



CONSEIL NATIONAL
DE PRODUCTIVITÉ

PRODUCTIVITY AND COMPETITIVENESS: POST-COVID CYCLICAL AND STRUCTURAL ANALYSES

Third Report
National Productivity Council

Executive Summary

MAY 2022

This report presents both the cyclical and structural shifts triggered by the Covid crisis and the policy response to it, and draws comparisons between France and other countries. Compared to other countries, France managed the Covid crisis rather well in 2020-2021. The evolution of employment, GDP, mortality as well as the balance sheet of companies during the crisis and its aftermath is similar in France compared to other countries. Compared to Germany, the government's budget deficit and public debt increased slightly more, but much less than in the United Kingdom, Spain and the United States.

The crisis resulted in a short-run loss of productivity, reflecting the fall in GDP while employment was safeguarded. In the medium run, with considerable uncertainty, the crisis may positively affect productivity through the increase in teleworking, better dissemination of new technologies and accelerated reallocations.

To accelerate productivity gains, the role of skills, training and soft skills is France's major structural challenge, given its underperformance in this area. Focusing on skill acquisition could help narrow the gap between the most and least productive companies. Continuing to improve France's attractiveness for investment will be crucial to reindustrialize the country, regain competitiveness, accelerate productivity gains, improve employment and living standards, and enable better management of the ecological transition. Specifically, further changes to the tax system to reduce its weight on production factors (capital and labour) and align it with those of other advanced countries should be considered.

Impact of the Covid crisis and productivity

The comparative macroeconomic situation in France

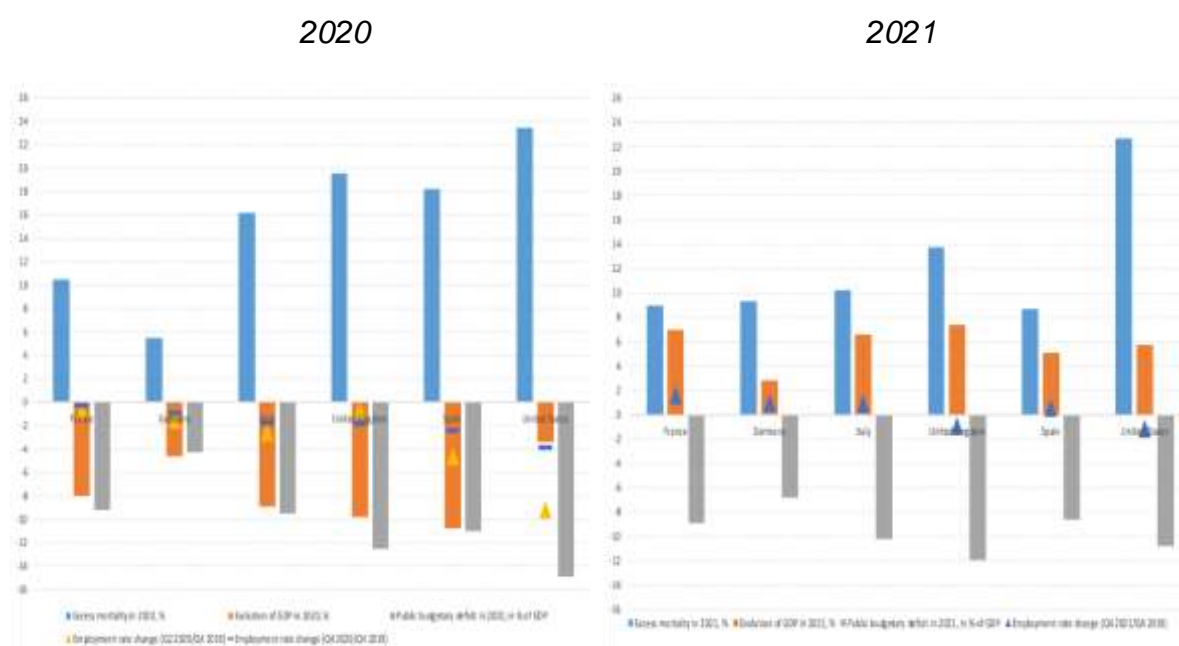
The recovery has been stronger in France than in the comparison group of selected European countries. France was one of the first countries to catch up with its pre-crisis GDP level in the summer of 2021.

Compared to before the crisis, employment has improved in France. This improvement is seen both in the unemployment rate (7.4% at the end of 2021 compared to 8.1% at the end of 2019) and in total employment, which is 1.1 percentage points higher already in the third quarter of 2021. Hours worked per job have almost returned to their pre-crisis level.

