transformation, specifically through green and digital technologies (such as connected, autonomous, shared/smart and electric vehicles) and changes to its business model (Mobility as a Service), even before the COVID-19 crisis. However, the crisis has negatively affected the sector's capability to continue transforming its technology and business model. The latest *OECD Main Science and Technology Indicators* (OECD, 2021[24]) show a sharp drop in research and development (R&D) expenses of selected top R&D companies in the automotive manufacturing sector in 2020. Yet, the sector requires heavy investment in R&D, innovation and restructuring, despite reduced financial capacities and the increasing presence of competitors from other industries (e.g. electric mobility start-ups and large IT firms).

In this regard, OEMs in particular are competing with start-ups for the development of electric vehicles (EVs) (e.g. almost 500 EV manufacturers were registered in China in 2019), and with IT giants to develop technologically integrated mobility solutions, to be part of broader smart city platforms (e.g. Toyota, Alphabet [Google]). OEMs do not necessarily have the relevant skills, know-how or critical mass to drive this software-based innovation. Despite multiple alliances across industries to mutualise costs, the investment capacity of OEMs may fall short of that of the IT giants, which are much bigger in terms of market capitalisation (Figure 6.9). The COVID-19 crisis has widened this size gap, as it detrimentally affected the automotive sector while the IT sector in general has benefitted.

Figure 6.9. Market capitalisation of the top five automotive and IT firms involved in autonomous vehicle development



Note: Market capitalisation of firms in all OECD member countries as of 30 September 2020, year-on-year, in USD billion. Tesla, an electric vehicle and clean energy company, overtook Toyota as the world's most valuable automotive firm in June 2020. For currency conversion, this figure used EUR 1 = USD 1.10899 (30 September 2019) and EUR 1 = USD 1.1724 (30 September 2020).
Source: Yahoo! Finance (2020[25]), https://finance.yahoo.com.

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The COVID-19 crisis has accelerated aspects of structural change in many sectors. The automotive sector is no exception. Indeed, permanent layoffs in OEMs and suppliers may also be driven by expectations of a long-term drop in the demand for labour-intensive traditional internal combustion engine vehicles, as opposed to the expected long-term increase in the demand for less labour-intensive EVs. Further, the demand for EVs has surged during the crisis, partly due to government support.

Governments fear that investments, in particular in green technologies, will slow down as a result of the COVID-19 crisis. This arises from two different mechanisms: direct effects from the pressure on firms' liquidity buffers, and indirect effects – notably through the low price of oil – that might discourage the demand for EVs. As a consequence, some governments' COVID-19 support instruments are integrated with their green strategies (e.g. through support for green innovation in the automotive sector or more generous scrappage schemes when buying an electric vehicle) and innovation strategies (e.g. developing autonomous, shared and connected vehicles).

Source: OECD (forthcoming[26]), "COVID-19 and the automotive sector", *OECD Policy Responses to Coronavirus (COVID-19)*.

Conclusions and policy implications

The overall image arising from the analysis of the connectedness of economies and industries through three main aspects – indirect effects through GVCs, direct sectoral effects (most notably through aviation and tourism), and longer-term impacts through the structure of demand – is that, perhaps unsurprisingly, it is mainly the small, open economies that are exposed the most to these channels.

Overall, countries in Europe are the most regionally integrated in terms of their GVC relationships. There are however a few European countries that are more connected with extra-regional trading partners, which might make them more susceptible to global disruptions in the sourcing of foreign inputs. The same holds true for Mexico and Korea, both of which are also heavily integrated through GVCs and rely – more than other countries – on extra-regional supply chains.

There are also some less obvious insights on countries that may be affected over the longer term, through investment demand and forward participation in GVCs. Noteworthy cases include G20 countries Indonesia, Turkey, and to a lesser extent also China. These countries may be more vulnerable because they have traditionally low levels of government spending, whereas high levels of government spending can dampen drops in demand over the longer term. Iceland stands out as particularly vulnerable due to its large tourism sector as well as being a major transport hub; both factors that rely heavily on international travel.

International collaboration and co-ordination are key to addressing the vulnerabilities, consequences and risks associated with the international nature of a pandemic, and other shocks like it. Policy co-operation, as well as cross-border strategies and agreements, can greatly reduce risks and mitigate damage to firms and industry caused by containment measures. The virus itself does not stop at borders, and so neither should policy responses to it. Governments now have the opportunity to form collaborative relationships and ensure careful planning for co-ordination systems, both with other countries and with the business sector. This will help with a strong recovery from the COVID-19 shock and for better preparedness for future crises.

There are different policy options to address the specific vulnerabilities arising through international connectedness. Certainly, enabling travel corridors and ensuring the transport of goods and services across borders are preconditions for maintaining the functioning of globalised production networks and the movement of goods and services. Cross-border mobility will be a large determining factor in the speed and strength of the recovery, particularly for the services and tourism sectors (OECD, 2021[27]), but such mobility will require co-ordinated health protocols, such as systems to recognise inter-country vaccine records. Further, international co-operation to establish common and coherent rules and regulations will be crucial to allow the travel and tourism industries to recover, and for consumers to plan travel and activities with certainty.

When it comes to GVCs, on-shoring of essential activities is not a solution to ensure the supply of critical goods, including because they can also be a source of resilience to domestic shocks. There are a number of more robust, sustainable, and efficient options. Most prominently, these options should include fostering increased diversification and international co-ordination.[5] The perceived gains of on-shoring are not likely to play out over the longer term, and many of the observed shortages during the initial stages of the COVID-19 pandemic were caused by increases in demand rather than disruptions in supply. Demand surges for certain items, such as surgical face masks or diagnostic tests, were indeed met through globalised production networks (OECD, 2020[3]). Additionally, differences in the timing of lockdowns will be less relevant over longer time horizons, as domestic essential activities will rely on inputs from other, non-essential, industries – which are likely also subject to domestic restrictions on production – over the medium term.

Very few countries can meet their own needs alone for different types of products, especially those which are essential in a crisis (OECD, 2021[5]). Reliance on only domestic markets entails risks, just as reliance on international markets does; and different types of shocks can entail vulnerabilities to domestic or international supply chains. Risk mitigation in supply chains of any type is therefore underpinned by policy co-operation

to ensure supply chains are not broken and to manage bottlenecks. Resilient economies are underpinned by resilient international supply networks.

Examples of collaborative steps governments can take include promoting transparency and predictability through clear regulations and the decision making, and the lowering of trade barriers by harmonising standards and norms and reducing red tape – striking a balance with consumer and environmental safety concerns – as outlined for example in OECD (2020[28]). More generally, resilience can be improved by facilitating cross-border trade. Other suggested areas for government action to help make GVCs more robust include regular stress tests (e.g. trial runs of scenarios in which parts of supply chains become untenable), and international co-ordination to avoid unilateral actions such as export restrictions, which may trigger harmful effects on other countries through GVCs (OECD, 2020[3]). At the firm level, fostering diversification of suppliers, and supporting co-ordination and information networks to increase transparency and the provision of back-up options, can help increase resilience. More detailed policy recommendations to build more resilient supply chains can be found in OECD (2020[1]).

Governments must work together to achieve development and climate goals alongside building resilience to crises, and the COVID-19 crisis represents a window of opportunity for heightened co-operation to address multiple goals and challenges at once. The recovery period from COVID-19 is a rare opportunity to foster intensive collaboration.

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Notes

[1] Some of these effects may be mitigated by regional policies for certain supply chains, such as within the European Union. Examples include “green lanes” for quicker checks of freight vehicles crossing country borders within the European Union during the pandemic, and leniency for airlines to fly planes outside of assigned slots. See more at https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/transportation-during-pandemic_en.

[2] The analysis focuses on the immediate impact of the pandemic, Q2-Q3 2020, and does not capture any subsequent v-shaped recoveries or surges in exports experienced by some countries, such as those documented in OECD (2021[29]).

[3] Fixed input-output coefficients do not necessarily capture the substitution effects of alternative sources of inputs, whether these be imports from different countries, or domestic sources replacing imports. Further, some of the COVID-19 shifts in demand (e.g. IT goods at home versus IT equipment used in the office) are likely to be too granular to be accounted for by the industry levels in the input-output framework used for this analysis.

[4] Air transport, airports and aircraft manufacturing are sometimes jointly referred to as the “aviation industry”; see for example OECD (2020[17]).

[5] It should be noted that not all measures are in the domain of governments, as most decisions are taken at the micro level, by individual firms. Governments can, however, play a role in promoting more diverse supply chains by easing regulations and fostering trade more generally. In addition to these broad measures, they can establish direct co-operation networks with and among firms, as laid out in OECD (2020[1]).

7 Inclusiveness across gender and skill groups

This chapter analyses short- and long-term channels through which the pandemic can affect inclusiveness due to differences in its impact on employment opportunities, both between men and women, and among workers with varying levels and types of skills and education. The chapter first describes ways in which women have been impacted differently than men, thereby potentially exacerbating gender inequality. It outlines contributing factors such as job and industry types, childcare obligations, and digital skills. This chapter then focuses directly on skills, exploring how the skill and education levels of workers contribute to heterogeneous effects. Workers in the middle of the skill distribution, whose jobs were already more at risk from pre-existing trends such as automation, appear to also be more exposed to the employment effects of the COVID-19 crisis. Differentiating further between different types of skills, digital skills are highlighted as being particularly important for preventing job loss.

Key findings

- **Essential industries rely disproportionately on women, shielding them from employment loss over the short term, and making their contribution to the workforce critical. Still, closures of school and childcare centres force women to drop out of the labour force** to take on unpaid care work, jeopardising progress made towards gender equality in the labour market. Opening childcare facilities and fostering a more equal division of unpaid home and care work should therefore be a policy priority for the COVID-19 recovery period.
- **The digital acceleration poses a threat to the employment of women over the longer term**. While women tend to work in industries that are less sensitive to recessionary demand drops, the rapid uptake of digital technologies in the pandemic, as well as trends in automation, might put female employment at risk going forward. This highlights the strong need for information and communication technology (ICT) upskilling and closing the digital gender gap.
- **Ensuring ICT skills for all is crucial for weathering the crisis, and success beyond it**. The top 11 industries that entail the highest ICT or digital skill levels used on the job are either teleworkable or essential. The industry-level analysis in this chapter highlights the importance of ICT skills for successfully making it through the crisis, but also points to laggard sectors where the average ICT skill level of the workforce is comparatively low, or where firms do not demand these types of skills. Raising the digital skills of the workforce in some of these industries – in particular those with potential for remote or contactless work and delivery of services – could help increase resilience in the future.
- **Workers with mid-level education and skills are particularly at risk of losing their jobs**, and policy should encourage upskilling and career changes. The crisis increased firms' incentives to digitalise, and automate production. Allowing workers in industries and occupations that were already at risk before the crisis to change careers and acquire new skills, rather than upgrading their job-specific human capital, can help keep people employed. It will also help accelerate structural change and labour market reallocation, which will foster an efficient and speedy recovery.

Introduction

One of the most important concerns about the crisis is its heterogeneous impact on employment outcomes across different groups in society – with potentially adverse consequences in terms of inequality. Two salient dimensions in which differential short-term impacts are observed across population groups are gender and skills.

The labour market participation of women remains a substantial concern in most OECD countries. Analysis of micro data from several national labour force surveys shows that, in most countries, the pandemic triggered what is being called a "shecession" – a recession causing larger employment declines among women than men (Alon et al., 2021[1]). Women are impacted differently than men in several ways, with evidence pointing to a "substantial and persistent drop in their labour force participation" (Albanesi and Kim, 2021[2]). Women are particularly adversely affected by the closures of schools and childcare facilities, as they still shoulder most of the childcare responsibilities within households – spending more than twice as much time on them as men (OECD, 2020[3]). Women also represent the majority of health and care workers, making their work essential during the crisis, and somewhat shielding them from job loss; although, this also means a disproportionate burden in terms of high-risk labour during a pandemic. Many women also work in retail and hospitality, which are being hit particularly hard by lockdowns and restrictions on travel and tourism, resulting in drops in demand for these occupations. In addition, some of these industries often use temporary forms of employment, which can make it more difficult for workers to benefit from employment retention schemes or other types of support linked to employment status.

Skills are another important dimension affecting how people are impacted. For example, jobs with high potential to shift to telework are mainly held by high-skilled workers (Espinoza and Reznikova, 2020[4]). To the extent that lower-skilled workers are employed more often in non-standard forms of employment (on temporary contracts and through agencies, but also via self-employment), they are also not always well covered by firm-level schemes that support jobs and incomes (OECD, 2020[5]).

Longer-term consequences of the crisis, including changes in demand, are likely to also have differential effects by gender and skill. In particular, as telework continues to be an important tool in preventing the spread of the virus, differential propensities in the ability to telework across different worker groups can affect longer-term labour market outcomes (e.g. through accumulated tenure and labour market experience). As the immediate health crisis abates, longer-term recessionary effects and structural changes in demand stemming from possible long-term changes in behaviour, induced by the crisis (e.g. a long-term move to more telework, as discussed in Chapter 5), have the potential to exacerbate or mitigate divergences that have emerged through the crisis.

This chapter complements existing OECD work (OECD, 2020[3]; 2020[6]; 2020[7]) by exploring the gender and skill dimensions of the COVID-19 crisis from an industry perspective, comparing the share of female and low-skill (and low-education) workers in each industry with indicators of potential economic impact. For each of the two dimensions, the analysis focuses first on an indicator that captures mainly short-term restrictions on the supply side, as a measure of whether employment opportunities – across essential, teleworkable,[1] and non-teleworkable industries.

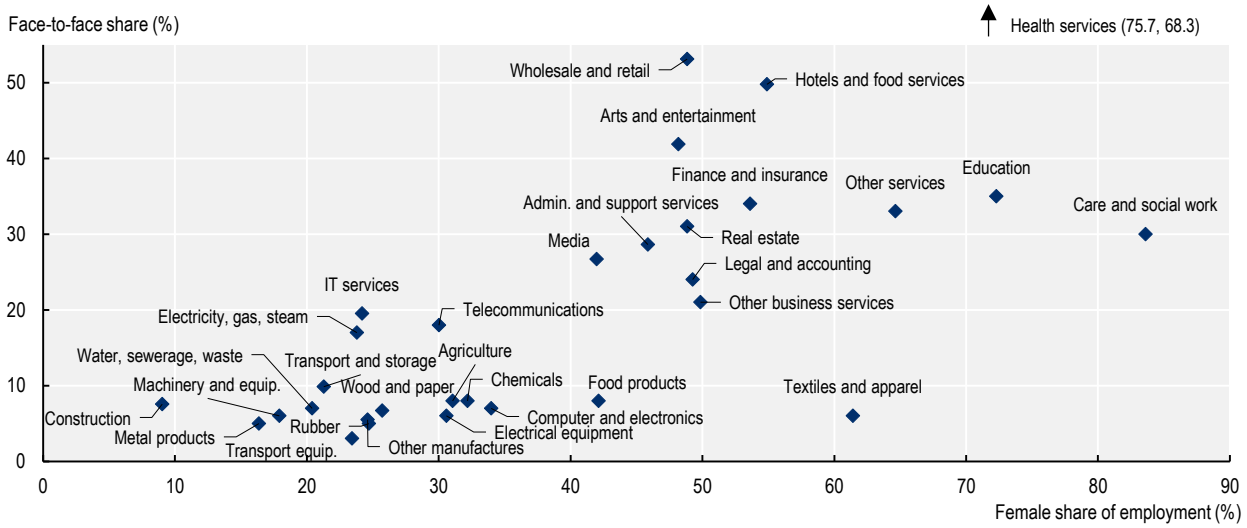
Gender differences in exposure to employment effects

Figure 7.1 displays the female share of employment against the share of employment in jobs that – under normal circumstances – involve regular face-to-face contact with customers. It is striking that several of the most female-dominated industries are also those in which significant in-person contact is required. Most notably, women make up at least 70% of the workforce in health and long-term care (as discussed more in depth in OECD (2020[3])). From a health perspective, this means that women face greater risks when doing their job than men. From a job security perspective, however, it seems as though female employment might be more shielded from the negative employment effects of the COVID-19 crisis, as the three industries with the highest shares of women are either deemed as essential (Care and social work, and Health services) or have continued operating via remote learning (Education).

The exposure of female employment in different industries, discussed in the following analysis, also shows that women tend to work in service industries (most importantly, the retail and hospitality sectors) that have been heavily affected by the pandemic and associated containment measures, and in certain essential industries that had greater job security during the pandemic. This suggests that their employment has been affected heterogeneously over the short term. The longer-term economic impact of the crisis might look different: due to high employment shares in essential and domestic service industries, female employment is potentially safer from longer-term recessionary effects.

While representing the majority of the essential workforce during the pandemic, women have simultaneously been facing additional childcare responsibilities, due to closures of childcare facilities and schools. Women with young children have therefore faced additional burdens in terms of both paid and unpaid work. However, their jobs are fundamental for maintaining basic functions in the health system and other parts of the economy, making their contribution to the workforce critical. Further, as women drop out of the labour force to take on more unpaid work, progress made towards gender equality in the labour market before the crisis is jeopardised, in terms of both participation and career prospects. Mothers dropping out of the labour force is a concern particularly in countries relying heavily on public childcare.

Figure 7.1. Share of women and share of jobs involving regular face-to-face contact by industry



Note: Female share of employment is the cross-country (unweighted) average of female labour share by industry in 2019, for 20 European countries and the United States. "Face-to-face share" indicates the share of jobs in each industry that involve face-to-face contact with customers. A job is defined as involving face-to-face contact if the job includes tasks such as dealing with external customers, assisting and caring for others, or providing consultation and advice to others, and face-to-face communication occurs at least several times a week. Indicators are constructed by matching the tasks associated with different occupations in O*NET, then matching these to the occupation structure of NAICS17 three-digit industries using the US Bureau of Labour Statistics industry-occupation matrix for February 2020. Koren and Petö's three-digit industry-level measures have been aggregated to SNA A38 industries to match the book definition. The reported Agriculture industry does not include Agriculture, but does include Forestry and logging; Fishing, hunting and trapping; and Services to agriculture. Three A38 industries could not be matched to the three-digit NAICS information: Pharmaceuticals, Scientific R&D, Public administration and defence, as in Figure 3.5.
Sources: Measures from Koren and Petö (2020[8]), "Business disruptions from social distancing", https://cepr.org/file/9913/download?token=xJlvOgjM aggregated to A38 industry classification for the face-to-share share; OECD calculations based on European Labour Force Surveys and United States Current Population Survey for the female share of employment (accessed in October 2020).

