

1 The impact of the COVID-19 crisis on productivity in the short and the long term

The pandemic triggered the most severe and abrupt global recession since the end of the Second World War. Concerns have risen that this would lead to a pronounced and long-standing fall in productivity growth. As productivity growth rates in many OECD and APO economies had been declining prior to the pandemic, the downturn could potentially drive productivity growth into zero or negative territory, lowering living standards. Rising uncertainties from the war in Ukraine and enhanced geo-political tensions have intensified those concerns. This chapter seeks to review the potential impact of the COVID-19 crisis on productivity in the short and long term, drawing on recent data and insights from the economic literature. Given the large uncertainties surrounding the pace of the recovery, the analysis remains explorative.

Introduction

The pandemic triggered the most severe and abrupt global recession since the end of the Second World War. Concerns have risen that this would lead to a pronounced and long-standing fall in productivity growth (di Mauro and Syverson, 2020). As productivity growth rates in many OECD and APO economies had been declining prior to the pandemic, the downturn could potentially drive productivity growth into zero or negative territory, lowering living standards. Rising uncertainties from the war in Ukraine and enhanced geo-political tensions have intensified those concerns.

The economic literature on the impact of the crisis on productivity remains inconclusive as several factors are at play. On the one hand recessions are likely to hit primarily less productive firms and result in a reallocation of resources toward more productive firms. On the other hand, permanent losses of capital and of jobs can hamper long-term productivity developments.

The specificities of the COVID-19 crisis make the assessment even more challenging: it affected both demand and supply, curtailing large areas of activity intermittently over months, was fully global and synchronised, combined with strong uncertainties for an extended period of time, with important consequences for corporate investment and savings. At the same time, the policy reaction to limit the spread of the virus and cushion the downturn was unprecedented. The acceleration of digitalisation and take up of teleworking also helped to mitigate the depth of the recession.

Against this background, this chapter seeks to review the potential impact of the crisis on productivity in the short and long term, drawing on recent data and insights from the economic literature. Given the large uncertainties surrounding the pace of the recovery, the analysis remains explorative.

What have been the short-term effects of the COVID crisis on productivity?

The crisis affected both supply and demand and triggered reallocation

In the short term, lockdowns and mobility restrictions sparked both a supply (firms could not operate fully or effectively) and a demand shock (consumers lowered their demand as a result of mobility restrictions, earning losses and rising uncertainties). This results in both a fall in output and hours worked.

The economic downturn also impacted firm dynamics. Under normal circumstances, the exit of the least efficient companies facilitates the growth and the entry of more efficient companies, boosting productivity (Schumpeter, 1939). In times of severe crises, however, this reallocation mechanism may be less effective, as the shortage of demand and financial hardships lead to the collapse of an unusual number of productive firms. At the same time, massive policy reaction in response to the crisis in 2020, is expected to have prevented the collapse of productive firms, but may also have kept in business unproductive firms, altering business dynamism. Reallocation can be counter-cyclical when less productive jobs are being destroyed and labour moves into more productive uses. It can be pro-cyclical when more productive firms are disproportionately affected by recessions. Network effects and participation into increasingly complex and globalised value chains can magnify these effects.

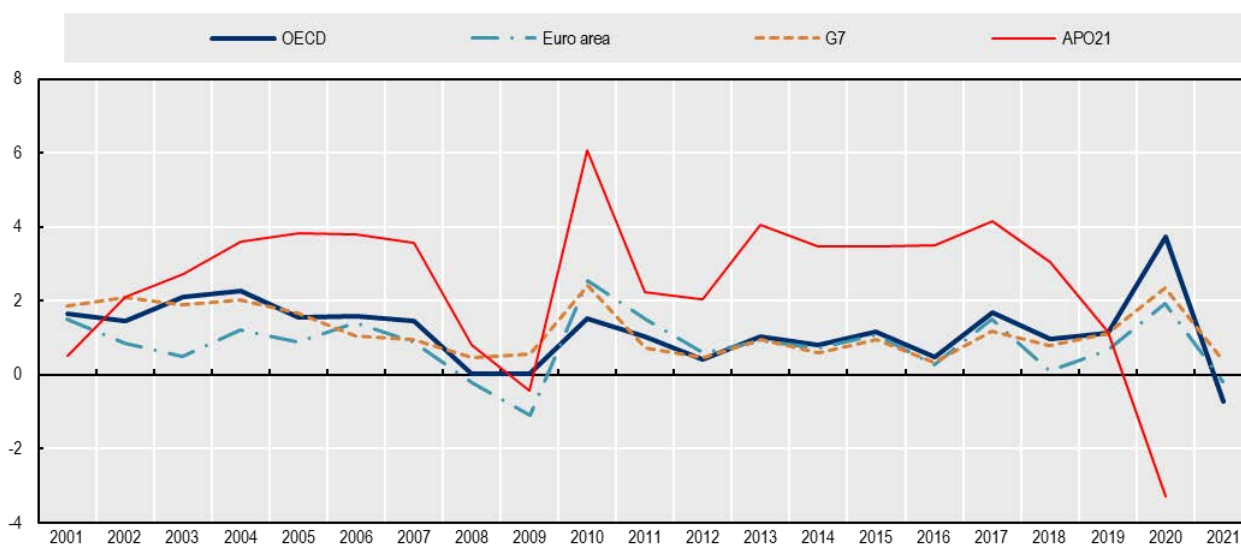
In the case of emerging-market economies, some reallocations may also happen between formal and informal firms, but the resulting impact on productivity during the COVID crisis is ambiguous. Historically, informality has been dampening economic downturns as informal economy output tends to move in the same direction as formal economy output, but in a more muted manner (Elgin et al., 2021). This will mechanically dampen economy-wide productivity growth in a typical economic crisis, as informal firms are usually less productive than formal ones (Ohnsorge and Yu, 2022). During the COVID crisis, however, firms in the informal sector, which are mostly concentrated in low-productivity services sectors, were hit severely (Qiang and Kuo, 2020).