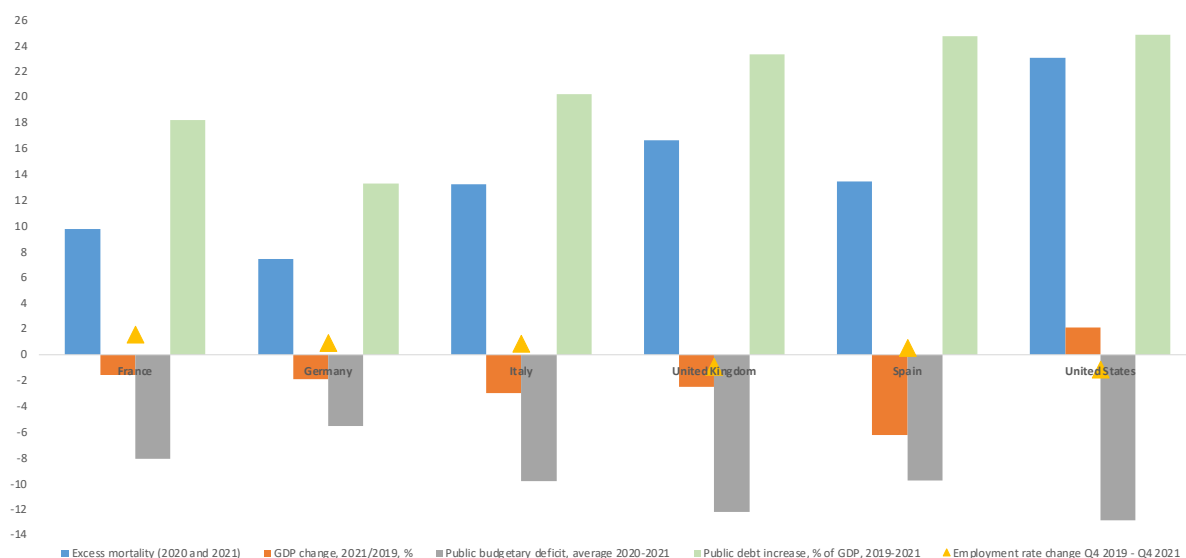
In the United States, the health effects of the pandemic were more pronounced, with higher excess mortality. Maintaining GDP levels was the policy priority, resulting in a larger government budget deficit and a more pronounced fall in employment than in European countries. This illustrates the effect of *furlough* schemes in European countries, which were not implemented in the United States. In particular, France experienced a very small drop in the employment rate, even during the pandemic's first wave.

Overall, over two years, the pandemic and the management of the crisis had a lesser impact on GDP in the United States but a greater impact on public debt and on short term employment fluctuations. The United Kingdom experienced a larger decline in GDP and employment, as well as a greater increase in public debt, compared to France, despite a comparable health impact of the pandemic. France appears to be in the average in terms of health outcomes (excess mortality) and public debt increase. However, the evolution of its GDP and employment is more favorable than in other European countries, including Germany, which was less affected by the pandemic over the whole period.

Figure 1 – Impact of the Covid crisis on key economic, fiscal and health indicators



Cumulative 2020 and 2021



Note: the excess mortality rate is calculated in relation to the average mortality between 2016 and 2019.

Source: EuroMomo, Human Mortality Database; IMF, OECD

Household purchasing power recovered and exceeded the pre-crisis level in France in the third quarter of 2021. This recovery is stronger than the one observed on average in other European countries, and partly explained by employment dynamics. The decline in employment had been less severe during the crisis (-1.3%). In 2021, household gross disposable incomes rose sharply (+3.9% after +1.0% in 2020), as a result of a marked rebound in earned income and a moderate decline in social benefits. Taking into account the rise in consumer prices, household purchasing power per consumption unit rose sharply in 2021 by 2.3%, after having stalled in 2020 (0.4%).

Business and household confidence indicators recovered faster than in previous crises. The crises of 2008 and 2011 had a lasting effect on household and business confidence. In contrast, the implementation of various measures to support households and businesses and the recovery of economic activity enabled business and household confidence to return to its pre-crisis level as soon as health restrictions were lifted or relaxed, before a relapse in March 2022 linked to the war in Ukraine. In France, the business climate is above its long-term average in industry, services, construction and retail trade. For households, the pre-crisis level of confidence was reached in May 2021. The other countries followed comparable trajectories except for Japan and the United States, which remained at levels of household confidence below the long-term average.

France's current account balance improved significantly in 2021 after a decline in 2020. After two exceptional years with a current account deficit limited to 7.1 billion euros in 2019 and rising to 43.7 billion euros in 2020, the current account deficit in 2021 fell to 23.2 billion euros. At -0.9% of GDP, it thus returns to a level close to balance and to its pre-crisis average (-0.6% of GDP on average between 2007 and 2019). This EUR 20.5 billion improvement in the current account balance is explained by the EUR 19.8 billion increase in the surplus on services and the EUR 11.2 billion increase in the income balance, which more than offset the EUR 10.4 billion decline in the goods balance including trade. Excluding trade¹; the goods trade deficit increased by EUR 20 billion, of which EUR 17.9 billion was due to higher energy prices. The income balance, which had worsened sharply in 2020, recorded a surplus of EUR 10.9 billion in 2021. Both energy and non-energy goods saw a decline in their balance.

There are risks to the recovery, particularly in view of the war in Ukraine and persistent bottlenecks. The recent rise in consumer prices, linked in particular to the sharp rise in energy prices, points to a sustained return of inflation in the medium term. However, the rise in inflation and energy prices is less strong in France than in its partner countries.

One of the explanations for this increase is the presence of global shortages of material or equipment in certain industrial sectors, which have caused the price of production inputs to rise. Another factor is the particularly high rise in energy prices. Another point of attention is the shortage of workers, which has been increasing in France, Germany and Italy in particular since the beginning of 2021.

A risk factor for the recovery is the fragility of firms, even if the health crisis has not necessarily deteriorated their financial health on average. Overall, the financial situation of firms has been relatively stable in France. Their outstanding net debt remained stable during the crisis even if this hides large disparities between firms. The fact remains that the level of net debt of French firms remains relatively high at 42.4% of GDP compared to most other European countries but below Sweden, Canada and the United States.

All in all, the major risks relate to the evolution of energy prices, consumer prices and therefore purchasing power, the evolution of interest rates and therefore the burden of

¹ Merchanting refers to (i) purchases of foreign goods resold to non-residents without transiting the French customs territory and (ii) purchases and sales to non-residents of French goods not leaving the French customs territory.

public debt, as well as the persistence of the epidemic risk and strong geopolitical tensions.