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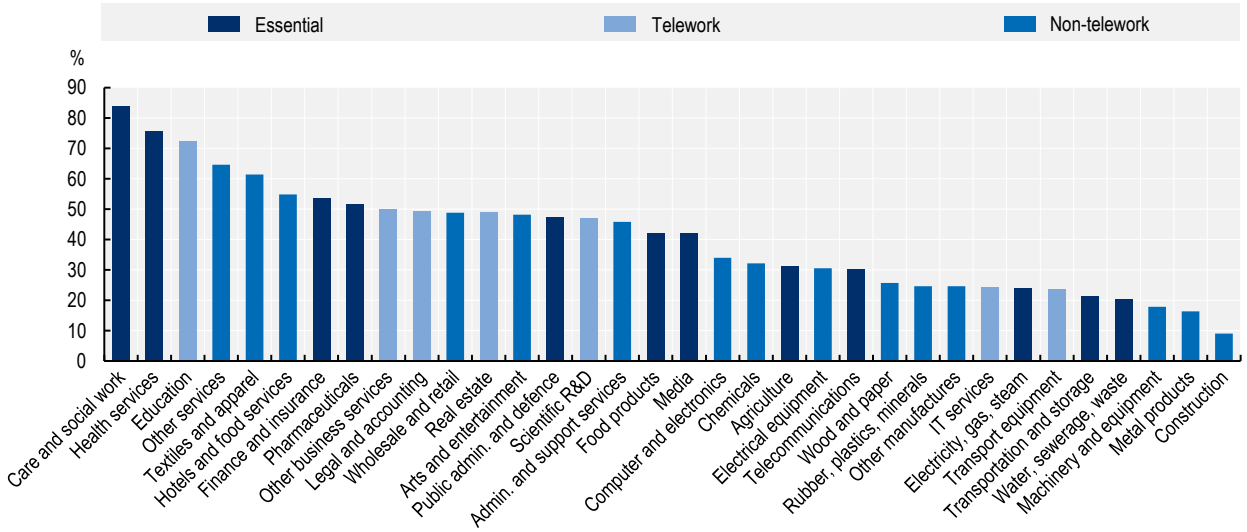
Potential labour demand impacts

Figure 7.2 shows the share of women employed in each industry, with bars colour-coded according to the classification into essential, non-essential but teleworkable, and non-essential and non-teleworkable industries. While no clear picture emerges from this simple comparison of industries, it is also important to consider that some of these industries (such as Wholesale and retail, but also Education, Health services, and Care and social work) are much larger than others (such as many of the male-dominated specialised manufacturing industries), as shown in Annex B. Taking the size of industries *within* the three broad groupings (essential, non-essential but teleworkable, and non-essential and non-teleworkable) into account, averages weighted by industry employment[2] show that female employment shares are lowest in non-essential, non-teleworkable industries (38.5%), followed by non-essential, teleworkable industries (50.5%), and are indeed highest in the essential industries, where women account for 56.9% of employment on average.[3]

When considering the absolute numbers of women affected across these three groupings, most women (41%) work in non-essential, non-teleworkable industries. This is driven by the large size of the retail sector, in which half the workforce is female and which accounts for more than 14% of total private sector employment on average, in OECD countries. Essential industries employ another 38% of all female workers. The remaining 20% are employed in non-essential, teleworkable industries. Given that a large proportion of retail businesses were permitted to stay open in most countries during lockdowns, due to being deemed essential (e.g. supermarkets and food stores such as bakeries and butchers), and that in many countries several other retailer types were allowed to operate during further phases of containment measures (although often only with hygiene and capacity protocols), the direct employment effects on

these industries are likely to be more varied than for those that are non-essential and non-teleworkable. In fact, there is evidence that working hours might have increased more for women than for men (Givord and Silhol, 2020[9]), due to heightened demand for work in some female-dominated industries (including not only Care and health services, but also Education and parts of Retail).

Figure 7.2. Share of women by industry



Note: Female share of employment is the cross-country (unweighted) average of female labour share by industry in 2019, for 20 European countries and the United States.
Sources: Espinoza and Reznikova (2020[4]), "Who can log in? The importance of skills for the feasibility of teleworking arrangements across OECD countries", https://doi.org/10.1787/3f115a10-en for teleworkability; OECD calculations based on European Labour Force Surveys and United States Current Population Survey for the female share of employment (accessed in October 2020).
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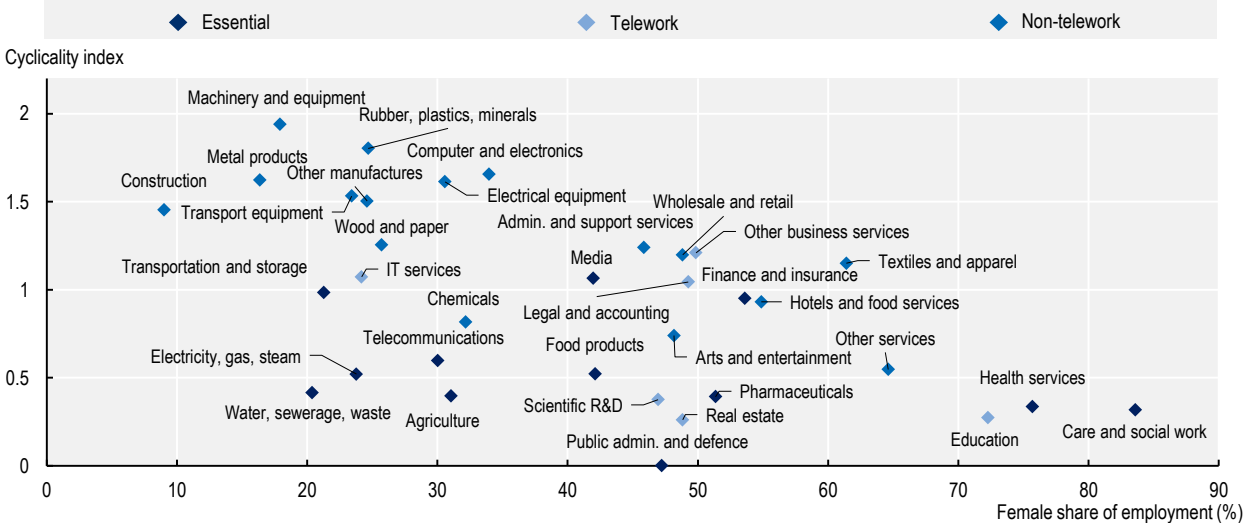
Figure 7.3. Share of women and cyclicality of demand by industry



Note: Female share of employment is the cross-country (unweighted) average of female labour share by industry in 2019, for 20 European countries and the United States. See note to Figure 3.5 for details on cyclicality index.
Sources: OECD calculations based on European Labour Force Surveys and United States Current Population Survey for the female share of employment, based on OECD (2020[10]), *Structural Analysis (STAN)* Database, http://oe.cd/stan for the cyclicality index (accessed in October 2020).
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Because relatively more women than men are employed in essential industries, which almost by definition entail a relatively low elasticity of demand, female-dominated industries might also be less at risk of long-term declines in demand. Figure 7.3 investigates this graphically, plotting the degree of cyclicality of industries (introduced in Chapter 3) against the female share of employment. There is a clearly discernible negative relationship between the degree of cyclicality and the share of female workers, driven by three essential industries: Health services, Education, and Care and social work. Several of the industries with the lowest cyclicality of demand (Public administration and defence, Real estate, Scientific R&D) are also easily teleworkable. An important consideration, however, is that until the health crisis is over, many of the service activities that require face-to-face contact (e.g. Hotels and food services), in which women have disproportionally high employment shares will not be able to resume. Because of this, the stabilising effect of domestic household demand on female employment will strongly depend on the evolution of the pandemic and the strategies of governments to deal with the health crisis. In addition, for some of these activities, employers may decide to switch to automated solutions (Chernoff and Warman, 2020[11]), putting employment in these sectors at risk despite their traditional resilience to business cycle fluctuations.

Factors affecting female labour supply: Household demographic structure and childcare

Concluding that women's employment is more resilient in the crisis rests on the assumption that women can maintain their labour supply through the crisis and its aftermath. Several features are relevant to understand how well the workforce is able to adjust to the challenges posed by the COVID-19 crisis and maintain labour supply at pre-crisis levels, either through telework or continued activity in essential industries. The closure of schools and childcare facilities during lockdowns represents one such challenge that particularly affects working parents, who need to adjust their daily schedules to accommodate both work and childcare obligations.

Especially with regards to telework, women, much more than men, face multiple demands throughout the crisis, particularly in terms of caring for children (but also other vulnerable relatives), which might prevent them from participating in the labour market to the same extent or intensity as before the crisis. Following the school and childcare facility closures through the first wave – and, to a lesser degree, also further waves – of the pandemic, subsequent sections explore the patterns of intra-household division of labour, childcare arrangements, and working-time arrangements. They highlight differences that exist across countries in these dimensions, which are important determinants of female labour supply.

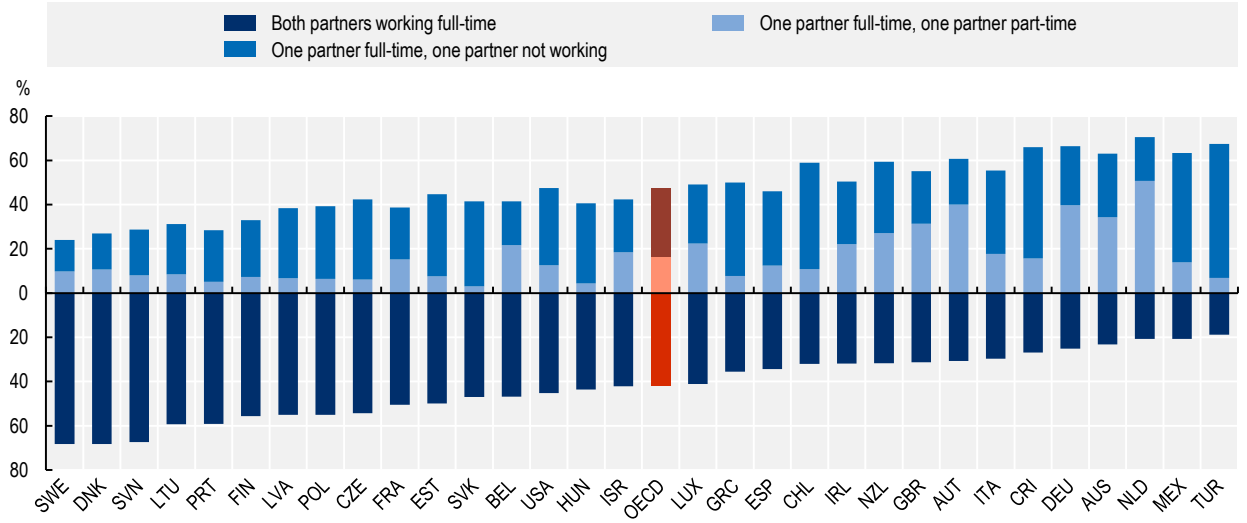
It should also be noted that while the closure of schools and childcare facilities may have been temporary, and has been avoided by many countries during later waves of the pandemic, quarantine rules at schools continue to force parents to care for their children at home, with few alternatives given that the nature of quarantine itself prohibits other forms of private arrangements for childcare.[4]

Countries in which households with children follow a more traditional division of labour (i.e. one partner working full-time and the other staying at home, all or most of the time) are likely to adjust more easily to this situation. Conversely, in economies with a more widespread use of childcare facilities, workers with small children face larger disruptions in their daily routines when these facilities suddenly become unavailable. Given that the majority of childcare is still provided by mothers (OECD, 2020[3]), this will likely disproportionately affect women's time availability, also for work purposes.

A third factor relevant to childcare is household and family structure. In countries with traditionally larger households, families will likely find it easier to cope with additional childcare responsibilities during the crisis, as duties can be divided between more members of the household. Countries in which smaller or single-parent households are more widespread may face greater challenges in reconciling work and childcare responsibilities.[5]

To capture the different facets related to the structure of families and childcare, the following graphs show the distribution of work in couple households with one or more children under the age of 14, the percentage of young children (0-2 years old) enrolled in childcare, and the percentage of children (6-11 years old) living with a single parent.

Figure 7.4. Distribution of work in couple households with at least one child under 14 years old



Note: Data refer to 2014 except for Denmark, Finland and Sweden (2012), and Chile, Germany and Turkey (2013). The definition of part-time employment varies slightly across countries (for details, consult the original source).For the United States, the data refer to children aged 0-17. Average refers to the unweighted average across the OECD reported countries.
Source: OECD (2020[12]), *Family Database*, www.oecd.org/els/family/database.htm (accessed in June 2020).

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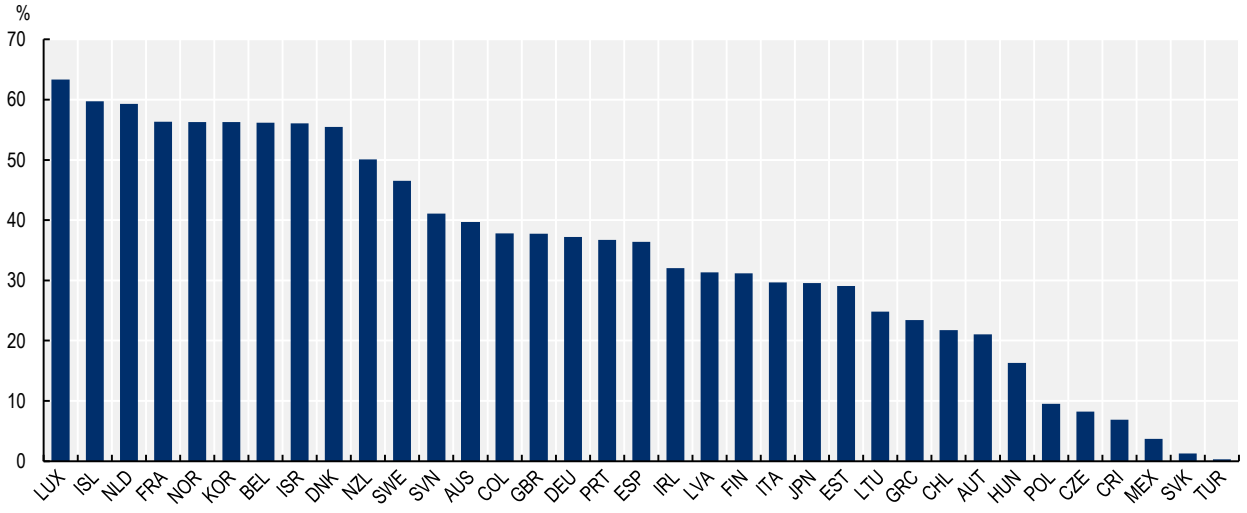
Figure 7.5. Percentage of children 0-2 years old in early childhood education and care services



Note: Data refer to 2017 except for the United States (2011) and Switzerland (2014). Data generally include children enrolled in early childhood education services (ISCED 2011 level 0) and other registered ECEC services, with the exception of a few countries as listed in the original data source.
Source: OECD (2020[13]), "Enrolment rate in early childhood education (indicator)", https://doi.org/10.1787/ce02d0f9-en (accessed on 26 June 2020).

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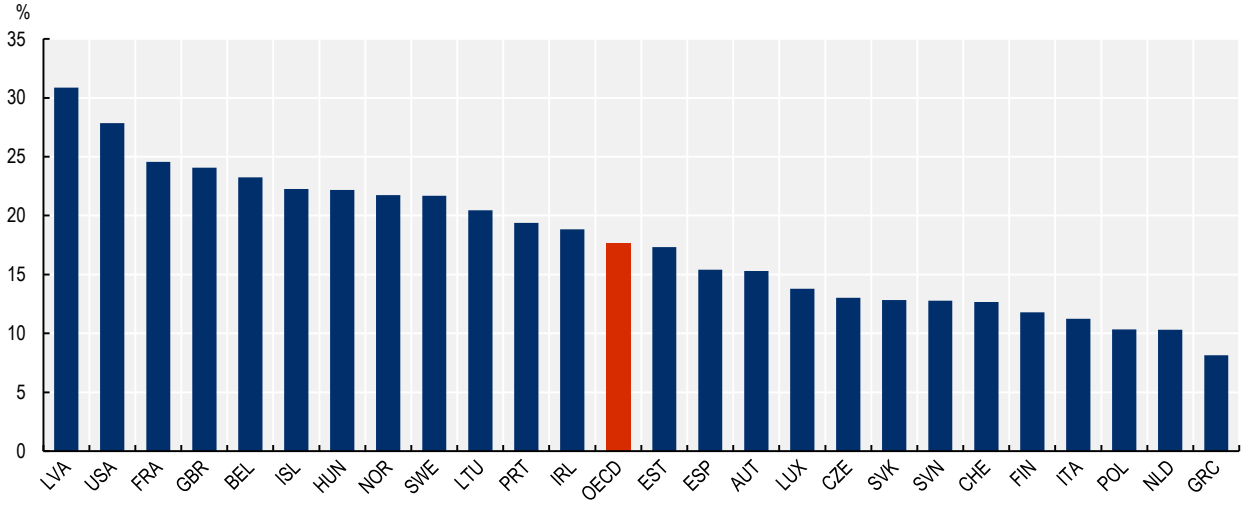
While the three indicators cover inherently related aspects of the same topic, and there is a certain degree of overlap in country rankings, some interesting differences nevertheless emerge among countries. For example, the Netherlands is among the top three childcare facility users, with almost 60% of infants and children under the age of two enrolled in early education and childcare facilities. While this would suggest that closures of care centres may be particularly challenging for parents in the Netherlands, the country also has one of the lowest proportions of children living in single-parent households (slightly over 10%) and a high proportion of couple households with children where at least one partner works only part-time

(over 70%). This suggests that households in the Netherlands might be able to cope better with school and day care centre closures than countries ranking in the middle of most indicators, such as Belgium, which has a relatively high share of single-parent households (23%), alongside a relatively high share of early education and childcare facility use (over 55%), and a low share of households in which one parent is not working (around 10%).