Productivity growth surged in 2020 in most OECD countries, reflecting a fall in hours worked

Labour productivity in the OECD, measured as GDP per hour worked, accelerated in the first year of the pandemic, with growth reaching almost 4% in 2020, compared to slightly above 1% in 2019 and 1.2% on average from 2000 to 2019 (Figure 1.1). The acceleration in 2020 was due to hours worked contracting sharply in low-productivity sectors and firms in the first half of the year, which more than offset a contraction in within-firm labour productivity. During the second half of 2020, hours worked recovered in line with output and resulted in a small drop in labour productivity, which continued in 2021. By contrast, labour productivity continued to slow down in the average of APO economies in 2020.

Figure 1.1. Growth in GDP per hour worked over time

Percentage change



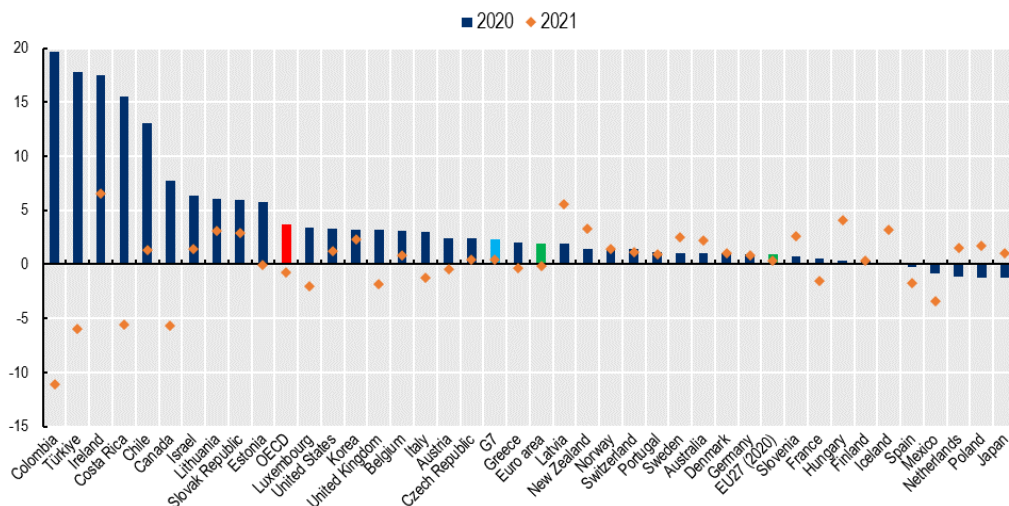
Note: APO 21 is the average of 21 APO economies.

Source: OECD Productivity Statistics database and APO Productivity Databook 2022 (forthcoming), October 2022.

A large disparity can also be observed amongst countries. The surge in labour productivity was less pronounced in the seven largest economies and in the euro area, but still significant (Figure 1.2). Labour productivity growth increased in 2020 at a very fast pace in Colombia, Türkiye, Ireland, Costa Rica and Chile, mostly reflecting a deep fall in hours worked during the year. By contrast, it was flat in Iceland, Finland and Hungary, where GDP and hours worked declined at the same pace, and even negative in Japan, the Netherlands, Poland, Spain and Mexico. In 2021, labour productivity growth was subdued in most OECD countries, reflecting a significant rebound in employment and average hours worked. In the APO economies, labour productivity growth varied significantly across member economies in 2020, with some economies and the APO average showing negative rates (Figure 1.3).