Productivity and Covid-19

In France, hourly productivity has returned to its pre-crisis level over the course of 2021, but it has not yet reached the level that would have been observed in a counterfactual "no crisis" situation. Catching up to the pre-crisis path will require a catching up of hourly productivity.

In the medium term, the effects of the Covid crisis on aggregate productivity can be broken down into two channels. The first channel corresponds to the "creative destruction": the exit of low-productivity firms and the reallocation of resources to the most efficient firms (a between-firm effect). The second channel is a within-firm effect: it corresponds to the productivity gains of existing firms through investment or innovation. For the first channel, the future evolution of employment between firms and sectors as well as at the aggregate level will mechanically influence the evolution of hourly productivity. For the second channel, part of the catching-up could come, for example, from a better organization of work within companies, once social distancing and other sanitary constraints have been fully lifted. Another contribution could come from progress linked to accelerated digitalisation, even if the effects of telework on productivity remain ambiguous at this stage (analyzed in Chapter 3).

To cope with a major shock, unprecedented emergency measures were put in place. These had a significant impact on the financial health of companies, and therefore on their productivity. Measures such as *furlough*, aimed at preserving people in employment when economic activity collapsed led to very significant short-term fluctuations in labour productivity, linked to variations in economic activity. As different economic sectors were affected differently, a composition effect played strongly during the health crisis between high productivity and low productivity sectors. This effect is expected to diminish gradually as pandemic-related sanitary constraints are relaxed.

The crisis has not led to an increase in bankruptcies, as emergency measures supported businesses. Instead of increasing, bankruptcies fell by 45% between March 2020 and October 2021 compared with the same period in 2018 and 2019. The fall in bankruptcies appears to be, paradoxically, particularly strong in sectors where the shock to activity was very strong, bearing witness to the significant effect of the emergency measures deployed. For example, the catering industry saw the number of bankruptcies fall by 57% over the period March 2020-October 2021, despite aggregate turnover contracting by 31%.

Highly productive firms experienced a large negative demand shock, but the shock was stronger for less productive firms. The emergency support measures may have reduced the risk of insolvency for all firms regardless of their productivity level. However, according to the OECD, in the absence of emergency measures almost a quarter of firms in the top productivity quartile might have been in an illiquidity position compared to only 5% with them.

Several risks remain concerning the productivity of enterprises after the Covid crisis. A first risk is the disappearance of potentially productive companies following a deterioration in their financial balance sheet. A second risk, in the medium term, lies in the increase in debt generated by the crisis for some companies.

Findings from initial empirical work on business productivity following the health crisis suggest a fairly good resilience of the main channels supporting the medium-term productivity of businesses. On the one hand, the 'creative destruction' mechanism stayed operational, despite a substantial reduction in business bankruptcies. A possible catch-up effect of future bankruptcies could, however, affect in part productive companies, as suggested by the various microsimulation results. On the other hand, corporate investment has held up better than expected, with a fall of 8.1% in 2020 for non-financial companies and a level at the end of 2021 that is 2.9% higher than before the crisis. This good performance in investment is driven in particular by IT and communication services, which points to increased digitalisation of businesses.

The increase in firm creation was initially concentrated on micro-entrepreneurs, with a drop in 2020 in creation of other businesses (-4%) but a strong recovery in 2021 (+13% compared to 2019).

While the increase in net debt has been contained so far, a deterioration in balance sheets during the recovery phase cannot be ruled out, particularly because of supply tensions. A rise in net debt could then reduce the investment capacity of companies, particularly in their digitalisation process or in R&D and innovation activities. However, this risk is mitigated by the low elasticity of investment and R&D to the financial situation of companies in France. For the year 2020, business R&D expenditure would have fallen by only -0.6%, i.e. a considerably smaller fall than the shock to GDP. Investment, notably driven by IT and communication services, and aggregate R&D spending have thus been more resilient than could have been expected at the start of the health crisis. The question remains as to the capacity of the digitalisation of companies to generate sufficiently strong productivity gains to make up for the loss of productivity linked to the pandemic. The effect of the crisis on the dispersion of business productivity remains uncertain as well. The shock may have led to a catching up or to a wider gap between

firms at the frontier and those lagging behind, but the data do not yet allow us to determine which effect prevails.

French start-ups have maintained their workforce or even grown in employment over the period despite the unfavorable economic climate. This underlines the resilience of innovation activities, even if employment in start-ups represents a very small share of national employment. The fourth Future Investment Program (€20 billion, of which €11 billion comes under France Relance) and the increase in the budget of the National Research Agency will support investment in innovation, which may represent another vector for catching up on the loss of productivity due to the pandemic.