Figure 7.6. Percentage of children 6-11 years old living with a single parent



Note: Data refer to 2016 except for Iceland (2015). Average refers to the unweighted average across the reported countries.
Source: OECD calculations based on OECD (2020[12]), *Family Database*, www.oecd.org/els/family/database.htm (accessed in June 2020).
StatLink https://doi.org/10.1787/888934261992

Of course, these numbers can merely give a rough indication, as a fraction of households will not face a trade-off between work and childcare if one or both parents are working in sectors affected by the lockdowns that are non-essential and not teleworkable. It is also possible that the crisis can lead to a reversal of traditional roles in some couple households, with men taking over more childcare responsibilities if the woman works in an essential (or teleworkable) industry and the man does not (Alon et al., 2020[14]). This, however, appears to be the exception rather than the norm; a study using timely data during the crisis (Eurofound, 2020[15]) finds that, on average, the unequal burden on women of care work continues; among individuals with children who report working from home, women spend around one hour more per day on unpaid household work.

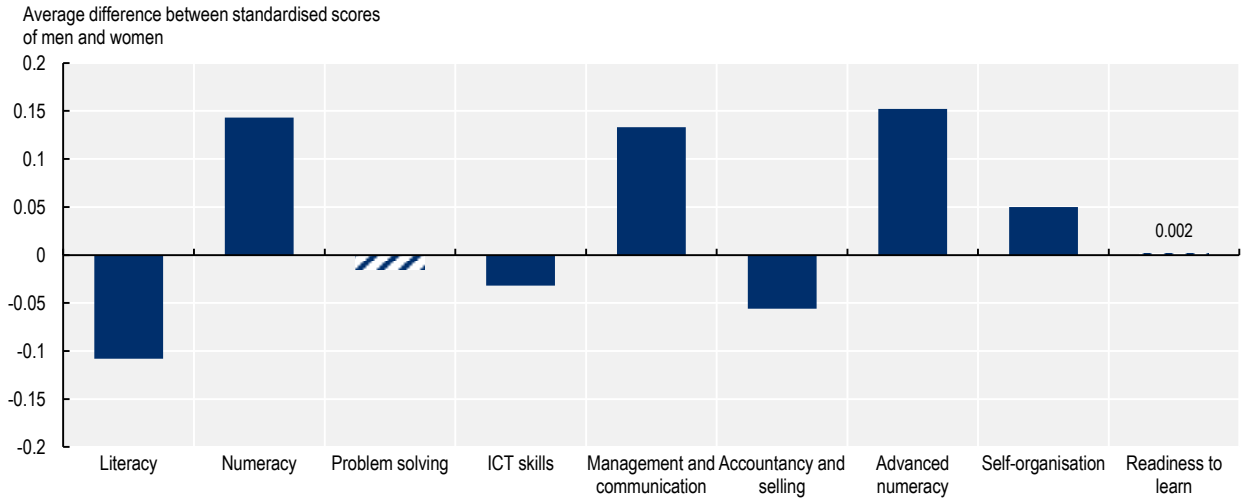
Importantly, the absence of women from their jobs may have long-term consequences for workforce gender equality, as levels of accumulated work experience are an important determinant of wages and promotions. Returns to experience tend to be higher in industries employing more women: they are higher in services than manufacturing, and higher in manufacturing than agriculture (Islam et al., 2018[16]). Absence from work because of COVID-19 related reasons may therefore exacerbate the already disadvantaged position of women.

Women also went into the pandemic at a disadvantage in terms of specific skills which seem to be particularly relevant for bridging the crisis, such as technical skills for telework. Using skill-related indicators (Grundke et al., 2017[17]; OECD, 2018[18]),[6] Figure 7.7 shows that men generally have higher levels of the skills that entail extra wage premia in digital intensive industries relative to women. Across countries, industries, occupations, men – on average – have higher numeracy and advanced numeracy skills, as well as higher task-based self-organisation and management, and communication skills.

Women, on average, already had lower levels of some of the skills needed for the digital era[7] before the pandemic. These divides, as well as other pre-existing inequalities between men and women (such as the gender wage gap), are likely to be exacerbated by the COVID-19 crisis, which has both accelerated the digital transformation and impacted female labour market participation. Further, since especially skills related

to management and communication, and self-organisation, are acquired and improved through learning-by-doing and experience, the gender skill gap is at risk of widening if women are given less opportunity to work in such roles and perform these tasks during and after the pandemic.

Figure 7.7. Differences in skill scores between men and women



Note: Differences in standardised skill scores between men and women are conditional on the covariates from the wage regressions (which include age and education of the individual; country-, industry-, and occupation effects; firm size and part-time status). The skill measures are taken from Grundke et al. (2017[17]). For each skill variable, OLS regressions of workers' skill endowment on the covariates from the wage regressions are estimated on the pooled set of 31 countries for which PIAAC data was available. For each of these regressions, the bars show the coefficients of the "male" variable, which takes value 1 if the individual is male and 0 if female. Shaded bars signal that differences between men and women are not significant at the 5% level. Bars above the x-axis reflect skills that men are relatively more endowed with; bars below the x-axis show skills that women are relatively more endowed with.

Source: OECD (2018[18]), *Bridging the Digital Gender Divide: Include, Upskill, Innovate*, www.oecd.org/digital/bridging-the-digital-gender-divide.pdf.

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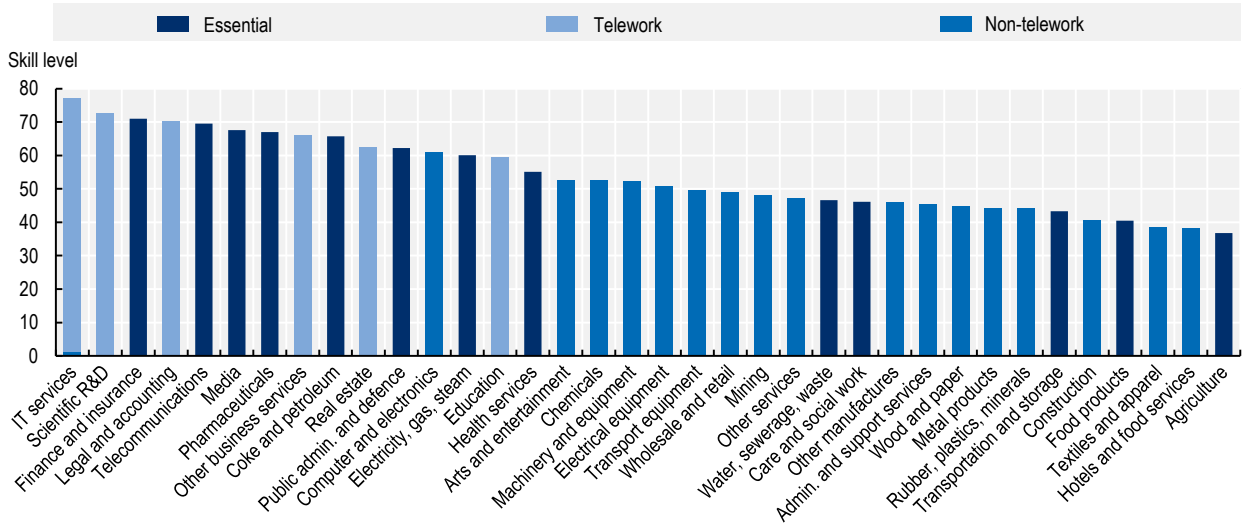
As discussed in detail in Chapter 5, the COVID pandemic has triggered an acceleration of the digital transformation of economies and societies. While this may in itself be good news, women display a relative shortage of skills that are considered particularly important for the digital era. Combined with the perceived "masculinity" of technologies,[8] and the fact that some women and girls feel insecure and at times aggressed in the digital space (OECD, 2019[19]),[9] these factors raise concerns about the erosion of female workers', citizens', and consumers' rights, and opportunities both during and after the COVID pandemic.[10] From a longer-term perspective, while job loss due to the pandemic and the lasting impact it is likely to have on labour demand patterns is certainly bad news for all workers, being made redundant may be especially detrimental to women. Given the gender gap in digital skills, finding a new and possibly different job may turn out to be more challenging for women than for men. OECD estimates (OECD, 2019[19]) suggest that, on average, women need to bridge greater skills shortages – and hence undergo more training – to move to another occupation, than men do. The following section will investigate the role of skills for coping with the possible short- and long-term impacts of the pandemic.

Skills and education differences in exposure to employment effects

Another salient dimension along which impacts of the COVID-19 crisis differ is skills and educational background. ICT skills in particular determine how well workers are able to adjust to remote organisation of their work, and the extent to which employers can rely on their workforce being able to efficiently work remotely. Recent OECD work (Andrieu et al., 2020[20]) using real-time data on job vacancy postings in the

United Kingdom also points towards the longer-term importance of digital skills, which were in demand throughout the crisis, but accelerated especially towards the end of the observation period in September 2020.

Figure 7.8. Average ICT skill level by industry



Note: Skill levels are scaled to range from a minimum of 0 to a maximum of 100. The ICT skills indicator consists of a number of different self-reported tasks carried out on the job in a sample of workers in each industry: frequencies of excel use, programming language use, transactions through internet (banking, selling/buying), email use, simple internet use, word use, real-time discussions through ICT computers, reading/writing letters, emails or memos, level of computer use required for the job, and frequency of working physically over long periods.
Source: Cammeraat, Samek and Squicciarini (2021[21]), "Management, Skills and Productivity", https://doi.org/10.1787/007f399e-en, with estimates of the task-based skill indicators constructed following Grundke et al. (2017[17]), "Skills and global value chains: A characterisation", https://doi.org/10.1787/cdb5de9b-en.

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As shown in Figure 7.8, the top 11 industries in terms of ICT skill levels used on the job are all either teleworkable (top 4) or essential. This underlines the importance of ICT skills for successfully making it through the crisis, but also points to laggard sectors where the average ICT skill level of the workforce is comparatively low, or where firms do not demand these types of skills. Raising the digital skills of the workforce in some of these industries – in particular those with potential for remote organisation of work or remote and/or contactless delivery of services – could help increase resilience in the future. As discussed above, these industries also have particularly low shares of female employees. Raising the digital skills of women in particular could yield a double dividend by reducing both the gender gap and the skills gap, aiding in the recovery phase as well as resilience in the future.

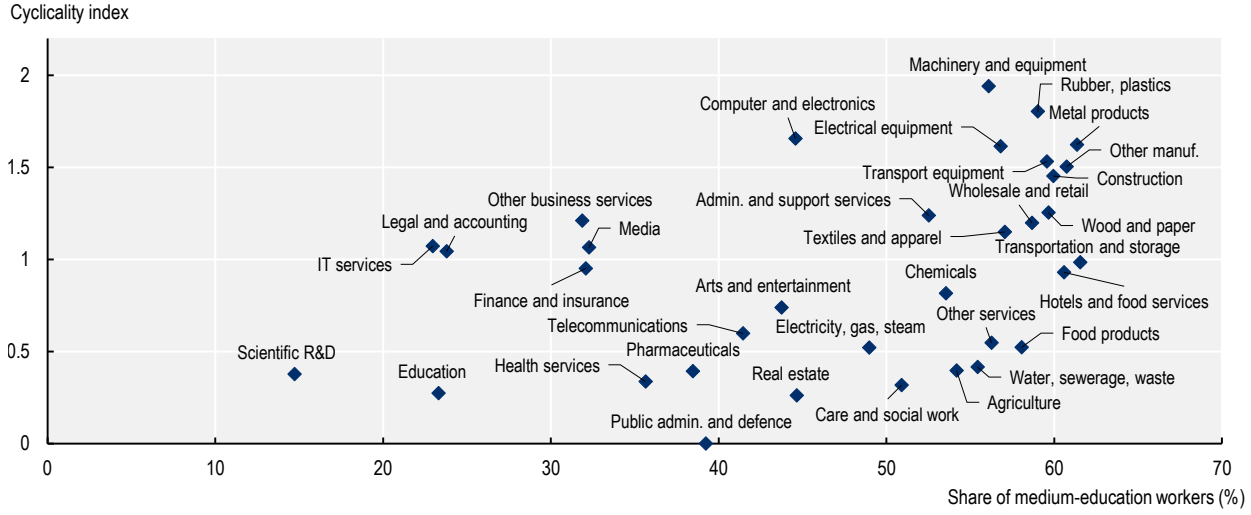
Looking at other types of skills, the picture changes to some extent. Numeracy skills are much more evenly distributed across sectors, with an average level – using the same scale as the above figure – of 52 in non-essential, non-teleworkable industries, 53 in essential industries, and 57 in teleworkable industries. Readiness to learn and creative problem solving[11] is equally similar across sector groups, with an average of 49 in non-teleworkable industries, 50 in essential industries, and 56 in teleworkable industries. This suggests that these broader types of general skills do not, from an industry perspective, represent a relevant dimension across which impacts of the crisis differ to a large extent.

Focusing on skill types as well as skill levels, recent research using data from job postings in the United Kingdom (Andrieu et al., 2020[20]), shows that medium-skilled workers experienced the most pronounced decline in posted vacancies during the crisis. Considering educational background instead of skills, empirical analysis at the industry level confirms this pattern for both the short- and the long-term measure of exposure to the crisis: Workers with low levels of education (defined here as lower secondary education

or less) make up 18% of the workforce in non-essential, non-teleworkable industries, 13% in essential industries, and only 5% in teleworkable industries. Workers with medium levels of education (higher than lower secondary but below tertiary) represent the largest share of the workforce. They account for 58%, 46%, and 25% of workers in non-essential, essential, and teleworkable industries, respectively. Highly educated workers (tertiary education or higher) are the mirror image of the other two groups, with shares of 25%, 41%, and 71% of workers in non-essential, essential, and teleworkable industries, respectively.[12]

Figure 7.9 depicts the correlation of the industry share of medium-educated workers with the cyclicality of demand index. The clearly positive relationship, with a correlation of 0.4, suggests that medium-education workers are particularly at risk of losing their employment over the medium term, as the recession following the health crisis unfolds. Low-education workers also tend to work more in industries that are more sensitive to the business cycle, but the relationship is weaker (correlation of 0.2) and this group also represents a smaller fraction of overall workers. Highly educated workers, on the other hand, tend to work relatively more in anticyclical industries, indicating that they are relatively more shielded from the longer-term impacts of the crisis.

Figure 7.9. Cyclicality of demand and share of medium-education workers by industry



Note: See note to Figure 3.8 for details on cyclicality index.
Sources: OECD calculations based on European Labour Force Surveys and United States Current Population Survey for the share of employment with medium education; and based on OECD (2020[10]), *Structural Analysis Database (STAN) Database*, http://oe.cd/stan for the cyclicality index (accessed in October 2020).

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The overall image arising from the analysis on skills is that the workers most at risk of being displaced over the short and long term from the economic impacts of the crisis are those in the middle of the skill – and consequently the wage – distribution. In this sense, the crisis is once again an accelerator of already existing pre-crisis trends, where precisely this group of workers had already been identified as being most at risk of losing their jobs, due to advances in automation and digitalisation. At the firm level, for example, the crisis is accelerating firms' incentives to automate production, in view of minimising the negative effects of further COVID-19 waves, or of future pandemics (Chernoff and Warman, 2020[11]).

A second key insight is that ICT and digital skills are a key dimension separating winners and losers of the crisis. This is true in both the short and long term. On the one hand, familiarity with the technology to telework has been crucial for maintaining labour supply through the crisis. On the other hand, longer-term trends in digitalisation – not only on the labour market, but in many other aspects of everyday life, as discussed in Chapter 5 – make digital readiness a key skill ensuring inclusiveness and participation in society more generally.

Conclusion and policy implications

In view of the differential effects the crisis is likely to have on female employment – not least through the additional burdens women face in terms of unpaid household and care work – it is crucial that immediate support as well as recovery measures incorporate a gender perspective, as highlighted in a number of gender-focused works on COVID-19 (OECD, 2020[3]; 2020[6]; 2020[7]; 2020[22]).[13] The industry-based analysis conducted in this chapter corroborates this view. Besides focusing on the immediate crisis period, it adds a longer-term perspective, highlighting the important role of ICT skills for increasing the resilience of female employment to shocks such as COVID-19.

Even when the demand for female employment has remained stable for women employed in essential or teleworkable industries, upholding labour supply can be an additional challenge due to the closure of schools and day care centres. Special consideration and financial support should be granted to self-employed single parents, and in particular female entrepreneurs, who were unable to work due to childcare obligations. Prioritising the re-opening of childcare services during lockdowns, and the provision of affordable and universal childcare during the recovery, are important to keep the disruptions on the labour supply of mothers and fathers as small as possible.

In parallel, it is important to foster a more gender-equal division of unpaid home and care work – for example through incentives at the firm level (e.g. through well-paid parental leave for fathers, or offering more flexible working-time arrangements) – as well as removing disincentives such as excessive overtime, and those inherent in the tax structure for second earners[14] (OECD, 2020[7]). More generally, these measures should be part of a broader strategy for fighting stereotypes about gender roles and the type of tasks women should perform (both in their careers as well as at home), complemented by policies fostering women's participation in labour markets.

Support policies targeting working parents should take into account not only periods of mandatory school closures, but also periods of reduced working hours due to quarantines of children or other care obligations. When providing emergency childcare facilities, these could be extended to women in non-essential jobs who are unable to continue working due to childcare obligations. Supporting female employment through the crisis not only provides short-term economic relief for affected women, but also has long-term implications for gender equality on the labour market. Similarly, while enabling female labour market participation, both during and after the crisis, is an important goal in its own right, it is also crucial in order to preserve job matches – thereby improving firm performance, resource allocation and overall efficiency in the long run – and to contribute to a stronger economic recovery.