Figure 1.2. Growth in GDP per hour worked in OECD countries

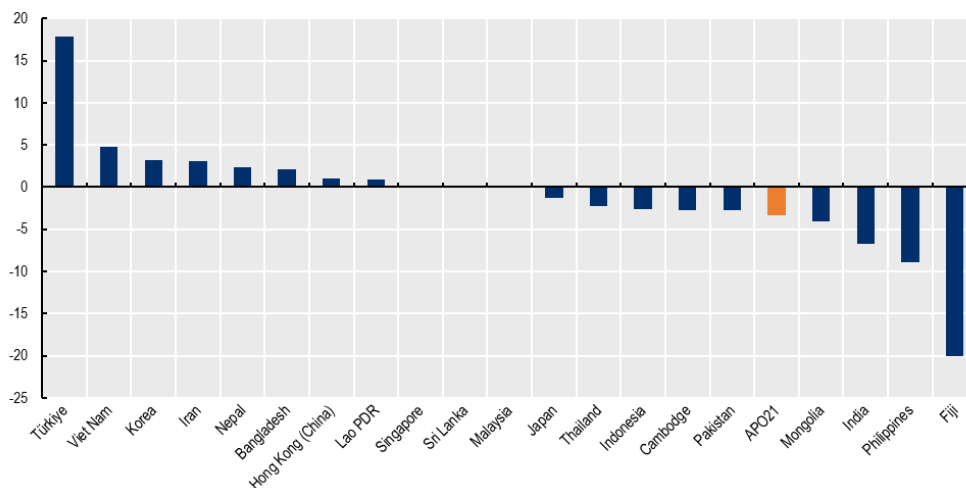
Percentage change



Source: OECD Productivity Statistics database, October 2022.

Figure 1.3. Growth in GDP per hour worked in APO economies

Percentage change, 2020



Note: APO21 is the average of 21 APO economies sourced from the APO Productivity Database 2022. Data shown for Korea, Japan and Türkiye are sourced from the OECD Productivity Database.

Source: APO Productivity Database 2022 (forthcoming), October, 2022.

Multifactor productivity (MFP) growth fell in 2020 in many countries, as capital inputs did not decline as fast as labour inputs (Figure 1.4; Bloom et al., 2022). The fall was particularly marked in France, Japan and the Netherlands. By contrast, MFP growth rose strongly in Canada, while Australia, Korea and the United States experienced a moderate increase.

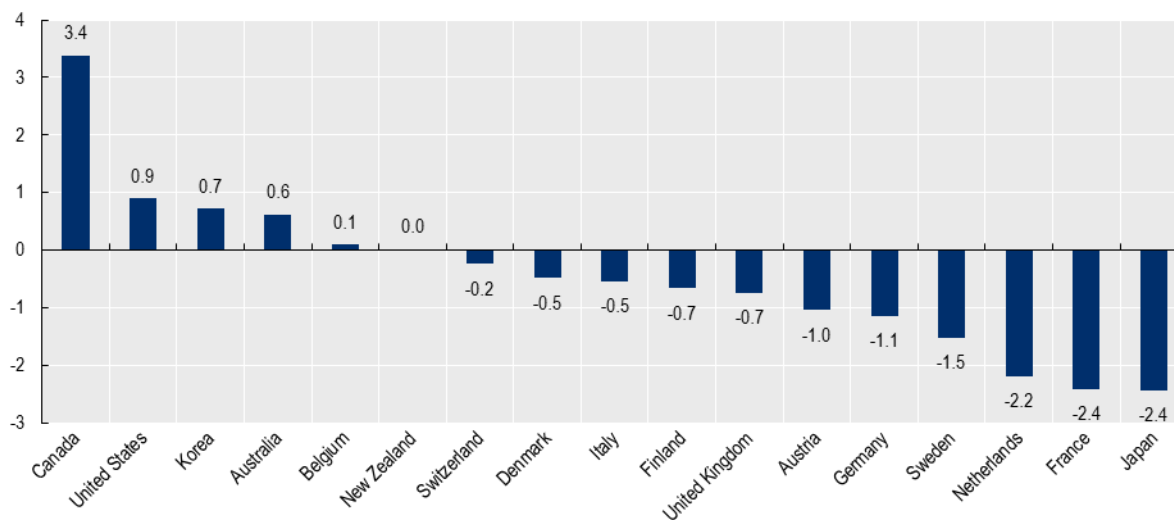
The wide disparity of productivity performances across countries and regions stems from a number of factors. First, recourse to job retention schemes has blurred the line between employment and

unemployment, leading to a different statistical treatment across countries and calling for some caution in international comparisons of productivity in 2020 (Box 1.1).