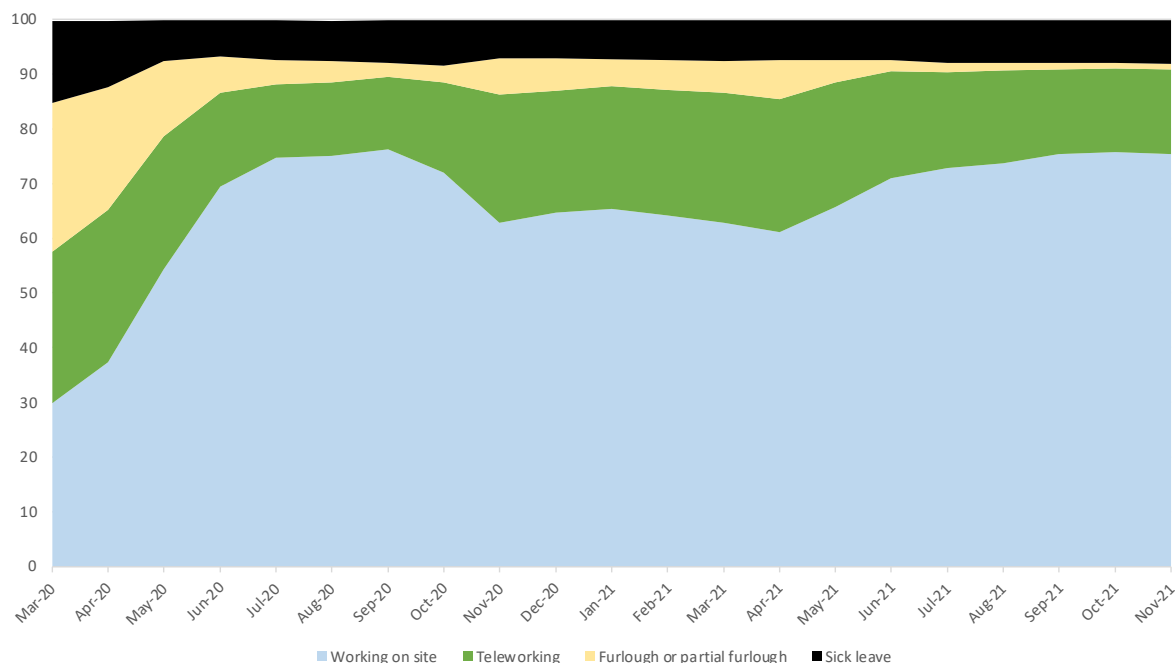
Telework and productivity

Prior to the Covid pandemic, telework was a marginal practice in France. The Covid crisis led to a massive development of this practice. The percentage of employees working from home on a regular basis increased from 4% in 2019 to 27% in January 2021. Regular teleworking concerns 56% of managers, while it remains marginal for commercial employees (5%) and skilled workers (3%). Between March 2020 and January 2021, 37% of employees have experimented working from home on a regular or irregular basis. This would represent the upper bound of the number of jobs that can be done remotely after the Covid crisis. Indeed, Dingel and Neiman (2020) conclude that about 38% of jobs in France can be done remotely. In November 2021, 21% of employees teleworked at least one day but only 6% teleworked every day of the week.

Working from home was reportedly a source of economic resilience throughout the pandemic, accounting for between 8% and 14% of GDP at the height of the Covid recession, according to some estimates.¹

¹ Eberly J., Haskel J. and Mizen P. (2021), "[Potential Capital](#)", [working from home, and economic resilience](#)", *NBER Working Paper*, No. 29431, October.

Figure 2 – Distribution of employees (excluding employees on holiday) in the last week of the month (% of employees)



Source: Dares, Acemo-Covid survey, December 2021

A significant proportion of telework is likely to continue after the crisis. Around 8 out of 10 teleworkers say they want to continue teleworking and 20% of employees work in a company that intends to expand or maintain their existing telework rule.

Paradoxically enough, unlike many previous crises which led to a slowdown in trend productivity, the acceleration in the use of telework linked to the health crisis could finally lead to a sustainable gain in productivity. However, if telework allowed more autonomy for the employee, it also led during the health crisis to a deterioration of working conditions for some and to an increase in psycho-social risks. Indeed, even if telework gives the employee more autonomy, the practice can lead to shifted or extended working hours, health problems (pain, sleep disorders) and difficulties in achieving work-life balance, as was observed at the height of the crisis. These psycho-social risks are not necessarily due to telework alone, but may also be directly related to the health crisis itself, with telework being an aggravating factor.

A future and sustainable implementation of telework in good conditions therefore implies an adapted managerial policy, in order to reduce the risks of degradation of working conditions.

Telework in the context of the Covid-19 shock may have frequently developed under less than optimal conditions in terms of preparation, training, management and equipment. However, the effects on productivity of the adoption of telework, designed in advance, in particular by the implementation of adapted IT solutions, are probably more beneficial in the short term than those of a sudden and unanticipated switch to this form of work organization.¹

Increased use of telework can have several effects on productivity, some positive, some negative. For example, it may reduce costs for companies that restructure to use less land (physical capital), i.e. reduce the use of a factor that has no effect on output, which leads to a mechanical increase in productivity.

Similarly, the reduction in commuting time could increase both the intensive margin of working time and employee's personal free time. On the other side, social distancing measures strongly reduce certain information flows, which are an important component of organizational and human capital, especially for employee training. Teleworking could therefore play a negative role in terms of productivity gains, hence the need to find a balance on the part it could play in the future.

As suggested in several studies, the productivity effects of telework would be non-linear and would have an inverted U-shaped profile. Although the net effect on overall productivity of telework in the post-Covid crisis period remains uncertain, a potential increase in productivity gains through greater use of telework can be expected.

Bergeaud, Cette and Drapala (2021) show that firms that have increased their use of telework in 2019 are on average more productive and have been more resilient overall to the crisis.² Based on certain assumptions, this study estimates that a one percentage point increase in the share of teleworkers in total employment would improve total factor productivity (TFP) by about 0.45 percent on average. Extrapolating, the overall long-term effect of extending telework from about 5% to 25% of total employment could improve productivity by about 9% under the assumption of an absence of a downward U-curve between telework and productivity gains. However, this is a first estimate, which would need to be confirmed by further studies once the telework situation has stabilized.

¹ Pora P. (2020), "[How does telework affect business productivity? Les enseignements très partiels de la littérature](#)", *Note de blog*, Insee, 23 October.