In terms of direct immediate support measures introduced during the crisis, employment support schemes that do not cover atypical forms of employment, such as temporary or agency work, self-employment, or – especially important from a gender perspective – part-time work, risk deepening pre-existing inequalities across worker groups that were already in more precarious forms of employment before the crisis. It is therefore crucial to extend employment retention and furlough schemes to these types of workers, as already done by a number of countries (OECD, 2020[5]).

The ICT and digital skills gap impacts inclusiveness and employment disparity, including along the gender dimension, and analysis shows that during the crisis this divide has become even more significant. This finding underscores the strong need for digital upskilling, especially for low-skilled workers and women, as well as older parts of the population, who lag behind the most in terms of basic digital knowledge. Closing the digital gender divide should also be a priority to ensure women in teleworkable jobs can continue to work, especially given that many firms are likely to keep some form of telework arrangements even after the crisis subsides.

While sustaining the jobs of those who are unable to work due to restrictions on economic activity is important, this crisis can also be taken as an opportunity to offer training, skill upgrading, or fully-fledged occupational changes to workers whose jobs are at risk over the longer term. Allowing workers in industries

and occupations that were already at risk before the crisis – for example, due to pre-existing trends in automation – to change careers and acquire new skills, rather than upgrading their job-specific human capital, can also help accelerate structural change and efficient labour market reallocation. Accompanying measures can include fostering mobility, reducing regulatory barriers on occupational licensing, and promoting firm entry and business dynamism more generally, through the policy options discussed in Chapter 4.

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Notes

[1] "Teleworkable" and "teleworkability" are terms used throughout the report to describe jobs and tasks that are able to be done through telework. Originating mainly in the COVID-19 crisis, given extensive literature and research arising from the rapid global uptake of telework, the terms are now of demonstrated accepted and common use in many official documents. As such, they are used within this context in this document.

[2] The cross-country average of employment in each industry, computed from Annex table A B.1, is used for weighting.

[3] Note that data on female employment shares in the Mining and Coke and petroleum industries are not reliable. Due to the small size of these industries, this does not affect the averages (imputed shares between 10% and 50% women yield the same results).

[4] In Germany, for example, over 3 200 schools did not provide presence-based teaching for all pupils in mid-November due to coronavirus precautionary measures (Der Spiegel, 2020[35]).

[5] The vast majority of single parents are still mothers. For example, in the United States in 2016, the share of single fathers was just under 20% (Grall, 2020[29]). In the same year in Germany, the share was even lower, at around 10% (BMFSFJ, 2018[30]).

[6] These encompass workers' cognitive skills, which are assessed through tests in the Survey of Adult Skills (PIAAC), namely literacy, numeracy, and problem solving; as well as indicators of the frequency with which workers perform certain tasks on the job. The latter provide information on some of workers' cognitive abilities, namely ICT-related skills, "Advanced numeracy" STEM skills, and "Accountancy and selling", as well as on non-cognitive skills such as "Managing and communication" and "Self-organisation", and socio-emotional skills like "Readiness to learn and creative problem solving".

[7] Women are generally better endowed with literacy, ICT and accountancy, and selling skills than men, suggesting that women are not short on all the skill dimensions relevant for the digital transformation. See OECD (2018[18]) for more details.

[8] Research indicates that the connection between masculinity and technology (Tiainen and Berki, 2019[24]) is a result of the historical and cultural construction of gender (Wajcman, 1991[28]). Existing studies show that, in girls' minds, technologies are largely male-centric, reinforcing the idea and the social norms defining technologies to be mostly in the range of experience or thought of men (Antonio and Tuffley, 2014[31]; Harding, 1986[27]; Lie, 1995[32]). See OECD (2019[19]) for more details.

[9] A report from the UN Broadband Commission for Digital (2015[25]) finds that close to three quarters of women online have been exposed to some form of cyber violence. Female user of the Internet are also frequently subjected to harassment and hate speech, and experience threats, violence and abuse on social media platforms, often with little accountability. The aim of violence and abuse creates a hostile online environment for women with the goal of shaming, intimidating, degrading, belittling or silencing women (Amnesty International, 2018[26]).

[10] Aggression and violence against women has also potentially increased for women in their homes. Research using emerging information from media coverage and reports from organisations responding to violence against women points to substantial increases in domestic violence during lockdowns (Roesch et al., 2020[33]). A further analysis of 38 articles published between December 2019 and June 2020 suggests that factors that increase women's vulnerabilities to violence were exacerbated during the social distancing and lockdown period (Sánchez et al., 2020[34]).

[11] Similar to the ICT skills indicator, Readiness to learn and creative problem solving consists of a number of different items from the PIAAC survey: "I like to get to the bottom of difficult things", "If I don't understand something, I look for additional information to make it clearer", "When I come across something new, I try to relate it to what I already know", "When I hear or read about new ideas, I try to relate them to real life situations to which they might apply", "I like learning new things", and "I like to figure out how different ideas fit together". The indicator is constructed following Grundke et al. (2017[17]).

[12] In absolute terms, almost two thirds (62.8%) of low-education workers are employed in non-essential and non-teleworkable industries; another third (32.4%) work in essential industries, and less than 5% are employed in teleworkable industries. For medium-education workers, the shares are 22%, 66% and 11.6%, respectively; and for high-education workers they are 10.7%, 63.2%, and 26.1%.

[13] A number of further policy options for improving gender equality are outlined in extensive OECD work on the topic, including in (OECD, 2020[6]; 2020[7]).

[14] Tax structures that imply a disproportionately higher tax burden on second earners – more often women than men – discourage labour market participation of second earners, thereby further exacerbating the pre-existing divides (Harding, Perez-Navarro and Simon, 2020[23]).

Annex A. Industry dashboard

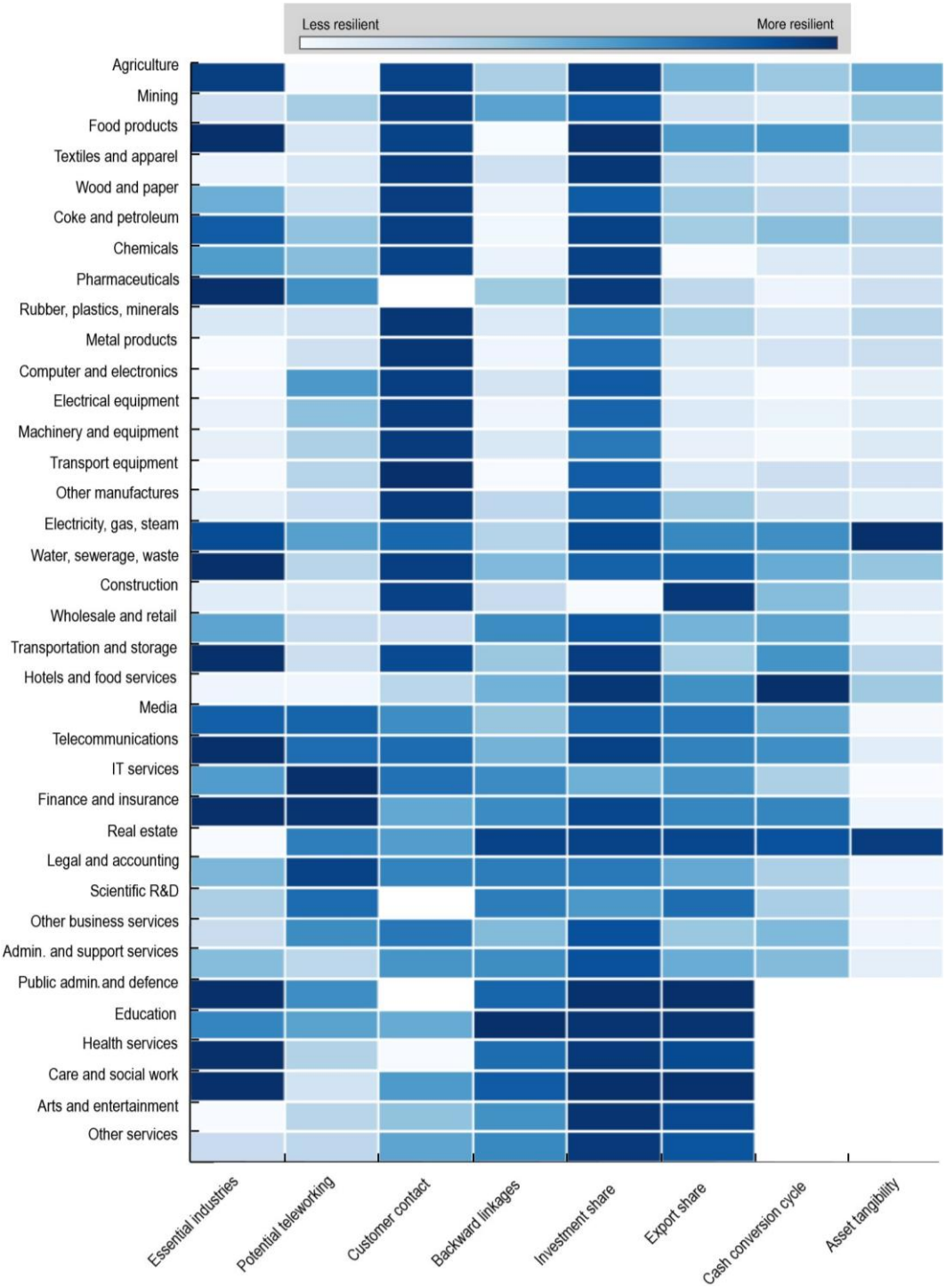
This section organises the different dimensions of resilience across industries set out in Chapter 3, and summarised for reference in Table A A.1 below. While this report deliberately refrains from condensing the different aspects into a single measure of risk for each industry,[1] it is nevertheless interesting to see how each industry or each dimension fares compared to the others. This aids in understanding which dimensions might be most relevant for an industry, and which industries are most vulnerable in a particular dimension. The overview table provided in Annex B, directly after this dashboard, shows the size of each industry by country, allowing policy makers to assess the relative importance of each dimension for individual economies, based on industry size (provided in terms of employment as well as value added).

Table A A.1. Overview of indicators, by affected dimensions

ABILITY TO PRODUCE AND SUPPLY	Essential industry classification	Industry designated as an essential industry, exempt from confinement measures, based on Fana et al. (2020[1])
	Ability to reorganise production remotely	Task-based measure of potential teleworking, based on Espinoza and Reznikova (2020[2])
	Ability to supply products remotely	Share of employment in occupations involving face-to-face contact with customers, based on Koren and Petö (2020[3])
	Potential for supply chain disruption	Hirschman-Rasmussen index of the relative importance of backward supply chain linkages, based on OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio
EXPOSURE TO INDIRECT DEMAND SHOCKS	Exposure to domestic demand fluctuations	Cyclicality of demand based on OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio
	Exposure to foreign demand fluctuations	Share of value added embodied in exports based on OECD (2018[4]), *Inter-Country Input Output* (ICIO) Database, http://oe.cd/icio
FINANCIAL CONSTRAINTS	Short term liquidity risk	Cash conversion cycle based on Orbis
	Longer term borrowing constraints	Share of tangible assets in total assets based on Orbis

Figure A A.1 below provides a colour-coded graphical summary, transforming the dimensions into eight indicators for each industry. The graphical representation enables a comparison across all eight dimensions and 36 industries, with darker colours indicating that a particular industry is potentially more resilient (i.e. it faces a lower risk) in a given dimension. The columns can be interpreted as comparing resilience across industries within a given dimension. Looking across the rows provides an indication of which dimension may be more relevant for each industry's resilience, and also how resilient individual industries might be, given their vulnerability across multiple dimensions.

Figure A A.1. Industry dashboard: Indicators of industry resilience



Note: Comparison of eight indicators of industry resilience to economic impacts of COVID-19. Indicators have been normalised to lie between zero and one based on the minimum and maximum values observed in the industry sample for each indicator. Darker colours show industries that are expected to be relatively more resilient than others with respect to a particular measure. Pure white indicates the minimum (0 by construction), and pure black the maximum (1 by construction), of each indicator. Some indicators are missing because of the lack of suitable data (Customer contact for Pharmaceuticals, Scientific R&D, Public administration and Health; Cash conversion cycle and asset tangibility for Public administration, Education, Health, Social work, Arts and entertainment, and Other services).

Sources: OECD calculations based on Fana et al. (2020[1]), Espinoza and Reznikova (2020[2]), Koren and Petö (2020[3]), OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio and ORBIS.

As discussed in Chapter 3, there are substantial differences across industries in the extent to which they are allowed, and able, to continue operating through the crisis. While the classification of industries into essential and non-essential is binding for industries in which most jobs cannot be done remotely, there are a number of industries with high to medium telework potential which are fully or partially able to continue operating through lockdowns and confinement periods. Therefore, in the short term, industries can be broadly assigned into one of three categories:

- **Essential industries**: continued operation and relatively unaffected by short- and long-term demand fluctuations. Examples: Food production, Pharmaceuticals, Utilities.
- **Non-essential, moderate to high telework potential**: potentially vulnerable to direct and indirect (second-round) demand fluctuations but less affected by supply restrictions. Examples: Education, Media, Real estate.
- **Non-essential, low telework potential**: highly vulnerable to short-term supply and demand restrictions and to long-term changes in demand (e.g. due to changing preferences). Examples: Hotels and food services, Arts and entertainment, Manufacturing industries.

This categorisation serves as a basis for discussion of the different mechanisms relevant to the industries within each group in the following sections.