Second, cross-country disparities can also be explained by differences in the timing of the start of the crisis, economic structure and in the magnitude and composition of fiscal packages. There is also evidence that the acceleration in the pace of digitalisation and teleworking has varied across countries (see below). Finally, changes can take time and involve transitory adjustment costs, meaning that effects on productivity may materialise with a lag which can vary across countries and sectors.

Figure 1.4. Multifactor productivity growth in selected OECD countries

2020, percentage change



Source: OECD Productivity Statistics database, October 2022.

Box 1.1. International comparability of employment measures during the pandemic

The comparability of unemployment data across OECD countries is achieved through the adherence of national statistics to International Guidelines from the International Conference of Labour Statisticians (ICLS) – the so-called ILO guidelines.

Departures from these guidelines may however exist across countries depending on national circumstances (e.g. statistical environment, national regulations and practices). Typically, these departures have only a limited impact on broad comparability of employment and unemployment statistics. However, the unprecedented impact of COVID-19 is amplifying divergences and affects the cross-country comparability of employment and unemployment measures.

This concerns in particular the treatment of persons on temporary layoff or employees furloughed by their employers. These are persons not at work during the survey reference week due to economic reasons and business conditions (i.e. lack of work, shortage of demand for goods and services, business closures or business moves).

According to ILO guidelines, 'employed' persons include those who, in their present job, were 'not at work' for a short duration but maintained a job attachment during their absence (ILO, 2013 and 2020). Job attachment is determined on the basis of the continued receipt of remuneration, and/or the total duration of the absence. In practice, formal or continued job attachment is established when:

The expected total duration of the absence is up to three months (which can be more than three months, if the return to employment in the same economic unit is guaranteed and, in the case of the pandemic, once the restrictions in place where applicable are lifted)

OR

Workers continue to receive remuneration from their employer, including partial pay, even if they also receive support from other sources, including government schemes.

In turn persons are classified as 'not employed' if:

The expected total duration of absence is greater than three months or there is no or unknown expected return to the same economic unit

AND

People in this condition do not receive any part of their remuneration from their employer.

Not-employed persons are classified as 'unemployed' if they fulfil the criteria of active "job search" and "availability" specified for the measurement of unemployment.

However, departures from these guidelines in national practices do exist. In Canada and the United States persons on temporary layoff are considered to be "only weakly or not at all attached to their job and are to be counted as unemployed" (Sorrentino, 2000). In the United States, people on temporary layoff are classified as 'unemployed' if they expect to be recalled to their job within six months. If they have not been given a date to return to work by their employer and if they have no expectation to return to work within six months, they need to fulfil the "job search" criteria to be classified as 'unemployed'. For the latest US figures "people who were effectively laid off due to pandemic-related closures were counted among the unemployed on temporary layoff" without further testing for their return to their previous job (BLS, 2020). In Canada, persons in temporary layoff are also classified as 'unemployed' if they have a date of return or an indication that they will be recalled by their employers.

Conversely, persons on temporary layoff are classified as employed (not at work) in Europe, as recommended by the ILO Guidelines (Eurostat, 2016). In practice, formal job attachment is tested on

the basis of (i) an assurance of return to work within a period of three months or (ii) the receipt of half or more of their wage or salary from their employer. Somewhat stricter than ILO guidance, absences during COVID-19 crisis whose duration is unknown are treated as absences longer than three months. Those failing to satisfy these two criteria are classified as unemployed if they are “available to start work” (over the next two weeks) and have actively searched for a job in the last four weeks. All other persons on layoff are classified as inactive.

Source: Arnaud (2020).

Developments during 2020 do not necessarily capture the impact of the pandemic on productivity as they also encompass other factors at play, in particular the unprecedented policy reaction and the take-up of teleworking that contributed to mitigate the original impact of the crisis. Estimates of the short-term crisis impact on productivity are scarce. Bloom et al. (2022) find that MFP fell by up to 5% in the United Kingdom during 2020-21, using firm-level survey data. The impact was largely driven by large reductions in ‘within-firm’ productivity, with firms, on average, reporting higher unit costs corresponding to a combination of higher intermediate input costs and lower and less fully utilised capacity. These were offset partially by positive ‘between-firm’ effects as less productive sectors, and less productive firms within them, contracted. Those results match at least qualitatively those in the United States and could be eventually generalised to other developed economies that have been heavily affected by the pandemic.

The aggregate figure masks heterogeneous productivity performance

Services sectors were the hardest hit

Beyond its aggregate impact, the recession affected economic sectors in different ways, both in terms of output and hours worked, with heterogeneity across sectors exceeding heterogeneity across countries. Most of the hardest hit sectors correspond to low-productivity services activities where face-to-face interactions are essential (e.g. accommodation and restaurants, and household services). Value added and hours worked declined in these sectors, especially during the first half of the year, because of the social distancing regulations. Sectors which suffer from travel restrictions put in place to contain the propagation of the virus were also severely struck (e.g. air transport).