² Bergeaud A., Cette G. and Drapala S. (2021), "Telework and productivity before, during and after the crisis", Banque de France.

Various surveys show that teleworkers generally have a particularly positive view of the flexibility of the organization of their working day and the time saved on commuting. Increased job satisfaction usually leads to productivity gains and lower employee turnover. Other phenomena, such as communication difficulties or loneliness, on the other hand, undermine these potential productivity gains.

It is necessary to find the optimal frequency of remote working so that its positive effects on workers' efficiency outweigh the losses. Efficiency gains may be higher when employees do not telework for the whole week, and are free to choose telework voluntarily. Respondents to a 2020 OECD survey estimated on average that the optimal number of teleworking days would be between two and three days per week.¹

The OECD survey reveals that managers and employees view telework positively in general, both from a business performance standpoint and an individual well-being standpoint, and that they would like to see a significant increase in the share of employees teleworking regularly compared to pre-crisis levels. The survey found that the experience of employers and employees was overwhelmingly good: around 63% of managers and 74% of workers gave an overall positive assessment of their telework experience in terms of company performance and workers' subjective well-being respectively. In contrast, only 15% of managers and 12% of workers report a negative experience during the crisis.

In addition, 57.5% of the managers in the sample believe that employees are working more because of the time saved from not commuting to work. DeFilippis *et al* (2020) estimate, by comparing the time between the first and last e-mail sent, or the last meeting attended, that the average working day was extended by almost 50 minutes during the pandemic.² In practice, since hours teleworked remain declarative, managers may find it difficult to distinguish between the fraction of the increase in productivity that comes from the increase in hourly productivity or from the increase in hours worked.

About 70% of managers believe that training staff remotely is more difficult and that employees learn less on the job. Similarly, telework does not promote the successful integration of newcomers into their jobs. This can be a brake on productivity growth in the medium and long term, especially as training is a prerequisite for qualifications. Managers' training and experience is also an issue, in order to make manager-

¹ OECD (2020), "[Productivity gains from teleworking in the post COVID-19 era: How can public policies make it happen?](#)", OECD Policy Responses to Coronavirus (COVID-19).

² DeFilippis E., Impink S. M., Singell M., Polzer J. T. and Sadun R. (2020), "[Collaborating during coronavirus: The impact of COVID-19 on the nature of work](#)", *NBER Working Paper*, No. 27612, July.

employee relations more fluid in a telework context. In addition, more than 60% of the managers in the sample believe that the telework environment is less innovative and creative, which could be detrimental to innovation and productivity growth in the long run.

We still have little hindsight on certain phenomena, such as territorial reorganization (location and property prices), or the accelerating digitalisation of the economy in connection with teleworking. A number of lifestyle adjustments are underway, the economic effects of which are not yet fully visible, and which, combined with general equilibrium effects, will probably affect overall factor productivity.

Telework is likely to have an extremely varied impact on the attractiveness of jobs, on working conditions and on the split between full and part-time work.

Ultimately, the overall longer-term effects of telework on business productivity, innovation and worker welfare remain uncertain also because of horizontal effects, which generally confound the anticipation of potential productivity effects of telework.

In particular, Barrero, Bloom and Davis (2021a) anticipate, in connection with the pandemic, a surge in IT innovations facilitating telework and an associated increase in the productivity of remote workers.¹ Indeed, productivity can be improved if firms save on the least useful expenses and devote these savings to investment and innovation.

The OECD survey results suggest that health constraints greatly accelerated the catching up of companies that had not yet invested much in these areas, with their competitors who already had a higher level of teleworking before the crisis. The Banque de France survey suggests that companies planning to telework more are 35% more likely to increase their IT investment.

The effects of spatial reorganization are difficult to predict. For example, a lower density of economic activity within a geographical area may reduce the advantages of the agglomeration and, therefore, the performance of firms in the area. On the other hand, working from home or nearby may strengthen the economy of neighborhoods previously considered only residential, and thus revitalise suburban neighbourhoods at the expense of core business districts. Gupta *et al* (2021) analyzed the effect of the Covid-19 pandemic on housing prices and rents, and found

¹ Barrero J. M., Bloom N. and Davis S. (2021a), "[Why working from home will stick](#)", *CEP Discussion Paper*, No. 1790, August, 72 p.

a flattening of the inner-city/suburban differential, particularly in cities where telework was more widespread.¹

Given that real estate assets weigh heavily on business costs, sometimes constraining young companies in their growth, and that it is a very rigid asset that is difficult to adjust to, easing access to it will lead to greater responsiveness to the business cycle. *Ultimately*, a relaxation of real estate constraints and a release of resources could increase productivity. In addition, the Banque de France notes that the restructuring of the real estate market could lead some companies to re-evaluate the location of their employees and reduce labour costs if these employees were to be located in lower cost areas. The increase in teleworking could therefore reduce both land and labour costs.

But these positive geographical effects on the balance sheet of companies have a downside: real estate is often used as collateral by companies, so reducing its weight in the balance sheet of companies could weaken them by making their access to credit more difficult.

Productivity can also be improved from a human resources perspective, if companies expand the pool of workers from which they can choose and improve the skills of workers by hiring new talent or training existing workers. By relying on new and better ICT tools, companies can streamline the recruitment process and better match workers' skills to job vacancies. However, if increased telework is used to replace geographically close and more expensive workers with cheaper, more distant workers, this could lead to a new wave of outsourcing and offshoring, which some call "telemigration". The effects of potential dumping, encouraging the lowest social and fiscal standards, could therefore affect the productivity of countries (brain drain and increased bargaining power of companies which would compress wages), but also competitiveness between countries.