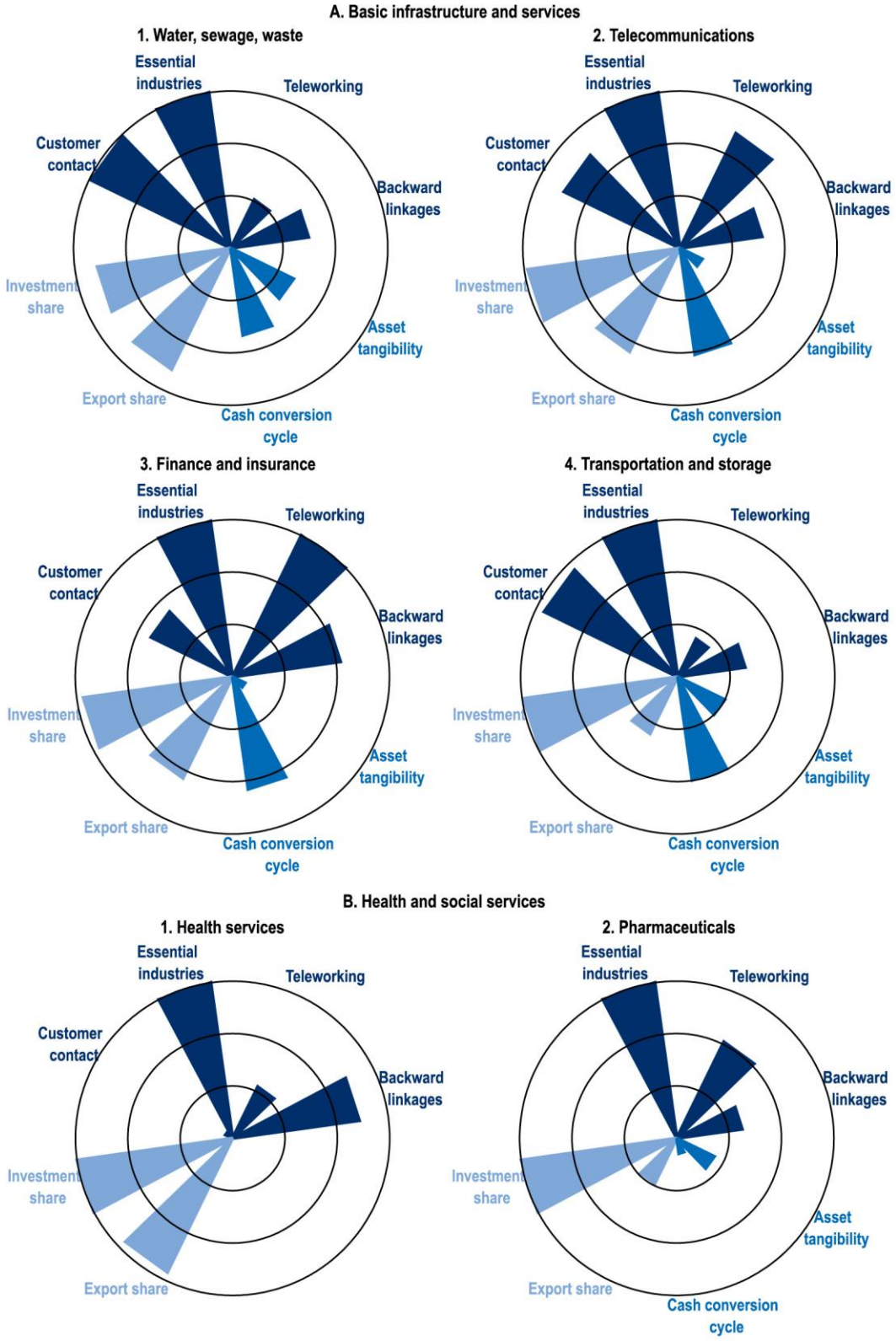
Essential industries

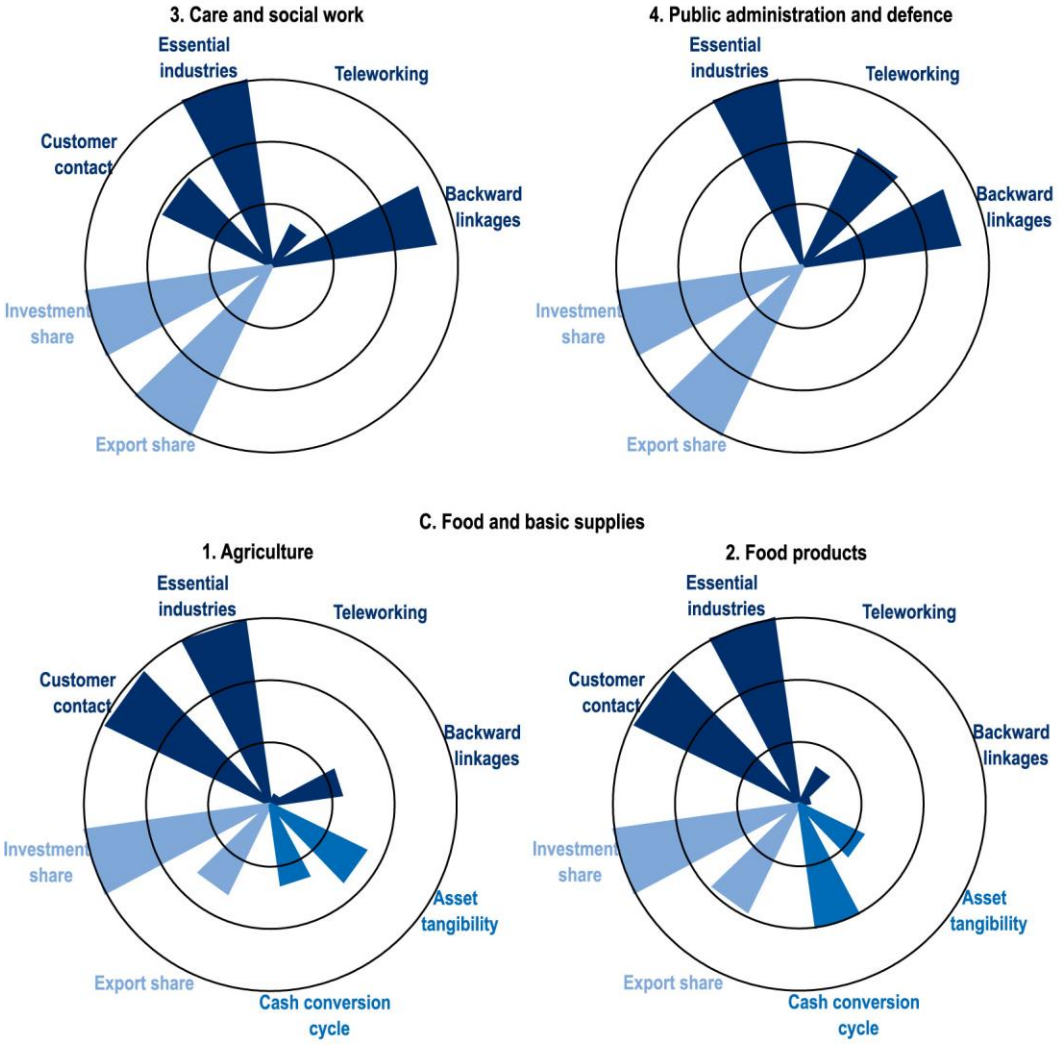
In the initial phases of the pandemic, the most critical factor for business continuity was the extent to which firms were prevented from operating by the containment restrictions. As discussed in Chapter 2, while the strength of restrictions has differed across countries and over time (Figure 2.1), the industries and activities deemed to be "essential" are largely the same across countries. As these industries have largely been able to continue operations, and produce products for which demand is relatively inelastic, they are expected to be rather resilient to both direct immediate and indirect longer-term effects of the crisis. In this case, other aspects – such as whether an industry is able to engage in telework or is prone to liquidity concerns – become less relevant for business survival.

Figure A A.2 provides an overview of the eight indicators discussed above in the form of a flower graph, with longer petals representing more resilience in a given dimension. Each petal represents one of the eight indicators, and petals are colour coded by the different dimensions along which the crisis has been affecting industries (ability to produce and supply, exposure to indirect demand shocks and financial constraints). The figure shows a selection of essential industries, divided into three categories: basic infrastructure and services, health and social services, and food and basic supplies.[2] Aside from being classified as essential, these industries have a number of features in common. With the exception of those grouped under health and social services, they tend to have relatively low levels of customer contact, and in most cases limited reliance on investment demand.

Within the broad group of essential industries, some sub-industries have suffered more than others. For example, while transportation is considered an essential industry, firms that rely heavily on travel (as opposed to goods freight or storage) have seen strong negative effects from the reduction in personal mobility.[3] At the same time, where firms provide both essential and non-essential products, the reduction in demand for the latter due to reduced personal mobility can significantly affect revenues and profits, even if the sector is allowed to remain open. For example, while pharmacies remained open to provide medical supplies during lockdowns, incidental sales of non-essential goods such as cosmetics fell, as potential customers were confined to their homes.[4]

Figure A A.2. Relative resilience across multiple indicators: Essential industries





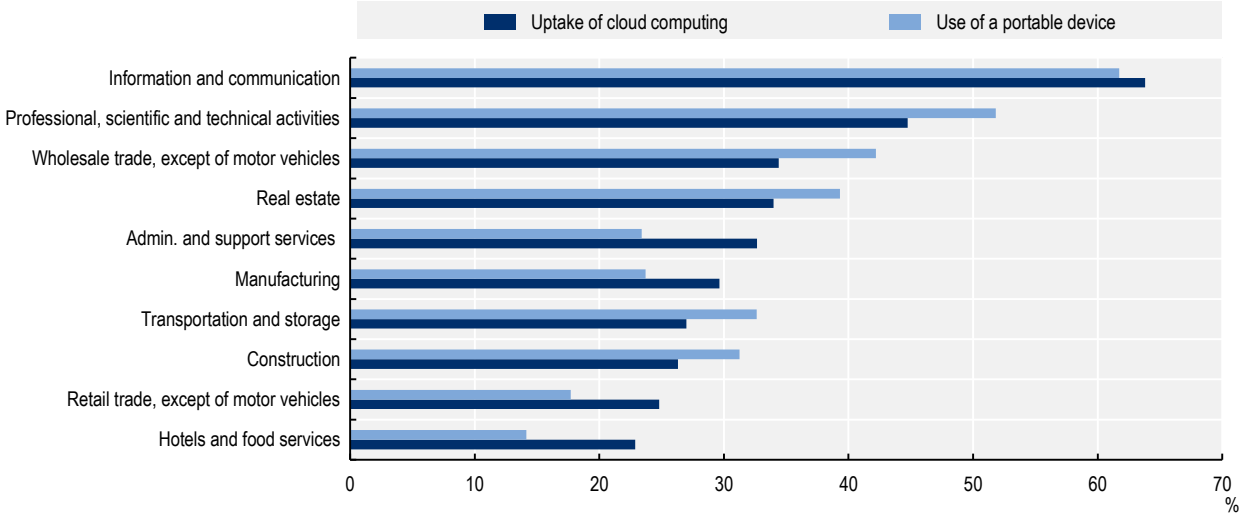
Note: Agriculture has a score of around 0.9 on the essentiality index, but is still grouped in the set of essential industries here. Indicators have been normalised to lie between zero and one, based on the minimum and maximum values observed in the industry sample for each indicator. Higher values (longer "petals") represent that an industry is expected to be relatively more resilient with respect to a particular measure. Labels are absent when data is not available for a specific industry. The Customer contact indicator is unavailable for Pharmaceuticals and for Public administration and defence. Financial indicators are not available for Health services, Care and social work, and Public administration and defence.

Sources: OECD calculations based on Fana et al. (2020[1]), Espinoza and Reznikova (2020[2]), Koren and Petö (2020[3]), OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio and ORBIS.

Non-essential, high telework potential

A second set of industries are those where in-person activity has been largely restricted, but where a substantial portion of activity can continue through remote work. These industries are largely in the knowledge-intensive services sectors, including IT services, Real estate, and Legal and accounting services, where digital tools and remote technologies tend to be relatively well established (Figure A A.3). Education is another sector where telework is feasible for a large proportion of activity, despite the fact that it previously relied heavily on face-to-face contact.

Figure A A.3. Adoption of digital and remote technologies



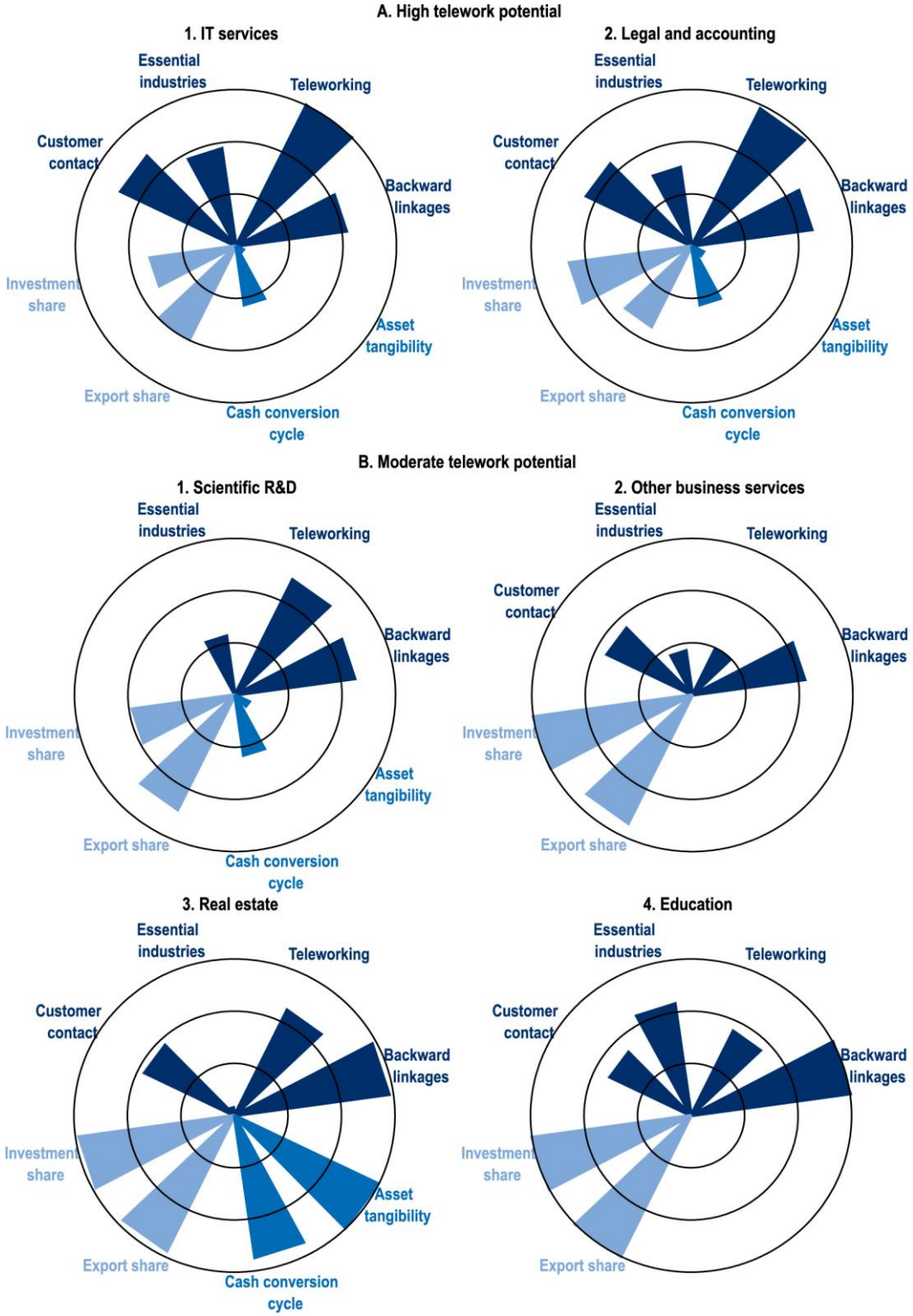
Note: Persons employed using an Internet-enabled portable device, as a percentage of all persons employed. Average across the following countries, 2019: the Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and Turkey.
Source: OECD (2021[5]), "ICT Access and Use by Businesses", *OECD Telecommunications and Internet Statistics* (database), https://doi.org/10.1787/9d2cb97b-en (accessed on 9 June 2020).

StatLink https://doi.org/10.1787/888934262068

In teleworkable[5] industries, a large proportion of activity can be continued in the face of containment policies through the use of digital technologies and telework. In these industries, support could be directed to assisting firms to adopt, and adapt to, new ways of working remotely, as discussed in (OECD, 2020[6]) and (OECD, 2019[7]).

However, even if activity continues, substantial losses in productivity and output can be expected in these sectors. In the short term, firms may face a significant drop in revenues in industries where core activities traditionally rely on face-to-face contact or physical presence (e.g. real estate viewings or onsite maintenance). Moreover, output in knowledge-intensive service industries (e.g. IT services, Legal and accounting) tends to be relatively strongly correlated with business cycle fluctuations, with a large share of output contributing to exports and fixed capital formation, and (with the exception of real estate) relying heavily on intangible assets. As such, while teleworkable industries may be less affected than others by the direct effects of the crisis, ongoing economic weakness and financial constraints can still be expected to take a toll. However, digitalisation and the shift towards automation have the potential to boost some of the digital-intensive industries, or producers of digital products, over the long-term (as discussed in Chapter 5).

Figure A A.4. Relative resilience across multiple indicators: High vs. moderate telework potential industries



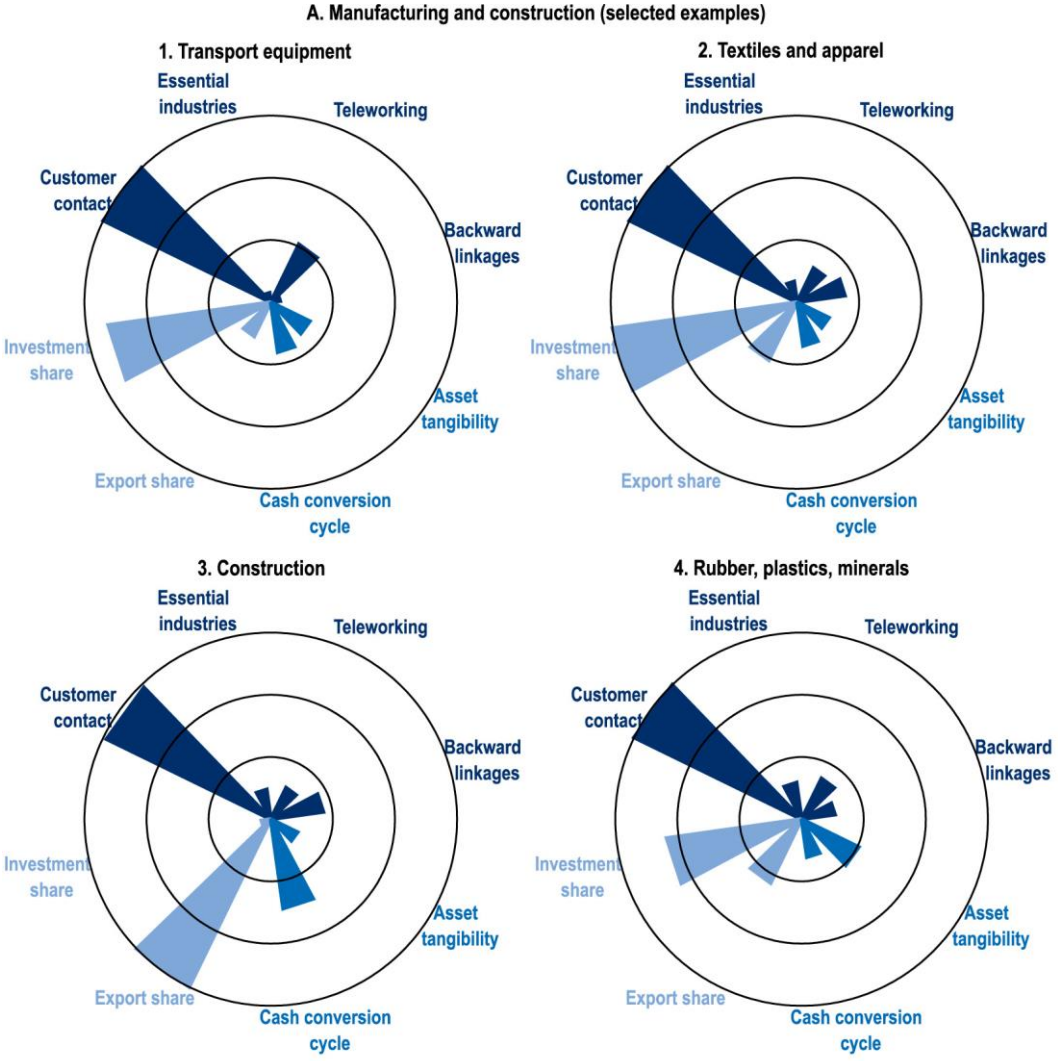
Note: Higher values (longer petals) represent that an industry is expected to be relatively more resilient with respect to a particular measure. Indicators have been normalised to lie between zero (the minimum value across industries) and one (the maximum value across industries). Labels are absent when data is not available for a specific industry. The Customer contact indicator is unavailable for Scientific R&D. Financial indicators are not available for Education. Sources: OECD calculations based on Fana et al. (2020[1]), Espinoza and Reznikova (2020[2]), Koren and Petö (2020[3]), OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio and ORBIS.