The impact on output and hours worked in most other sectors was negative but less severe because it occurred through indirect links, e.g. through a drop in demand in downstream sectors or through disruptions in the value chain (e.g. food). At the other end of the spectrum, some sectors, such as information and communication, experienced an increase in value added.

Sectoral reallocation changed the relative weights of economic sectors and, as low-productivity sectors contracted, contributed mechanically to sustain aggregate productivity levels in the short term. As restrictions were temporary, these effects are expected to be short-lived.

Small and informal firms were affected more severely

Beside the sectoral effects, small firms were less able to weather the crisis than larger firms (D’Adamo et al., 2021) and experience larger declines in hours (ILO, 2021), leading to a recomposition effect within sectors. Indeed, small and young firms were less likely to receive government support than larger firms (OECD, 2021a). More generally they have more limited access to finance and rely disproportionately on a few key customers (de Nicola et al., 2021; OECD, 2021a). In addition, small firms consistently report that costs, and lack of skills and awareness of digital tools, remain concerns for investing in digital technologies (OECD, 2021b).

Preliminary evidence on Indonesia also suggests that informal firms were particularly affected by the pandemic (Pitoyo et al., 2020). This contrasts with past episodes of recessions when the resilience of the informal sector traditionally served as a buffer. As informal firms are usually less productive than formal ones, this may have temporarily boosted aggregate productivity.

Stabilisation policies have preserved employment and ease access to finance in the short term

One specificity of this crisis was the massive policy reaction at the onset of the shock to support households and firms. Job retention schemes in most countries aimed at supporting incomes and preserving the working relationship between employers and employees. They led to a disconnection between the number of persons employed and the number of hours worked during the COVID-19 crisis and to an extreme case of labour hoarding, whereby firms retain their employees in times of economic downturns despite the drop in sales.

Government support directed to firms has also had an impact on productivity, even if those effects may take some time to materialise. These include measures to ease access to credit, such as loans or guarantees by the government and/or the easing of macro-prudential policies. Large-scale monetary policy measures also facilitated access to finance. Those policies are likely to have supported productivity, as there is significant evidence that negative credit shocks reduce firm investments in productivity-enhancing activities (Manaresi and Pierri, 2019; Duval, Hong, and Timmer, 2020; Lenzu, Rivers, and Tielens, 2020).

Regulatory measures such as changes in bankruptcy laws were also introduced and together with support to credit, had an impact on firm dynamics. Contrary to what observed during the financial crisis, firm entry increased significantly in the aftermath of the COVID crisis. By contrast, exit and bankruptcy declined, as emergency and recovery packages maintained many businesses in a hibernation stage.

Overall, the impact on productivity will depend on how effective those packages have been in protecting productive firms while not allowing non-productive firms to remain in business. If the former outweighs the latter the impact on productivity will be positive. Evidence from single country studies suggests that less productive firms were more likely to exit during the COVID crisis and reallocation of resources amongst incumbents has been positively related to size and productivity, pointing to an overall positive effect on productivity (Crisciuolo, 2021; Conseil National de la Productivité, 2021).

Adoption of digital technology and teleworking have cushioned the downturn

The pace of digitalisation has accelerated

The COVID crisis and resulting restrictions have been a catalyst for an unexpected acceleration in the adoption of digital technologies. By helping businesses to continue operating, those have cushioned the impact of the economic downturn.

The magnitude of these changes on productivity at short horizons is difficult to estimate precisely, given their unprecedented nature. It is also challenging to establish a causal link between the take up of digital technology and productivity, as productive firms are more likely to adopt new technologies. Finally, at the aggregate level, effects of the adoption of digital technologies are difficult to assess systematically, due to the variety of technologies involved and limitations in the coverage of data on technology adoption.

The adoption of digital technologies depends both on firms' capabilities (e.g. managerial and technical skills, access to financing) and incentives (e.g. a competitive business environment) with strong complementarities between the two (Andrews et al., 2018). In general, firms that are more productive than the average firm, have better access to key technical, managerial and organisational skills and have benefitted more from digitalisation. In addition, the low marginal costs and strong network effects of certain

digital activities tend to benefit a small number of highly productive “superstar” firms, increasing their lead compared to other firms.

The prevalence of teleworking has risen

Mobility restrictions have encouraged the take up of teleworking across the globe. A recent survey from the OECD Global Productivity Forum shows that the adoption rate of telework more than double in all firm size categories and reports a marked increase in the share of regular teleworkers (at least one day per week) from almost 31% to almost 58% in the first wave (Criscuolo et al., 2021).