Furthermore, as not all occupations and sectors are equally suited to telework, or have easy access to it, the move towards more telework may exacerbate existing inequalities, particularly in terms of the attractiveness of occupations.

¹ Gupta A., Mittal V., Peeters J. and Van Nieuwerburgh S. (2021), "[Flattening the curve: Pandemic-induced revaluation of urban real estate](#)", *NBER Working Paper*, No. 28675, April, 63 p.

Structural analysis of the slowdown in productivity gains

The role of sectors and employment reallocations in the productivity slowdown

To what extent do sectoral or regional dynamics help explain the differences in annual productivity gains between countries over the long term? The analysis of national accounts data since 2000, broken down into 37 sectors and broken down to a regional level, leads to the following conclusions:

- Intra-sectoral dynamics are the main source of productivity growth and their variability over time and between regions.
- In all the countries analyzed, employment is shifting to sectors with slightly higher average productivity levels but lower productivity growth; this is the case with the increase in employment in scientific and technical activities. While in the short term these movements increase aggregate productivity, in the long term they tend to reduce growth. France is characterized by weaker inter-sectoral employment reallocations than elsewhere, but the effect on productivity of this specificity remains uncertain.
- France is the country with the highest geographical concentration of productivity growth: only one region, Île-de-France, has a productivity growth rate per capita of more than 1% per year, compared with six regions in Sweden, five in Germany and Spain and two in the UK. Excluding Île-de-France, the French regions remain more homogeneous in terms of productivity levels and growth than those of other European countries.
- The growth and divergence in labour productivity of the economies appear to be mainly driven by services, due to their large weight in employment. In France, productivity gains are driven by scientific, technical and administrative activities (mainly via growth in their workforce), followed by trade, transport, accommodation and food services (mainly via their productivity gains, and to a lesser extent growth in their workforce), construction (mainly via price increases), and computer products (mainly via their strong productivity gains).
- Due to high productivity levels and growth, the fall in manufacturing employment contributed negatively to productivity trends since the early 2000s, despite a reversal of the trend at the end of the period. In France, this sector fell from 13.7% to 9.6% of total employment between 2000 and 2017. This decline was coupled with a fall in relative prices, particularly strong in France. These two effects (employment effect and price effect) are greater than the strong productivity gains that the sector has been able to record. Germany is the only exception, with a continuously positive contribution from industry. Deindustrialization plays a greater role in explaining interregional divergences than differences between countries.

Over the last two decades, France experienced intra-sectoral productivity gains comparable to Germany and slightly above the euro area average, but below those of Sweden and the United States. The higher productivity gains in these two countries can also be explained by higher employment growth in highly productive sectors.

In order to understand the factors that explain lower intra-sectoral productivity growth, Bouche, Cette and Lecat (2021) analyze the evolution of productivity gains between the most and least productive firms.¹ Their analysis shows one or two downward breaks in the productivity trend in all sectors since 2000. This slowdown is observed across the distribution of firms, but is slightly more pronounced for firms at the productivity frontier. The slowdown for firms at the frontier suggests a declining contribution of technological progress. The more pronounced slowdown for laggards suggests a slowdown in the diffusion of productivity gains from the best performing firms.

Moreover, the renewal of firms at the frontier has slowed down, which may illustrate a reduced competitive pressure on the leading firms. This decline in the renewal of firms suggests that factor reallocation declined significantly in the 2000s, at the same time as an increase in productivity dispersion was observed, with a growing productivity gap between frontier and lagging firms.

These two simultaneous phenomena contribute to downward breaks in aggregate productivity growth trends and could, at least in part, be related to the decline in financial constraints and real interest rates, as described by Aghion *et al.* (2019).² This could also be related to the rise in firm concentration in both Europe and the US as illustrated by the work of Bajgar *et al.* (2018).³ Increases in firm concentration at the national level appear to be very different between countries. In France, this concentration does not seem to have increased and it has even decreased in Germany. However, this is not incompatible with an increase in concentration in certain sectors in each country and, above all, with an increase in concentration when measured at the continental or even global level due to the growing integration of international markets.

Reallocation was significantly lower on average over the period for sectors with a high share of information and communication technologies (ICT). The combination of an increase in the share of ICT sectors and lower reallocation efficiency in these sectors

¹ Bouche P., Cette G. and Lucat R. (2021), "[News from the frontier: Increased productivity dispersion across firms and factor reallocation](#)", Working Paper, No. 846, Banque de France, November, 51 p.

² Aghion P., Antonin C. and Bunel S. (2019), '[Artificial intelligence, growth and employment: The role of policy](#)', *Economics and Statistics*, vol. 510(1), pp. 149-164.