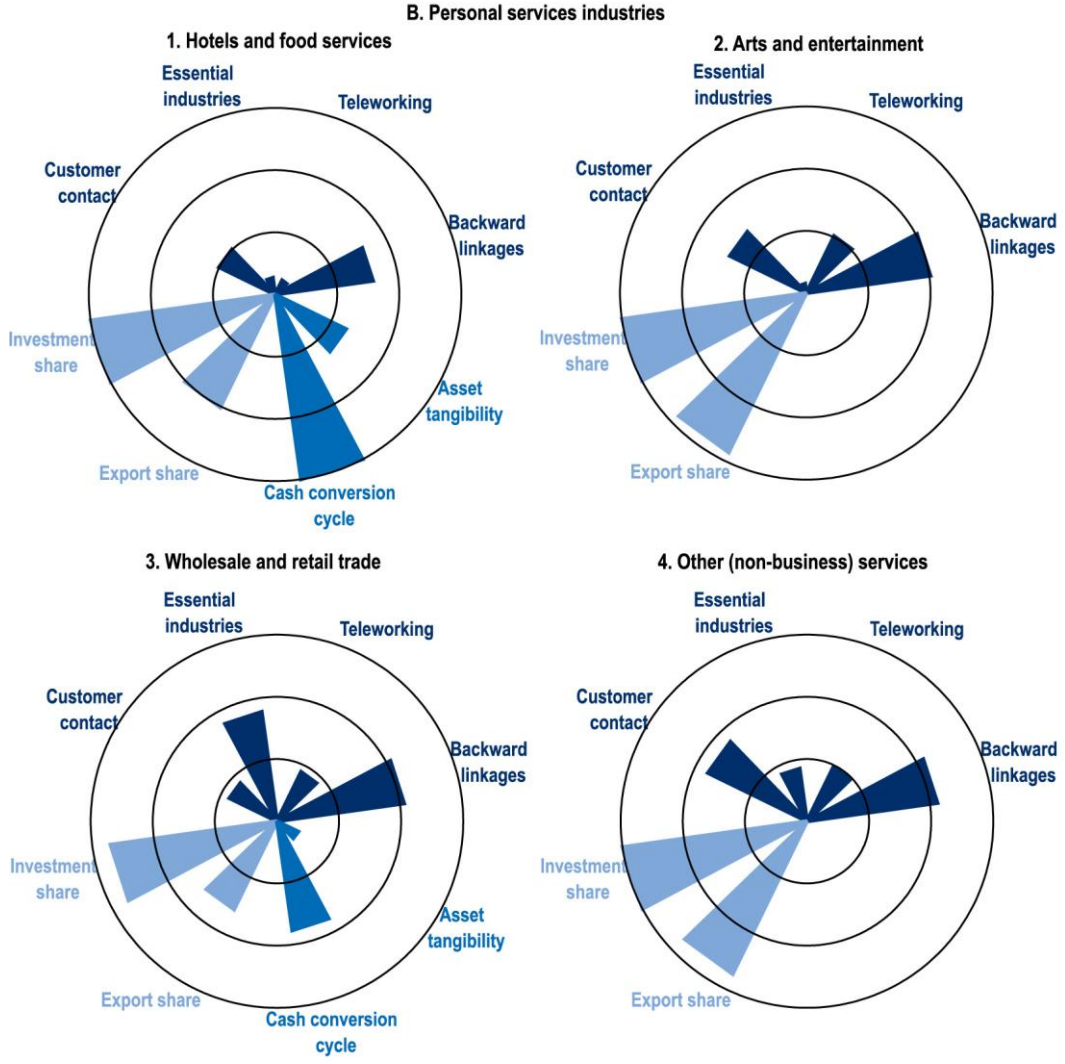
Non-essential, low telework potential

The remaining industries, being neither essential nor teleworkable, were heavily affected by the initial impacts of the crisis. They can be placed into one of two groups: they either rely heavily on face-to-face contact with customers (personal services industries such as Arts and entertainment, Hotels and food services, [Wholesale and] Retail trade, Other services), or their production requires physical on-site presence (e.g. Manufacturing industries, Mining, Construction, Wholesale [and retail] trade).

These two groups tend to differ in terms of their medium-term demand impacts. Service sectors which have greater customer contact have been subject to more prolonged restrictions on activity in most countries, and will continue to be more affected by changes in preferences for reduced physical interaction while the virus is still circulating (and possibly even beyond that time). In contrast, manufacturing industries – particularly heavy manufacturing – may be less affected after the initial period of containment measures, as hygiene and distancing measures can be implemented to some degree at most production facilities. Nevertheless, manufacturing is sensitive to falling demand and likely to suffer from a broader economic downturn.

Figure A A.5. Relative resilience across multiple indicators: Low telework potential industries





Note: Indicators have been normalised to lie between zero and one. Higher values (longer petals) represent that an industry is expected to be relatively more resilient with respect to a particular measure. Labels are suppressed when data is not available for a specific industry. Financial indicators are not available for Arts and entertainment or Other (non-business) services.
Sources: OECD calculations based on Fana et al. (2020[1]), Espinoza and Reznikova (2020[2]), Koren and Petö (2020[3]), OECD (2018[4]), *Inter-Country Input Output (ICIO) Database*, http://oe.cd/icio and ORBIS.

In manufacturing, strategies to protect both workers and customers are critical to businesses reopening and recovery. Besides direct financial support to weather the initial shutdown period, government responses could include education and regulation to support physical distancing in the workplace and reduce potential contagion from customers. They could also include financial and business support to promote greater use of technology and online tools in order to minimise the need for onsite presence.

The financial system and governments both play an important role in supporting firms through the initial shocks as they deal with both a dramatic decrease in revenues, and additional costs of adjusting their business operations and technology to meet new physical distancing and hygiene requirements. At a firm level, factors such as current profitability and financial position, firm size and age, and asset tangibility will affect firms' ability to borrow. Meanwhile, the capacity of governments and the financial system to accommodate credit requirements will determine firm and industry ability to weather the crisis, and affect the longer-term recovery.

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Notes

[1] A single measure of risk would involve a judgement of which dimensions are most relevant for each industry. In addition, the relevance of each risk dimension depends on a range of country-level or other country-specific factors, such as those discussed in the topical chapters.

[2] Industries are classified as "essential" if they have a value above 0.8 on the essential industry indicator. Note that the "essential industries" petal is, by construction, at a high to maximum level. For brevity, not all industries are shown. The heatmap in Figure A A.1 provides a summary across the full set of industries and indicators.

[3] For example, in the aviation industry, while revenue passenger kilometres fell by more than 90% in April 2020, relative to the previous year, freight was relatively less affected, with a year-on-year fall of around 30% for April 2020 (Demmou et al., 2021[8]).

[4] https://www.tvnz.co.nz/one-news/new-zealand/pharmacies-brink-collapse-covid-19-lockdown-continues.

[5] "Teleworkable" and "teleworkability" are terms used throughout the report to describe jobs and tasks that are able to be done through telework. Originating mainly in the COVID-19 crisis, given extensive literature and research arising from the rapid global uptake of telework, the terms are now of demonstrated accepted and common use in many official documents. As such, they are used within this context in this document.

Annex B. Industry composition by country

Table A B.1. Industry composition of value added and employment, SNA A38 industries

	AUS 2017		AUT 2018		BEL 2018		CAN 2014		CHE 2017		CHL 2016	
	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP
Agriculture	2.63	2.65	1.28	3.51	0.56	1.22	1.52	1.65	0.68	3.10	4.43	9.34
Mining	8.77	1.79	0.35	0.14	0.06	0.05	8.36	1.50	0.13	0.10	8.93	2.50
Food products	1.47	1.92	1.87	1.91	2.02	2.05	1.59	1.53	1.95	1.89	4.54	4.22
Textiles and apparel	0.14	0.31	0.28	0.38	0.33	0.46	0.13	0.24	0.17	0.24	0.24	0.54
Wood and paper	0.59	0.81	1.63	1.37	0.72	0.85	1.13	1.19	0.84	1.22	2.05	1.49
Coke and petroleum	0.39	0.08	0.30	0.03	0.34	0.10	0.56	0.04	0.00	0.01	0.28	
Chemicals	0.31	0.27	0.78	0.40	2.23	0.88	0.71	0.31	1.13	0.59	0.78	2.10
Pharmaceuticals	0.22	0.15	0.66	0.37	1.91	0.57	0.27	0.17	5.32	0.94	0.28	
Rubber, plastics, minerals	0.70	0.53	1.55	1.37	1.22	1.08	0.89	0.87	0.81	0.80	0.78	
Metal products	0.98	1.03	3.29	2.62	1.78	1.69	1.55	1.27	1.65	1.90	0.18	1.05
Computer and electronics	0.30	0.30	1.13	0.57	0.40	0.25	0.33	0.28	3.00	1.99	0.14	
Electrical equipment	0.13	0.18	1.60	1.01	0.27	0.29	0.18	0.20	0.77	0.64	0.17	0.58
Machinery and equipment	0.29	0.48	2.79	1.89	0.95	0.62	0.82	0.79	1.83	1.51	0.49	
Transport equipment	0.48	0.57	1.56	1.07	0.79	0.77	1.49	1.05	0.40	0.34	0.19	0.07
Other manufactures	0.18	0.54	1.49	1.63	0.81	0.95	0.80	1.30	0.98	0.90	0.61	0.80
Electricity, gas, steam	1.60	0.62	1.80	0.59	1.32	0.38	2.07	0.52	1.26	0.56	2.65	0.52
Water, sewerage, waste	1.08	0.57	1.03	0.56	0.99	0.69	0.51	0.31	0.30	0.37	0.75	0.59
Construction	8.21	9.41	6.69	6.71	5.26	5.80	8.03	7.88	5.45	6.86	7.54	8.74
Wholesale and retail	8.58	13.27	11.62	15.01	11.74	12.24	10.50	16.93	14.14	12.26	10.59	19.38
Transportation and storage	4.96	5.14	5.67	4.92	5.54	5.34	4.35	4.59	4.29	4.75	5.87	6.75
Hotels and food services	2.47	7.15	5.30	6.85	1.90	3.27	2.13	6.90	1.71	4.82	2.33	4.20
Media	0.77	0.81	0.72	0.64	0.77	0.47	1.06	0.97	0.53	0.63	0.33	
Telecommunications	1.29	0.77	0.84	0.33	1.30	0.48	1.72	0.69	1.25	0.61	1.33	1.62
IT services	2.27	2.09	1.99	1.80	2.28	1.60	1.64	1.69	2.41	1.99	1.39	
Finance and insurance	9.33	3.46	4.04	2.76	6.22	2.45	7.06	6.07	9.26	4.55	5.14	2.04
Real estate	11.57	1.41	9.87	1.42	9.30	0.61	11.55	1.54	7.57	1.24	8.43	0.89
Legal and accounting		4.98	4.20	4.59	9.10	9.41	3.34	3.29	5.71	6.74	5.73	
Scientific R&D	5.06	0.38	0.44	0.37	0.50	0.24	0.31	0.32	1.15	0.49	0.11	2.94
Other business services		1.00	0.69	1.21	0.68	0.90	0.70	1.28	0.61	1.05	1.10	
Admin. and support services	3.99	3.64	4.48	5.95	5.17	9.50	3.23	5.56	2.86	6.43	4.38	2.67
Public admin. and defence	5.54	5.93	4.98	6.00	7.53	9.04	7.00	5.92	10.72	3.86	5.37	5.43
Education	5.06	8.23	5.31	7.19	6.89	8.35	5.35	7.22	0.60	6.75	5.61	8.21
Health services	4.10	7.88	5.26	6.22	4.50	6.76	5.37	6.64	5.64	7.72	5.56	5.10
Care and social work	3.26	5.55	1.72	4.11	2.52	6.37	1.73	3.75	2.45	5.90		
Arts and entertainment		1.98	1.23	1.40	0.72	0.96	0.72	1.79	0.62	1.90	0.40	1.16
Other services	2.76	3.98	1.48	2.88	1.24	2.48	1.13	3.02	1.45	3.07	1.33	2.79
Households and extrater. orgs		0.03	0.05	0.21	0.12	0.83	0.17	0.73	0.35	1.29	0.00	4.25

	CRI 2015		CZE 2018		DEU 2017		DNK 2018		ESP 2018		EST 2018	
	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP
Agriculture	5.40	11.93	2.19	2.97	0.92	1.39	1.18	2.35	3.09	4.03	3.06	3.31
Mining	0.33	0.08	0.68	0.51	0.15	0.12	1.13	0.16	0.26	0.10	1.10	0.74
Food products	5.20	4.27	2.24	2.42	1.58	2.11	1.77	1.63	2.36	2.07	1.78	2.26
Textiles and apparel	0.40	0.86	0.56	1.12	0.26	0.32	0.17	0.19	0.84	0.65	0.82	1.94
Wood and paper	0.97	1.22	1.40	1.95	0.86	1.00	0.49	0.66	0.76	0.81	3.17	3.45
Coke and petroleum	0.00	0.05	0.05	0.03	0.19	0.04	0.31	0.01	0.32	0.04	0.35	0.08
Chemicals	0.78	0.75	0.89	0.58	1.71	0.81	1.04	0.37	0.86	0.46	0.55	0.59
Pharmaceuticals	0.28	0.21	0.42	0.24	0.76	0.29	3.72	0.84	0.61	0.21	0.08	0.09
Rubber, plastics, minerals	1.26	0.48	3.06	3.05	1.63	1.55	0.99	0.87	1.08	0.97	1.56	1.51
Metal products	0.47	0.54	3.74	4.82	2.63	2.68	1.08	1.39	1.70	1.56	1.95	2.49
Computer and electronics	0.60	0.40	1.50	0.96	1.39	0.82	0.94	0.52	0.16	0.13	0.65	1.00
Electrical equipment			2.00	2.19	1.53	1.12	0.43	0.31	0.43	0.35	0.98	1.11
Machinery and equipment			2.26	2.62	3.52	2.61	2.27	1.76	0.66	0.56	0.68	0.62
Transport equipment	0.06	0.06	5.72	4.17	5.34	2.33	0.25	0.24	1.56	1.07	0.67	0.55
Other manufactures	2.38	2.01	1.80	2.49	1.43	1.49	1.54	1.13	1.06	1.17	1.95	2.77
Electricity, gas, steam	2.21	1.19	2.81	0.67	1.73	0.58	1.24	0.31	2.06	0.19	3.52	0.99
Water, sewerage, waste	0.88	0.37	1.05	1.15	1.05	0.62	0.85	0.40	1.14	0.98	0.66	0.49
Construction	5.35	6.75	5.61	7.49	4.71	5.60	6.17	6.37	6.23	6.18	7.26	7.59
Wholesale and retail	10.33	17.60	11.39	13.61	10.01	13.40	12.90	16.38	12.96	17.20	11.68	13.13
Transportation and storage	4.74	4.26	5.69	6.25	4.38	5.11	4.90	4.94	4.59	4.63	7.37	7.56
Hotels and food services	3.30	5.85	2.11	3.86	1.59	4.19	1.71	4.76	6.23	7.91	1.97	4.28
Media	0.27	0.61	1.12	0.52	0.99	0.70	1.43	1.25	0.80	0.58	0.77	1.02
Telecommunications	1.97	0.39	1.32	0.42	0.91	0.26	0.94	0.45	1.30	0.32	1.48	0.72
IT services	2.35	0.47	3.07	1.89	2.69	1.94	2.25	1.90	1.62	1.64	3.98	3.06
Finance and insurance	4.97	2.21	4.00	1.73	4.03	2.55	5.68	2.66	4.03	1.81	4.00	1.86
Real estate	9.05	0.73	8.74	1.80	10.56	1.07	10.25	1.58	11.56	1.09	10.64	1.57
Legal and accounting	4.11	2.19	3.08	3.63	4.63	4.85	4.35	4.04	3.08	3.60	3.08	3.05
Scientific R&D	0.62	0.25	0.77	0.54	0.84	0.49	1.45	0.48	0.50	0.33	0.96	0.28
Other business services	2.15	0.70	1.20	1.76	0.93	1.10	0.82	1.32	1.07	1.21	1.32	1.28
Admin. and support services	5.45	5.26	1.85	2.91	5.07	7.44	3.29	5.15	4.31	7.31	3.68	3.60
Public admin. and defence	4.90	4.62	6.31	5.71	6.07	5.91	4.85	5.04	6.15	7.99	6.79	6.25
Education	8.62	6.41	4.52	5.90	4.55	5.63	6.10	7.67	5.19	6.76	4.91	9.13
Health services	7.29	3.59	3.85	4.94	5.32	13.14	4.80	6.96	6.62	7.37	3.67	4.36
Care and social work			0.82	1.50	2.24		5.42	10.55	1.48		0.50	1.71
Arts and entertainment	0.66	1.34	0.98	1.42	1.37	1.54	1.55	2.13	1.98	2.15	1.51	2.85
Other services	1.22	4.07	1.08	1.96	2.19	3.31	1.50	2.42	1.90	3.37	0.84	2.28
Households and extrater. orgs	1.44	8.23	0.11	0.20	0.24	1.90	0.25	0.81	0.92	3.23	0.06	