The take up of teleworking was more common in developed economies with a high share of occupations where face-to-face interactions is not essential. But variation was also observed across developed countries. In Japan, for instance, the prevalence of teleworking has been much less pronounced than in other advanced economies. By contrast, the share of workers teleworking rose from 15% before the pandemic in the United States to around 50% (Brynjolfsson et al., 2020) and about 34% of the workforce worked exclusively from home in the European Union (Eurofound, 2020). Heterogeneity across countries is likely to be related to the availability of ICT infrastructure and skills or educational attainment and a managerial culture conducive to teleworking together with the stringency of lockdown measures (Criscuolo et al., 2021; OECD, 2021).

Teleworking shapes productivity and firm performance through several channels. First teleworking can affect worker satisfaction in conflicting ways. While less commuting or empowering working with greater autonomy can help to raise productivity, isolation, lower prospects for career development, inadequate working environment and the difficulty to separate work from private life have an opposite effect. Second, teleworking reduces capital use (office space and equipment) and raises MFP and enlarges the pool of potential workers, reducing skill mismatch and/or labour costs. However, the lack of physical proximity is less suitable to communication and knowledge flows within and across firms, and management oversight. Finally, the relationship between teleworking and productivity may vary depending on the presence and quality of ICT and broadband infrastructure.

The combination of all these factors suggests the existence of a U-shape relationship between the intensity of teleworking and efficiency at the worker level (Bloom et al., 2021). Countries or firms may have fallen in different place within this curve, explaining the variety of estimates of the impact of teleworking on productivity across countries. Survey evidence points to a positive impact on self-assessed productivity by managers or by employees in OECD economies (Criscuolo et al., 2021; Barrero et al., 2021; Taneja et al., 2021). But evidence from Asia points to a negative effect (Gibbs et al, 2021; Morikawa, 2021).

What long-term impact can be expected?

Even though the COVID shock originated from beyond the economic circle, lockdowns and mobility restrictions triggered a deep economic recession. In this regard, its long-term impact on productivity may not differ markedly from what was observed in past economic crises. Losses incurred in the short term may have had an impact in the long term, through potential hysteresis effects (e.g. via human capital and investment).

Contrary to past crises, however, the COVID crisis has altered significantly production and consumption behaviours and preferences. At this stage, it is too early to determine whether these changes will be long-lasting, revert back to a pre-crisis environment or to a situation in-between.

The second major difference regards the massive policy reaction in response to the crisis. In particular, difficulties of managing reallocation dynamics during the economic downturn may have distorted the potential for productivity-enhancing reallocation in the long run. Future policy settings and regulatory measures will also shape productivity developments at this horizon.

Against this background, this section examines the main long-term impact of the COVID crisis on productivity. Given the large uncertainties at this horizon, predicting the most likely outcomes and quantifying an impact are beyond the scope of this chapter.

A number of factors may hamper long-term productivity gains

Elevated uncertainties and tightened financial conditions will deter investment

History suggests that pandemics are usually followed by sustained periods with depressed investment opportunities (Jorda et al., 2020). The post-COVID environment is expected to be less conducive to investment than in the past and thus to hamper long-term productivity gains. Financial conditions are likely to tighten, as support measures which have eased access to finance and protected illiquid firms from bankruptcies unwind and monetary policy normalises. The war in Ukraine has also endangered the recovery. Energy costs, inflation and supply-chains disruptions have increased. At the same time, uncertainty has risen to unprecedented levels and, because of geo-political tensions, it is unlikely to dissipate soon (OECD, 2022). This combined with rising private debts, is likely to deter investment in both tangible and intangible assets, which are often long term and irreversible (Aghion et al., 2010).

The exit of productive firms means the loss of some intangible assets that matter for productivity and will be difficult to rebuild, including the loss of supply chain relationships, firm-specific workers skills and know-how and is likely to negatively hamper long-term productivity developments.

Overall, de Nicola et al. (2021) reckon that the pandemic is likely to have a long-lasting impact on productivity growth in the East Asia and Pacific region, as firm indebtedness and increased uncertainties will inhibit investment and firm closures led to a loss of valuable intangible assets.

Labour-market scarring can restrain productivity prospects

Recessions may result in a labour-market hysteresis effect, whereby long periods of unemployment may lead to irreversible loss in human capital (Blanchard and Summer, 1986; Blit, 2020). Those scarring effect may affect vulnerable workers in particular women, youth and low-income workers, disproportionately and loosen their attachment to the labour markets (ILO, 2021a; OECD, 2021c).

The situation has been particularly critical for young people in the first years of the pandemic. While usually in periods of economic crises, young people facing high unemployment risks may decide to remain in school, this decision has been influenced by disruptions in the provision of educational services during the pandemic and the shortage of student jobs. This has increased the risk to drop out from school and weighed down on human capital accumulation.