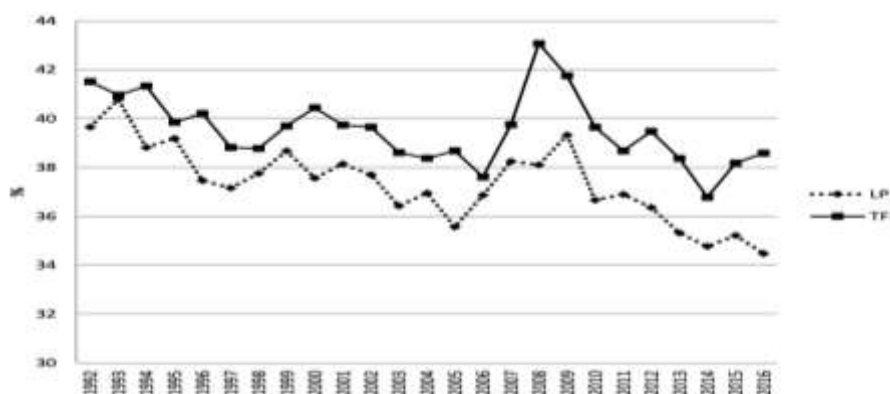
³ Bajgar M., Berlingieri G., Calligaris S., Criscuolo C. and Timmis J. (2018), "[Industry concentration in Europe and North America](#)", *OECD Productivity Working Papers*, No 18, January.

may explain both the increased dispersion of productivity and its overall slowdown. Reallocation has also been lower since the 2000s in import-intensive sectors. This may relate to the impact of global value chains, with an increase in the competitive advantages of world-leading firms whose market shares have risen. These two features help explain the productivity slowdown.

A recent INSEE study also analyzes within-sector firm productivity growth in France, and it shows varying developments between sectors.¹ For example, in industry and high-tech services, productivity growth has been relatively high for all companies. The dispersion of productivity decreased in high-tech services, where the least productive companies have "caught up" the most with the rest. This trend is not observed in the sectors using low and medium technology services, where the productivity dispersion increased. In those sectors, productivity growth was zero for frontier firms and slightly negative for intermediate and low productivity firms. This contrast between sectors could suggest that the diffusion of technology between firms is faster in manufacturing and high-tech services compared to low-tech services.

The turnover rate of firms at the productivity frontier has decreased between 1992 and 2016 except during the most difficult years of the financial crisis between 2008 and 2010. The turnover rate at the frontier is higher for firms in sectors with a higher financial dependency ratio, a higher ICT investment rate or a higher import rate. This confirms that competition between firms is positively related to these three dimensions.

Figure 3 – Business renewal at the productivity frontier



LP = Labour productivity TFP = Total factor productivity

Source: Bouche et al (2021), calculations on FIBEN data covering French companies over 1991-2016

¹ Khder M.-B. and Monin R. (2019), "La productivité en France de 2000 à 2015 : poursuite du ralentissement et hausse modérée de la dispersion entre entreprises", in *L'Économie française*, Paris, Insee.

The Covid-19 crisis could accelerate job reallocations that will not be limited to mobility from affected sectors to job-creating sectors. Within-industry reallocations could also occur, with the least productive firms closing while others grow in the same industry through a process of creative destruction.

To encourage and support retraining, an important focus must be to inform the working population. The tools for retraining must also pay special attention to low-skilled workers: they have fewer opportunities for retraining, less access to vocational training and their skills are further removed from those of the job-creating sectors. It is also important, at the end of the crisis, to articulate policies to support labour reallocation with emergency measures, which aim to maintain employment.

The impact that current and future trends may have on productivity growth remains highly uncertain. The current trend of productivity slowdown could very well continue: the ecological transition combined with the continued development of the digital economy could prolong this trend if employment increases in lower productivity growth sectors. This could happen, for example, if there is a drop in employment in the banking and insurance sectors or in the automotive industry, while at the same time an increase in the construction sector.

In this context, a policy aiming to develop certain industrial activities based on green innovation in particular would make it possible to compensate partially for this trend, particularly for France. Indeed, France has a less marked development of the highest-growth sectors compared to the best-performing countries in terms of productivity gains: Sweden and the United States. It is also a matter of reinforcing the productivity dynamic within sectors where employment is set to increase. To this end, measures to facilitate worker mobility could promote inter- and intra-sectoral dynamics.

Human capital and declining productivity gains

Chapter 5 focuses on the role of human capital in the labour productivity slowdown over the last four decades. The chapter presents an analysis developed by Bruneau and Girard (2022), comparing the trend of productivity gains in four European countries: France, Germany, Italy and the UK.¹

Between 1976 and 2018, France experienced the sharpest slowdown. Annual productivity growth fell from 3.8% to 0.7% between the beginning and end of the period.

¹ Bruneau C. and Girard P.-L. (2022), "Évolution tendancielle de la productivité du travail en France, en Allemagne, en Italie et au Royaume-Uni depuis 1976, éléments de comparaison internationale sur les quarante dernières années", Working Paper, No. 2022-03, France Stratégie, May.

Nevertheless, it retains one of the highest average annual growth levels at the end of the period, just behind Germany which stands at 0.8%. Italy has the lowest productivity gains over the longest period, with less than 0.3% average annual growth between 1998 and 2018. The UK is also in a similar situation, but with an average annual growth rate still below 0.4% since 2005.

Understanding the causes of this long-lasting slowdown is of crucial importance in order to be able to put in place appropriate policies to counter it. A decomposition of the sources of productivity growth, after adjusting for cyclical fluctuations, is conducted to identify the most influential explanatory factors. This analysis reveals the fundamental role of human capital. The slowdown in the growth of the human capital stock explains one fifth of the slowdown in productivity gains in the United Kingdom, and around half (between 45% and 52%) in France, Italy and Germany. The other explanatory factors analyzed in the study are technical progress, working time and investment. The importance of human capital is explained by its strong links with the quality of management, the diffusion of new technologies, in particular information and communication technologies, automation and the capacity for innovation.