	ISL 2015		ISR 2016		ITA 2018		JPN 2017		KOR 2018		LTU 2017	
	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP
Agriculture	6.18	4.25	1.33	1.83	2.19	3.66	1.22	3.84	1.91	5.00	3.90	7.72
Mining	0.10	0.11	0.94	0.10	0.27	0.09	0.06	0.06	0.12	0.07	0.30	0.21
Food products	4.90		1.42	1.78	1.85	1.88	2.52	2.29	1.34	1.49	4.01	3.08
Textiles and apparel	0.15		0.23	0.39	1.63	1.98	0.26	0.76	0.92	1.25	1.43	2.05
Wood and paper	0.39		0.44	0.56	0.93	1.08	0.95	1.12	0.87	0.80	2.25	2.25
Coke and petroleum	0.00		1.07	0.00	0.19	0.06	0.87	0.05	0.86	0.05	0.88	0.12
Chemicals	0.36		1.23	0.55	0.78	0.46	1.66	0.50	2.33	0.70	1.39	0.38
Pharmaceuticals			1.00	0.39	0.59	0.25	0.57	0.18	0.50	0.19	0.27	0.08
Rubber, plastics, minerals	0.55	10.29	0.95	0.88	1.42	1.37	1.48	1.61	2.25	1.70	1.91	1.31
Metal products	2.97		1.23	1.88	2.70	2.68	2.74	2.06	3.78	2.58	1.18	1.09
Computer and electronics	0.05		2.94	1.46	0.53	0.41	1.62	1.00	8.54	1.95	0.57	0.29
Electrical equipment	0.10		0.17	0.17	0.72	0.64	1.43	0.96	1.69	1.07	0.38	0.37
Machinery and equipment	0.62		0.59	0.43	2.46	1.93	3.11	2.04	2.55	1.96	0.63	0.54
Transport equipment	0.06		0.60	0.54	1.45	1.08	3.33	2.05	2.81	2.04	0.67	0.51
Other manufactures	1.43		0.65	1.03	1.46	1.76	0.38	0.53	0.69	1.01	3.32	3.27
Electricity, gas, steam	4.31	0.82	1.74	0.43	1.58	0.32	1.22	0.86	1.36	0.26	1.86	1.06
Water, sewerage, waste	1.13	0.49	0.21	0.44	1.03	0.89	1.42		0.67	0.47	1.07	1.15
Construction	5.46	6.21	6.06	7.10	4.26	6.04	5.74	7.35	5.95	7.58	6.69	7.36
Wholesale and retail	9.45	12.96	10.16	11.47	11.99	14.71	13.99	17.21	7.86	13.88	17.90	16.75
Transportation and storage	6.60	6.26	3.56	4.02	5.56	4.68	5.11	5.89	3.34	5.25	12.01	7.75
Hotels and food services	3.23	6.04	2.11	4.66	3.94	6.62	2.61	6.10	2.53	8.36	1.71	2.51
Media	0.89	1.91	0.57	0.62	0.57	0.38	0.62		1.66	1.94	0.50	0.42
Telecommunications	1.29	0.65	1.74	0.65	1.11	0.35	1.86	2.76	1.07	0.25	1.26	0.33
IT services	2.62	2.56	6.65	3.51	2.01	1.75	2.42		1.85	0.93	1.88	1.31
Finance and insurance	6.25	3.48	4.74	3.19	4.88	2.53	4.15	2.58	6.00	3.13	2.04	1.48
Real estate	10.07	0.49	15.23	0.82	13.54	0.73	11.39	1.64	7.96	1.97	6.67	1.06
Legal and accounting	3.13	4.08	4.86	4.86	4.23	4.69	7.40	8.91	2.83	2.55	2.71	2.74
Scientific R&D	1.03	0.71	1.39	0.84	1.03	0.49			3.04	0.95	0.22	0.35
Other business services	0.56	1.36	0.91	1.28	1.12	1.53			0.29	0.59	1.04	0.99
Admin. and support services	3.80	3.05	3.69	4.71	3.29	5.77			3.55	4.89	2.99	4.10
Public admin. and defence	5.42	4.03	5.93	9.65	6.55	4.84	4.95	2.91	6.61	4.14	5.71	6.15
Education	6.13	12.79	6.60	11.71	4.11	6.17	3.60	2.81	5.22	6.89	4.37	9.91
Health services	7.99	11.38	3.95	10.36	5.02	7.76	4.69	12.61	3.68	3.93	3.36	5.30
Care and social work			2.07		0.93		2.33		1.00	3.69	0.64	1.50
Arts and entertainment	1.32	3.43	1.93	1.85	1.14	1.35	1.60	9.31	1.06	1.66	1.18	2.16
Other services	1.38	2.50	1.09	2.29	1.80	2.96	2.70		1.21	4.61	1.01	2.23
Households and extrater. orgs	0.07	0.00		3.48	1.14	6.14	0.00		0.13	0.18	0.09	0.11

	LUX 2017		LVA 2017		MEX 2018		NLD 2018		NOR 2017		NZL 2018	
	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP
Agriculture	0.27	0.86	3.98	7.35	3.58	7.69	1.84	2.14	2.23	2.38	6.17	5.95
Mining	0.07	0.07	0.51	0.28	4.31	0.82	1.03	0.09	16.84	2.03	1.04	0.20
Food products	0.54	1.25	2.33	2.87	4.69	2.91	2.34	1.43	1.56	1.79	3.96	3.30
Textiles and apparel	0.45	0.28	0.58	1.26	0.72	1.85	0.17	0.18	0.11	0.16	0.24	0.44
Wood and paper	0.22	0.37	3.23	3.11	0.58	0.73	0.64	0.54	0.54	0.75	1.13	1.34
Coke and petroleum	0.00	0.00	0.00	0.00	0.71	0.07	0.17	0.05	0.13	0.04	0.79	0.04
Chemicals	0.16	0.27	0.28	0.35	0.93	0.39	1.73	0.48	0.52	0.35	0.40	0.24
Pharmaceuticals	0.05	0.02	0.40	0.28	0.33	0.33	0.38	0.14	0.29	0.09	0.11	0.10
Rubber, plastics, minerals	1.10	1.64	1.19	1.00	1.02	1.18	0.75	0.59	0.51	0.53	0.95	0.64
Metal products	1.71	1.87	1.10	1.36	1.80	1.21	1.43	1.21	1.06	1.14	1.18	1.24
Computer and electronics	0.15	0.23	0.64	0.25	1.58	1.97	0.65	0.28	0.31	0.27	0.32	0.13
Electrical equipment	0.06	0.11	0.38	0.38	0.60	0.70	0.42	0.23	0.27	0.28	0.32	0.18
Machinery and equipment	0.81	0.98	0.36	0.46	0.80	0.92	1.74	0.89	0.55	0.63	0.73	0.66
Transport equipment	0.09	0.12	0.42	0.48	4.03	2.24	0.62	0.46	0.57	0.72	0.48	0.46
Other manufactures	0.18	0.32	1.16	1.62	0.62	1.44	1.31	1.87	0.81	1.02	0.28	0.94
Electricity, gas, steam	0.79	0.35	2.67	1.35	1.77	0.26	1.17	0.29	2.21	0.57	2.26	0.45
Water, sewerage, waste	0.48	0.62	0.82	0.85	0.39	0.37	0.64	0.37	0.71	0.55	0.80	0.43
Construction	5.53	10.26	5.89	7.17	7.89	11.53	4.70	5.13	6.64	8.37	7.29	9.29
Wholesale and retail	10.17	11.93	14.40	16.18	20.20	12.93	13.74	15.83	7.93	13.14	10.21	14.36
Transportation and storage	4.57	6.01	8.92	7.74	6.74	6.32	4.76	4.31	4.95	5.70	4.78	4.39
Hotels and food services	1.72	4.74	1.96	3.29	2.41	3.69	2.13	4.77	1.49	3.60	2.43	5.91
Media	0.81	0.63	0.53	0.49	0.39	0.20	0.76	0.61	1.09	1.15	0.71	0.81
Telecommunications	2.50	0.85	1.54	0.60	1.28	0.22	1.08	0.32	1.11	0.45	0.64	0.59
IT services	3.14	2.91	3.15	2.58	0.11	0.15	3.15	2.35	1.93	1.78	1.16	2.31
Finance and insurance	27.28	10.82	3.88	1.85	4.30	0.91	6.71	2.21	5.38	1.70	6.20	2.88
Real estate	7.52	0.97	12.45	2.47	9.92	1.16	7.32	0.79	7.74	1.07	14.33	1.62
Legal and accounting	7.41		2.90	3.55	2.06	1.23	6.78	5.84	3.44	3.56	7.63	5.34
Scientific R&D	0.58	9.89	0.57	0.06	0.11	0.14	0.30	0.42	0.49	0.38	0.05	0.29
Other business services	0.54		1.24	1.51	0.29	0.40	1.02	2.04	0.53	0.99	1.02	1.63
Admin. and support services	3.57	6.82	3.02	3.84	3.86	12.22	7.19	13.60	2.74	4.74	3.45	4.43
Public admin. and defence	5.89	5.69	7.89	6.13	3.94	7.14	6.98	5.11	6.71	8.09	4.32	5.41
Education	4.13	4.48	4.91	9.12	3.89	6.11	4.90	5.75	5.39	7.82	4.65	8.69
Health services	3.13	4.28	3.00	5.52	2.26	2.71	4.88	6.25	5.04	8.18	6.52	6.94
Care and social work	2.63	6.12	0.57		0.07	0.26	4.21	9.06	6.19	12.25		3.74
Arts and entertainment	0.66	0.99	2.06	2.44	0.44	0.45	1.11	1.88	0.94	1.84	3.44	1.96
Other services	0.81	1.92	0.91	1.97	0.94	1.12	1.13	2.20	1.05	1.78		2.58
Households and extrater. orgs	0.28	1.32	0.18	0.22	0.45	6.05	0.10	0.28	0.01	0.13		0.03

	POL 2018		PRT 2017		SVK 2018		SVN 2016		SWE 2015		TUR 2015	
	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP	VA	EMP
Agriculture	2.67	9.55	2.42	8.99	2.63	2.98	2.17	7.68	1.36	2.23	7.83	20.82
Mining	1.75	1.17	0.36	0.24	0.41	0.28	0.37	0.26	0.42	0.19	0.93	0.45
Food products	3.15	3.16	2.44	2.35	1.35	1.94	1.53	1.76	1.17	1.14	2.86	2.56
Textiles and apparel	0.59	1.37	2.47	4.47	0.83	1.59	0.70	1.02	0.12	0.17	3.67	5.27
Wood and paper	1.74	2.03	1.37	1.22	1.56	1.77	1.78	1.85	1.79	1.52	0.90	0.98
Coke and petroleum	0.59	0.13	0.49	0.03	0.41	0.11	0.00	0.00	0.20	0.06	0.35	0.04
Chemicals	0.84	0.70	0.55	0.27	0.68	0.36	1.13	0.70	0.75	0.40	0.95	0.11
Pharmaceuticals	0.46	0.25	0.35	0.15	0.09	0.09	2.47	0.84	1.35	0.23	0.24	0.05
Rubber, plastics, minerals	2.64	2.64	1.59	1.39	2.56	2.34	2.56	2.25	0.82	0.79	2.41	2.42
Metal products	2.78	2.89	1.67	1.93	4.51	4.55	4.60	4.56	2.14	2.18	2.85	2.44
Computer and electronics	0.47	0.53	0.30	0.24	0.73	0.64	0.77	0.68	0.74	0.44	0.28	0.18
Electrical equipment	0.78	0.83	0.38	0.39	1.28	1.45	2.41	2.02	0.64	0.54	0.65	0.80
Machinery and equipment	0.93	1.09	0.53	0.50	1.91	2.01	1.57	1.40	1.92	1.54	0.90	1.11
Transport equipment	1.98	2.47	1.00	0.97	4.61	3.57	1.87	1.33	3.00	1.64	1.35	1.17
Other manufactures	2.16	2.98	1.12	1.68	1.42	1.80	1.84	2.05	0.83	0.96	1.55	1.71
Electricity, gas, steam	2.77	0.95	2.43	0.18	2.45	0.72	2.57	0.93	2.19	0.60	1.45	0.44
Water, sewerage, waste	1.32	0.97	0.99	0.88	0.87	1.01	0.90	0.98	0.65	0.58	1.07	0.54
Construction	7.65	7.30	4.05	6.02	7.92	7.18	5.23	6.45	5.77	7.11	9.25	7.27
Wholesale and retail	17.76	14.03	13.76	15.03	11.60	16.05	11.68	12.17	10.79	11.69	13.03	14.03
Transportation and storage	7.03	6.31	4.98	3.64	6.34	6.07	6.26	5.27	5.44	5.10	8.92	4.21
Hotels and food services	1.32	2.50	5.91	6.93	1.55	4.03	2.41	3.91	1.81	3.83	3.21	5.50
Media	0.83	0.55	0.59	0.41	0.65	0.54	0.66	0.78	2.71	1.21	0.41	0.22
Telecommunications	1.15	0.49	1.45	0.32	1.42	0.50	1.40	0.52	1.17	0.48	1.30	0.29
IT services	2.29	1.52	1.47	1.23	2.64	1.90	2.05	1.69	3.80	2.35	1.02	0.44
Finance and insurance	4.16	2.52	5.02	1.70	3.12	1.92	3.88	2.32	4.63	2.00	3.40	1.12
Real estate	4.89	0.92	12.49	0.76	9.82	1.19	7.82	0.59	8.37	1.62	8.77	0.81
Legal and accounting	4.03	2.53	2.79	3.16	4.79	4.11	4.18	4.77	4.71	4.37	2.12	2.25
Scientific R&D	0.54	0.21	0.32	0.21	0.36	0.35	1.13	0.66	1.90	1.08	0.03	0.01
Other business services	1.34	1.00	0.64	0.78	1.42	1.34	1.49	2.30	1.06	1.25	0.53	0.59
Admin. and support services	2.63	2.76	3.88	7.59	3.57	4.67	3.15	5.38	3.53	5.45	3.21	4.90
Public admin. and defence	5.47	6.67	7.06	6.01	6.93	6.88	6.04	5.16	4.74	5.39	4.93	5.47
Education	4.58	7.80	5.78	6.45	3.71	7.27	5.46	7.35	5.49	10.15	4.66	5.36
Health services	3.76	4.29	4.65	8.14	3.18	4.25	4.11	4.49	5.41	6.91	2.59	3.26
Care and social work	0.70	1.69	1.77		0.62	1.39	1.11	1.94	5.60	9.94	0.18	0.73
Arts and entertainment	0.77	1.43	0.91	1.08	0.83	1.31	1.49	1.83	1.35	2.25	1.06	
Other services	1.36	1.63	1.35	2.29	1.18	1.66	1.13	1.91	1.60	2.58	1.08	3.58
Households and extrater. orgs	0.13	0.14	0.66	2.36	0.05	0.19	0.08	0.17	0.04	0.06	0.05	

	USA 2018		Average (excluding those with missing values)	
	VA	EMP	VA	EMP
Agriculture	0.90	1.35	2.34	4.19
Mining	1.67	0.41	1.50	0.47
Food products	1.25	1.17	2.09	2.05
Textiles and apparel	0.14	0.24	0.68	0.69
Wood and paper	0.69	0.76	1.21	1.19
Coke and petroleum	0.85	0.07	0.35	0.06
Chemicals	1.04	0.33	0.99	0.44
Pharmaceuticals	0.84	0.18	0.90	0.33
Rubber, plastics, minerals	0.73	0.70	1.45	1.21
Metal products	1.19	1.23	2.16	1.99
Computer and electronics	1.51	0.65	1.12	0.70
Electrical equipment	0.34	0.24	0.76	0.64
Machinery and equipment	0.78	0.69	1.39	1.14
Transport equipment	1.59	0.99	1.79	1.25
Other manufactures	0.73	0.63	1.26	1.46
Electricity, gas, steam	1.44	0.31	1.91	0.55
Water, sewerage, waste	0.32	0.30	0.86	0.62
Construction	4.22	5.52	6.00	7.23
Wholesale and retail	9.94	14.30	12.10	14.35
Transportation and storage	3.42	4.01	5.72	5.28
Hotels and food services	2.81	8.61	2.66	5.18
Media	2.35	1.04	0.99	0.83
Telecommunications	1.56	0.46	1.36	0.48
IT services	3.03	1.68	2.33	1.78
Finance and insurance	7.68	4.00	5.63	2.69
Real estate	12.71	1.32	10.11	1.22
Legal and accounting	6.00	4.83	4.22	4.40
Scientific R&D	0.64	0.48	0.79	0.49
Other business services	1.25	1.15	0.92	1.24
Admin. and support services	4.00	6.30	3.74	5.98
Public admin. and defence	8.55	8.27	6.61	6.35
Education	5.48	8.82	4.91	7.51
Health services	6.28	7.95	4.44	6.09
Care and social work	1.43	4.74	2.00	4.89
Arts and entertainment	1.07	1.74	1.17	1.73
Other services	1.46	3.73	1.37	2.63
Households and extrater. orgs	0.11	0.78	0.22	0.63

Note: Average across countries is based only on those countries with the full set of A38 shares available. This includes: AUT, BEL CAN, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, ITA, KOR, LVA, LTU, LUX, MEX, NLD, NOR, POL, PRT, SVK, SVN, ESP, SWE, CHE, TUR, GBR, USA for value added and AUS, AUT, BEL CAN, CZE, DNK, FIN, FRA, GRC, HUN, IRL, KOR, LTU, MEX, NLD, NZL, NOR, POL, SVK, SVN, SWE, CHE, GBR, USA for employment.
Source: OECD (2020[1]), *Structural Analysis (STAN) Database*, http://oe.cd/stan (accessed in December 2020).

StatLink https://doi.org/10.1787/888934262087

Reference

OECD (2020), *Structural Analysis (STAN) Database*, http://oe.cd/stan. [1]

Annex C. Industry classification

Table A C.1. SNA A38 industry classification

Code	Long form	Short form (for graphs)	Label
1	Agriculture, forestry and fishing	Agriculture	A
5	Mining and quarrying	Mining	B
10	Food products, beverages and tobacco	Food products	CA
13	Textiles, wearing apparel, leather and related products	Textiles and apparel	CB
16	Wood and paper products, and printing	Wood and paper	CC
19	Coke and refined petroleum products	Coke and petroleum	CD
20	Chemicals and chemical products	Chemicals	CE
21	Basic pharmaceutical products and pharmaceutical preparations	Pharmaceuticals	CF
22	Rubber and plastics products, and other non-metallic mineral products	Rubber, plastics, minerals	CG
24	Basic metals and fabricated metal products, except machinery and equipment	Metal products	CH
26	Computer, electronic and optical products	Computer and electronics	CI
27	Electrical equipment	Electrical equipment	CJ
28	Machinery and equipment n.e.c.	Machinery and equipment	CK
29	Transport equipment	Transport equipment	CL
31	Furniture; other manufacturing; repair and installation of machinery and equipment	Other manufactures	CM
35	Electricity, gas, steam and air conditioning supply	Electricity, gas, steam	D
36	Water supply; sewerage, waste management and remediation activities	Water, sewerage, waste	E
41	Construction	Construction	F
45	Wholesale and retail trade, repair of motor vehicles and motorcycles	Wholesale and retail	G
49	Transportation and storage	Transportation and storage	H
55	Accommodation and food service activities	Hotels and food services	I
58	Publishing, audiovisual and broadcasting activities	Media	JA
61	Telecommunications	Telecommunications	JB
62	IT and other information services	IT services	JC
64	Financial and insurance activities	Finance and insurance	K
68	Real estate activities	Real estate	L
69	Legal and accounting activities, etc.	Legal and accounting	MA
72	Scientific research and development	Scientific R&D	MB
73	Advertising and market research; other professional, scientific and technical activities; veterinary activities	Other business services	MC
77	Administrative and support service activities	Admin. and support services	N
84	Public administration and defence; compulsory social security	Public admin. and defence	O
85	Education	Education	P
86	Human health activities	Health services	QA
87	Residential care and social work activities	Care and social work	QB
90	Arts, entertainment and recreation	Arts and entertainment	R
94	Other service activities	Other services	S
97	Activities of households as employers; undifferentiated activities of households for own use	Households	T
99	Activities of extraterritorial organisations and bodies	Extraterr. organisations	U

Note: Industries 97 and 99 are not included in the industry level information in Chapter 3.