Evidence from a number of countries also suggests that the cohort of young people entering the labour market during a recession encounters less job opportunities and fails to catch up in terms of employment and/or wages with those of previous cohorts over time (von Wachter, 2020). Recessions also have an impact beyond career prospects on fertility (Currie et al., 2014), self-reported health (Maclean and Hill, 2015) and more generally well being (de Neve et al., 2018), which all are particularly important for productivity (Chapter 3).

Looking further ahead, lockdowns and successive waves of the pandemic have sometimes lowered the efficiency of the education system, especially for children from disadvantaged backgrounds for whom homeschooling was difficult. Those factors are likely to alter the quality of human capital in the long term, which is a key driver of long-term productivity, though the extent of this effect is hard to gauge.

The missing start-ups will slow technology diffusion

A severe economic downturn may also lead to a missing generation of start-ups or limit the growth of start-ups that manage to survive. Recent studies have suggested a drop in start-up creation during the crisis (Benedetti Fasil et al., 2020). Fewer start-ups in East Asia and the Pacific entered during the crisis: for instance, new business registrations dropped by 5.1% in Viet Nam in the first seven months of 2020 (National business registration portal, 2020). While this effect is expected to be marginal in the short term, as new firms account for a small share of firms, the absence of those start-ups can affect long-term productivity as they often play a key role in diffusing new technologies and business models (Criscuolo et al., 2017)

Rising concentration in digital sectors may dampen productivity growth

By stifling reallocation and firm dynamics, rising market concentration and market power can be detrimental to long-term productivity gains. Rising concentration preceded the COVID-19 crisis in many OECD countries (Calligaris et al, 2018; Calvino and Criscuolo, 2019). Such a trend was visible in Europe, but less pronounced than in the United States (Bajgar et al., 2019). More recent evidence points to increased concentration in digital intensive sectors, given the larger number of sizeable merger and acquisition deals by the largest players in these sectors (Criscuolo, 2021). Looking forward, concentration may increase even further, as some new technologies such as artificial intelligence require large intangible investments (e.g. in R&D, algorithms and data), with unknown consequences on aggregate productivity (Chapter 3).

Slower integration in global value chains may limit productivity gains

The extensive and fast of integration of global production into global value chains (GVCs) has raised the issue of their impact on productivity. There is a widespread perception that the positive effects such as lower costs or better inputs and reallocation of factors towards more efficient tasks more than offset any cost due to the outsourcing of value added previously produced domestically arising from transportation, administrative duties, institutional and cultural barriers (Chapter 3). In this context, international trade integration can suppress the least productive firms, which cannot bear these additional costs, and aggregate productivity increases thanks to the reallocation of productive resources from less to more efficient firms.

The COVID-19 crisis and the disruption in supply chains experienced in the past few years have encouraged countries to consider reshoring strategies to reduce dependence in strategic areas. This suggests slower or even perhaps reversion of global integration trends, resulting in limited productivity gains at the firm level in the medium to long term.

Digitalisation and new forms of work may support productivity gains

Digitalisation will continue, although perhaps at a slower pace than in 2020

Digitalisation can spur long-term productivity gains by altering the production process through the automatisisation of certain tasks. It can also help performing some tasks remotely and facilitate communications with suppliers and customers. It enables firms to access wider markets, for instance by simplifying access to information through digital platforms. Digitalisation can also have the potential to enhance skills, for example thanks to online courses and educational games. Conversely, high exposure to screens and an overflow of information can contribute to sleep deprivation and reduce workers' ability

to focus and lead to mental health sickness, undermining productivity (Bubonya et al, 2017; Gibson and Shrader, 2018).

Evidence from business surveys points to the majority of firms across the globe having intensified their use of digital technologies during the pandemic. In East Asia and the Pacific, the pandemic has encouraged many firms to have recourse to digital platforms and increase the use of digital financial services (De Nicola, 2021; Fu and Mishra, 2020).

Looking ahead, artificial intelligence is expected to extend the range of automatable tasks, including routine cognitive tasks that are typical of service activities, while further development of communication technologies will increase possibilities to outsource service tasks (Sorbe et al., 2019). However, the rapid pace at which firms and households adapted their ways of producing and consuming at the start of the pandemic suggests that even if the trends continue the pace of digitalisation is likely to slow in the coming years.

Reaping the benefits of digitalisation will require changes in business practices, work organisation, skill composition, and a reallocation of resources within and across firms and industries (OECD, 2019). This necessitates three forms of complementarities: between the technologies; with firms' capabilities and assets, such as technical and managerial skills, organisational capital, innovation and financing capacity; and with policies that promote competition and an efficient reallocation of resources in the economy.