Annex D. Examples of government support measures

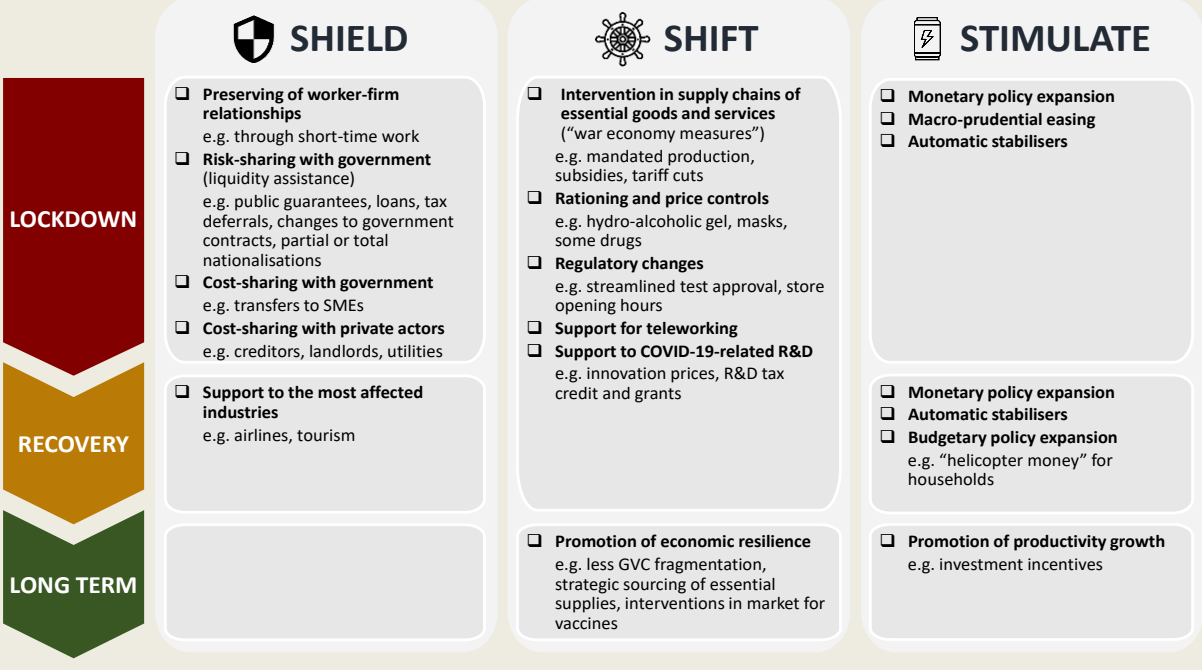
This annex section offers context related to policy measures that provide support to firms and workers in times of economic hardship; both for general recessions and more specifically to economic shocks such as the COVID-19 crisis. It complements the evidence presented in Chapter 2, providing more detail and presenting selected examples of interventions and supports. These include measures for workers, through employment resilience; firms, through liquidity support; and industry, in this example through support for the aviation sector (Box A D.2). Generally speaking, governments across the OECD have designed their strategy to address the economic consequences of COVID-19 around three key policy objectives: supporting firms and workers, stimulating the economy, and promoting structural change (Figure A D.1).

Box A D.1. Government's overall economic policy response to COVID-19

Governments across the OECD have followed what could be termed a **"3 S" strategy** to tackle the economic consequences of the COVID-19 crisis:

- **Shield** firms in the short term to minimise long-term damage, in particular by preventing the "death by accident" of otherwise healthy firms.
- **Shift** the industrial structure to address current needs in terms of essential goods and services, adapt to the current situation and increase resilience to future crises.
- **Stimulate** aggregate demand through expansionary fiscal and monetary policy, ensuring effective timing and leveraging synergies with the "shield" and "shift" efforts.

Figure A D.1. A taxonomy of governments' overall response to COVID-19



Different types of policies are needed at each **phase of the crisis**:

- The short run ("**containment**"), as non-essential activities are suspended.
- The medium run ("**co-existing with COVID**"), as some businesses remain subject to COVID-19-related restrictions and demand is weak.
- The long run ("**vaccine/treatment**"), when interventions should focus on increasing resilience.

Figure A D.1 sketches the overall policy response and provides **examples for each type of intervention**.

Pre-existing government schemes to support workers

As discussed in Chapter 2, labour market institutions contribute to economic resilience by helping employment rebound in the wake of economic downturns, like the one due to COVID-19 and the shutdown of non-essential activities. Moreover, they protect workers' incomes and thus are a key automatic stabiliser to dampen output fluctuation and repercussions on the financial system through loan defaults.

Two main types of policies contribute to such resilience: policies aimed at job retention (temporary work schemes, temporary layoff schemes and administrative measures to limit dismissals) and unemployment insurance systems. Their relative efficiency depended on the length and persistence of the COVID-19 shock, as well as the dynamics of recovery.

Transitory and exogenous shocks typically require limited reallocation of resources on economic grounds. Many of the activities that were temporarily disrupted due to COVID-19 – especially during the initial shutdown period – are likely to bounce back towards pre-crisis conditions (e.g. in professional services). In this case, job retention policies that preserve efficient firm-worker matches are important for ensuring that businesses can resume activity quickly.

Other types of shocks require a sizeable reallocation of resources on efficiency grounds because they induce persistent changes in preferences and relative prices. With COVID-19, some existing jobs may become unviable or obsolete, either through tipping some firms which were only marginally profitable prior to the crisis into loss, or because consumption patterns will be permanently affected by new norms, such as those regarding health (e.g. travel or recreational services). In this case, relying on the unemployment insurance system can be more efficient as it allows for the necessary reallocation of resources.

Table A D.1 categorises OECD countries into those with extensive job retention schemes ("retention-based countries") and those that continue to rely mostly on unemployment insurance ("unemployment insurance-based countries"). Retention-based countries have either expanded existing job retention schemes or introduced large schemes during the crisis, with take-up suggesting that a significant share of businesses and workers are participating in them. Unemployment insurance-based countries do not have a job retention scheme in place, or take-up of existing schemes has been limited to a small fraction of businesses and workers.[1]

Table A D.1. Job retention-based vs. unemployment insurance-based countries

	Job retention-based	Unemployment insurance-based
Australia	•	
Austria	•	
Belgium	•	
Canada	•	
Chile	•	
Colombia		
Costa Rica		

Czech Republic	•	
Denmark	•	
Estonia		•
Finland	•	
France	•	
Germany	•	
Greece		•
Hungary		•
Iceland	•	
Ireland	•	
Israel	•	
Italy	•	
Japan	•	
Korea		•
Latvia		•
Lithuania	•	
Luxembourg	•	
Mexico		
Netherlands	•	
New Zealand	•	
Norway	•	
Poland		•
Portugal	•	
Slovak Republic	•	
Slovenia	•	
Spain	•	
Sweden	•	
Switzerland	•	
Turkey	•	
United Kingdom	•	
United States		•

Note: Split based on expert opinion of the OECD country desks and on the OECD COVID-19 Policy Tracker. For details, see OECD (2020[1]). No data was available for this analysis for OECD countries with blank cells.
Source: OECD (2020[2]), *OECD Economic Outlook, Volume 2020 Issue 1*, https://doi.org/10.1787/0d1d1e2e-en.

Policies enacted to support firms

Protecting healthy firms from the immediate impact of mitigation and containment measures not only aides in short-term resilience, but also helps minimise long-term damage and supports a speedy recovery. As stressed throughout this report, liquidity assistance is key in preventing "death by accident" of otherwise economically viable firms.

Tax systems play a key role in quickly delivering financial support to businesses.[2] Short-term tax measures aim at cushioning the immediate impact of the crisis on firms and maintaining economic capacity. Table A D.2 lists the main tax measures that OECD countries introduced to reduce the adverse impacts of the containment response by supporting business cash flow. Measures are similar across countries, with a strong focus on increased flexibility for taxpayers. As discussed in Chapter 2, the most common measures are tax payment deferrals (mainly for corporate income tax, value added tax and social security contributions), additional time to file tax returns, more lenient tax debt repayment and enhanced tax refunds (OECD, 2020[3]). A few countries also introduced measures that reduce firms' tax burden during the health crisis, with the most common type of waiver related to social security contributions.

Beyond horizontal support measures affecting firms across the board, governments also enacted support targeted at specific industries because of their extreme vulnerability to the consequences of the COVID-19 shock and/or their employment weight (e.g. the aviation industry – see Box A D.2).

Table A D.2. Main tax measures to support business cash flow in OECD countries

	Filing extensions	Payment deferral	Tax debt repayment	Tax refund	SSC reduction	Other tax waivers	Loss offset
Australia		✓	✓	✓			
Austria	✓	✓	✓				
Belgium	✓	✓	✓				
Canada	✓	✓		✓			
Chile		✓	✓	✓			
Colombia							
Costa Rica							
Czech Republic		✓					✓
Denmark		✓					
Estonia			✓				
Finland	✓		✓				
France		✓					
Germany		✓	✓	✓			
Greece		✓		✓	✓		
Hungary		✓		✓	✓	✓	
Iceland		✓		✓			
Ireland			✓				
Israel		✓					
Italy		✓	✓				
Japan	✓	✓					
Korea	✓					✓	
Latvia		✓		✓			
Lithuania		✓					
Luxembourg	✓	✓		✓			
Mexico	✓	✓			✓		
Netherlands		✓	✓				
New Zealand			✓				✓
Norway		✓			✓		✓
Poland		✓				✓	✓
Portugal		✓	✓				
Slovak Republic	✓				✓		✓
Slovenia	✓	✓					
Spain		✓			✓		
Sweden		✓		✓	✓		
Switzerland		✓	✓				
Turkey		✓					
United Kingdom		✓	✓			✓	
United States	✓	✓		✓			✓

Note: Most common tax measures introduced in response to the COVID-19 crisis as of August 2020. Information collected by the OECD Centre for Tax Policy and Administration through delegates from the Inclusive Framework on Base erosion and profit shifting (BEPS) and delegates to Working Party No.2 on Tax Policy and Statistics and No.9 on Consumption Taxes of the Committee of Fiscal Affairs. Categories of measures as follows from left to right: "Tax filing extensions"; "Deferral of tax and/or SSC payments and/ or changes in timing when payments are due and/ or reduction or waiver of advance tax payments (but not of final tax liabilities)"; "More flexible tax debt repayments, including waiving of interest and fines in case of late payments"; "Enhanced tax refunds (VAT and other taxes)"; "Reduced SSCs"; "Tax waivers (in general or targeted to specific sectors or firms) (note that waivers of advance tax payments are included in the tax admin section as they do not imply a waiver of final tax liabilities)"; "Enhanced tax loss provisions (carry-forward or carry-backward)". No data was available for this analysis for OECD countries with blank cells.

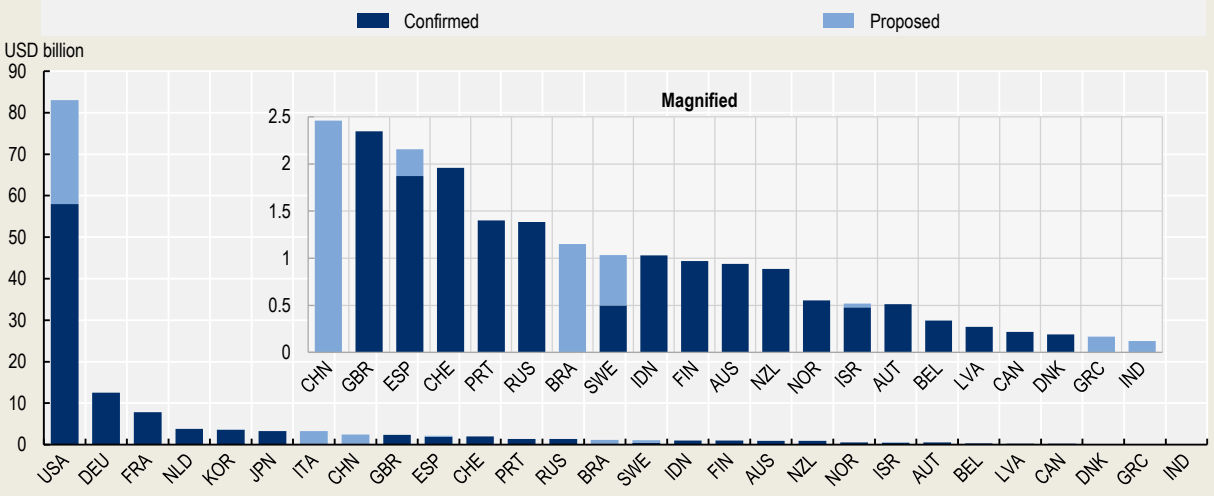
Source: OECD (2020[4]), *OECD Tax Policy Responses to COVID-19* (database), http://www.oecd.org/tax/tax-policy/covid-19-tax-policy-and-other-measures.xlsm (accessed on 20 August 2020).

Box A D.2. Industry support: COVID-19 and the aviation industry

The dramatic drop in demand for passenger air transport (and freight, to a lesser extent) due to the COVID-19 pandemic and containment measures is a threat to the viability of many firms in the aviation industry. These firms are in the air transport sector, but also in support activities to air transportation (including the operation of airports), aircraft manufacturing, rental and leasing services, and refined petroleum manufacturing. The combination of negative demand and supply shocks and the uncertainty around the medium-run outlook creates an uncertain perspective for airline companies. Through inter-industry linkages, this uncertainty affects the whole aviation industry, with many jobs at stake (for more on inter-industry linkages, see Chapter 6).

The aviation industry has often been subject to government intervention, mostly in support of aircraft manufacturers with the rationale of learning-by-doing and significant economies of scale. Public policies have also aimed at coordinating a wide array of suppliers and different sources of knowledge and ensuring aircraft safety. More recently, aircraft manufacturers have been the target of green industrial policies, seeking to accelerate the shift towards low-carbon aircraft. Beyond supporting aircraft manufacturers, governments have also intervened to preserve employment in large air transport companies.

Figure A D.2. Government support to airlines in the aftermath of the COVID-19 crisis



Note: Proposed or confirmed, monetarily quantified relief measures for airlines provided by governments or government-backed entities across 57 countries as of August 20, 2020 in USD billion. Measures include: government-backed commercial loans and government guarantees; recapitalisation through state equity; flight subsidies, nationalisation; deferral and/or waiver of taxes and charges; grants; and private equity.
Source: Adapted from Abate, Christidis and Puwanto (2020[5]).

StatLink https://doi.org/10.1787/888934262106

When it comes to the response to the COVID-19 crisis, many sector- or firm-specific measures have targeted air transport. By August 2020, governments had provided about USD 160 billion of support to airlines (Box A D.2). Almost two thirds of that support consisted of direct aid (e.g. subsidies, loans, equity, cash injection), while a quarter took the form of wage subsidies. Interventions have generally taken three forms:

- untargeted support schemes, designed to provide liquidity to firms irrespective of their activity, including the extension of existing job-retention schemes or the introduction of new ones
- sectoral schemes (e.g. airlines operating in Australia or the whole aviation industry in France), including those supporting airline workers (e.g. the Payroll Support Program in the United States)

- firm-specific support measures, including partial or total nationalisation, implemented by some countries because of the presence of large companies in the air transport sector (e.g. Alitalia, Lufthansa).

Governments can promote a sustainable trajectory for the aviation industry by prioritising sector-wide measures and competition, in particular to:

- strike the balance between the need for support and the risk of distorting competition
- preserve business dynamics and allow exit
- encourage investments in the green transition and thereby increase long-term resilience
- address sustainability along the whole aviation value chain.

Source: OECD (2020[6])."COVID-19 and the aviation industry: Impact and policy responses", https://doi.org/10.1787/26d521c1-en.

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Notes

[1] The categorisation relies on expert opinion of the OECD country desks and on the OECD COVID-19 Policy Tracker to determine whether the system is mostly job retention-based or unemployment insurance-based. In practice, many countries have hybrid systems that combine short-time work schemes and unemployment benefits. Some countries also introduced wage subsidies, which support both worked and non-worked hours. Details on the schemes can be found in Annex Table 2B1 in the June 2020 issue of the *OECD Economic Outlook* (OECD, 2020[2]).

[2] Governments also made use of non-tax measures (e.g. loan guarantee schemes or interest-free loans and cash grants). Moreover, job retention schemes act as a liquidity support measure for firms since employment is not fully adjustable in the short term.

Strengthening Economic Resilience Following the COVID-19 Crisis

A FIRM AND INDUSTRY PERSPECTIVE

The crisis triggered by the COVID-19 pandemic has been unlike any other the world has experienced, requiring social distancing and restrictions on mobility, and rendering some economic activity impossible. This publication explores and compares the characteristics that have affected the ability of firms, workers and consumers to maintain production, employment and consumption during the COVID-19 crisis, across industries and countries. It takes an analytical forward-looking perspective, considering a broad collection of indicators and evidence to guide policies. The aspects covered centre around topics of business dynamics; productivity; innovation and digital technologies; interconnectedness; inclusiveness; and skills.

The report incorporates both a short-term perspective – analysing the supply restrictions and lockdowns that have characterised containment responses – and a medium- to long-term view, focusing on changes in demand that have arisen through recessionary effects and changes in preferences.

The purpose of this publication is to provide insights to policy makers in three ways. First, by providing an overview of the different channels through which the crisis has affected firms differently across industries; then, by identifying country characteristics which may mediate these channels and mitigate or amplify the impacts of this and future shocks on the economy; and finally, by exploring systematic differences in the impact across population subgroups and the implications for policy.

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