If all these complementary factors are in place, OECD analysis on past take up of technologies suggests that gains from digital adoption could be substantial. A 10-percentage point increase in the share of firms using high-speed broadband internet is associated with a 1.4% increase in MFP for the average firm in the same industry after 1 year and 3.9% after 3 years across EU countries (Gal et al., 2019). Estimates related to the adoption of cloud computing are smaller but still significant (0.9% after one year and 2.3% after 3 years). These estimates probably represent an upper bound of actual gains since they assume that the estimated effects are fully causal. Effects for individual firms, industries and countries can vary widely around these averages as they depend on complementary factors.

Platform development is found to have enhanced the productivity of existing service firms over the past decade (Bailing et al., 2019). The order of magnitude is roughly similar to the one found for the effect of increased access to high-speed internet (about 0.4% every year over 2011-17 for the average service firm). These positive effects on the productivity of incumbent service firms come from aggregator platforms which connect users to existing service providers (e.g. Tripadvisor), while there has been on average no significant effect of disruptor platforms which enable new types of service providers (e.g. Airbnb). Effects for individual firms, industries and countries vary depending on complementary factors, including the intensity of competitive pressures among platforms.

Overall, while new technologies offer many possibilities, the extent to and the horizon at which they will foster productivity remains difficult to assess, especially as the COVID-19 crisis may have changed substantially the economic environment. At the same time, a greater diffusion of existing technologies (e.g. broadband internet, cloud computing and online platforms) could already yield clear productivity benefits in the future (Criscuolo, 2021).

There are signs that the increase in teleworking is here to stay

There are some emerging signs that the increase in teleworking is likely to persist over time, even though full teleworking is unlikely to become the norm. Survey data collected by the OECD Global Productivity Forum suggest that managers and workers had an overall positive assessment from teleworking both for firm performance and for individual well-being, and wish to increase substantially the share of regular teleworkers from pre-crisis levels (Criscuolo et al., 2021). Respondents, on average, find that the ideal amount of telework is around 2-3 days per week, in line with other recent evidence and with the idea that

the benefits (e.g., less commuting) and costs (e.g., impaired communication and knowledge flows) need to be balanced at an intermediate level of telework intensity.

Empirical analyses also suggest an asymmetric reaction of the recourse of teleworking to restrictions, with a strong increase in teleworking after a tightening in restriction, but no strong effect after an easing. This asymmetry implies that the increase in teleworking experienced at the start of the pandemic is likely to be only partially reverted (Adrián et al, 2021). One feature that is likely to influence the decision to telework is the quality and the ease of access to broadband.

Although quantifying the long-term impact of teleworking on productivity is challenging, Barrero et al. (2021) foresee a 5 % productivity boost in the post-pandemic US economy on employer plans and given the relative productivity of teleworking compared to work in the office. Only one-fifth of this productivity gain will show up in conventional productivity measures, because they do not capture the time savings from less commuting. At this stage it is difficult to expand those results to other countries, given the country, sector and firm-specific nature of the mechanisms at play.

Long-term developments in productivity remain uncertain

The long-term impact of the COVID-19 crisis on productivity will depend on the balance of the negative and the positive effects mentioned above. Quantitative estimates are still scarce and fragile, and have relied on a range of methods (Table 1.1). They point to no significant effect on MFP in the long term, when considering all past recessions, but to a significant negative effect in case of deep recessions.

It is likely that the effect will vary across countries, sectors and firms, depending on their initial conditions (e.g. in terms of broadband penetration rate, institutions). Indeed there are substantial costs borne by firms in terms time and resources associated with changing activity. Some of these costs are inherent to the process of reallocation but market structure and the regulatory and institutional framework play a critical role in determining the extent to which the reallocation is productivity enhancing (Haltiwanger, 2011). This is true for both advanced and emerging-market economies, where the scope for productivity-enhancing reallocation is higher.

Table 1.1. Selected studies on the long-term impact of the COVID-19 crisis on productivity

	Method	Effect on MFP	Effect on labour productivity
Furceri and Mourougane (2012)	Local projections on past financial crises in OECD countries	No significant effect in the long term	
Oulton and Sebastián-Barriol (2013)	Estimations looking at episodes of past banking crisis in 61 countries	Persistent impact on the level :- 0.8% (not significant)	
Furceri et al. (2021)	Local projections on episodes of past crises	No significant effect for recession on average Persistent impact on the level :- 3% after 5 years for deep crises	
Bloom et al. (2022)	Firms' responses to a questionnaire	Broadly unchanged, but fall by 1% when accounting for the deterioration in quality	Fall by 0.4% in the medium term

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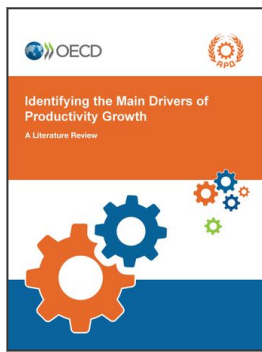
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