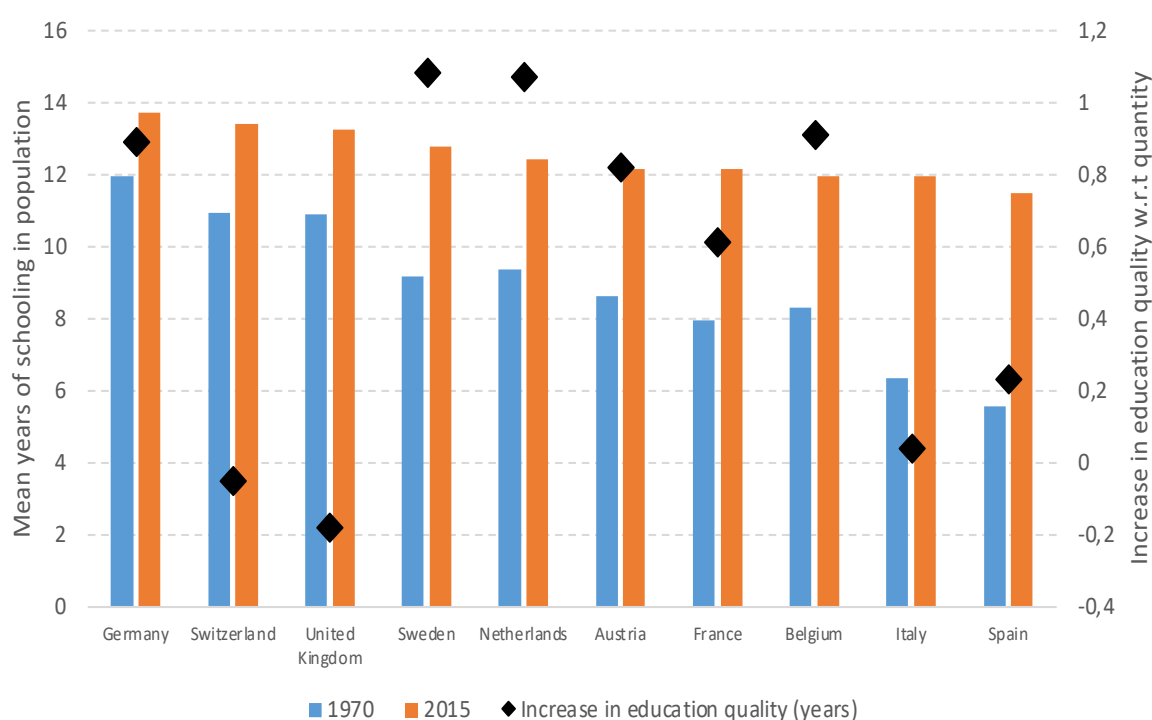
The growth in education level, approximated by the average number of years of study, has been consistent thanks to the increase in the number of entrants into the labour market, with an average level of study higher than that of previous cohorts. However, it has slowed down sharply over the last four decades when the average level of initial education began to increase less rapidly due to an already high proportion of young people having completed upper secondary education and then higher education.

In all four countries, the improvement in women's educational attainment, which is higher than that of men, has contributed most to productivity growth. Nevertheless, the convergence of education levels between the sexes, as well as the high level already achieved, indicates that the scope for further progress in terms of years of education is limited. Instead, sources of future growth will have to come from better education quality, to ensure that, given a constant number of years of education, human capital can continue to grow.

Given the already high level of years of schooling, improving the quality of education is now the main lever for increasing human capital and thus supporting productivity growth and living standards.

As shown in a study by Lutz *et al* (2021),¹ the working age population in France increased its years of education from an average of 8 years in 1970 to 12.1 in 2015. The increase in educational quantity was 4.1 years. The progression of quality-adjusted years of schooling was 0.6 years faster than that of educational quantity. Thus, in 2015, the population had an equivalent of 12.7 years of education if we take the quality of years of education in 1970 as a reference. The growth of educational quality in France has been in line with the European average: it has been lower than in Germany, Sweden and the Netherlands, but higher than in England, Switzerland and Italy.

Figure 4 – Average years of education in the population and relative growth in educational quality



Source: Data from Lutz *et al* (2021), NOC calculations

International analyses of skills indicate that France has considerable room for improvement in terms of the quality of education. At an equivalent level of education, at the age of 15, northern European countries manage to acquire skills equal to one additional year of study compared to students in France. These differences are

¹ Lutz W., Reiter C., Özdemir C., Yildiz D., Guimaraes R. and Goujon A. (2021), "[Skills-adjusted human capital shows rising global gap](#)", *Proceedings of the National Academy of Sciences*, vol. 118(7), February.

persistent, and they are even greater in adulthood. The challenge facing France is therefore to improve the quality of training, both initial and lifelong, in order to further improve the skills of its working population.

A recent benchmarking study, conducted with 2015 OECD data, estimates the effects of different educational reforms on productivity growth. It finds three main levers that France could use to improve the skills acquired by the youth.¹ First, increased autonomy of educational institutions, coupled with greater accountability. Second, a reduction in class size. And finally, an increase in early schooling. The last two measures have just been implemented at least partially in France, with compulsory schooling from the age of three to increase enrolment in early childhood and the doubling of CP and CE1 classes in priority education areas. However, it is still too early to measure the effects on productivity or on skills.

The labour market shows an increase in the demand for workers with a high level of both cognitive and non-cognitive skills. The latter, referred to as *soft skills*, correspond in particular to relational and organizational skills, autonomy at work and the ability to solve problems. Their importance on innovation and transformation of organizations is crucial as explained in chapter 6.

To ensure that the general level of skills can revitalize productivity growth and therefore living standards, education in France, both initial and lifelong, must therefore evolve towards greater quality, and towards an education system focused on both cognitive and non-cognitive skills.

The role of skills in business productivity

The skills available in a firm's workforce are the most important explanatory factor of productivity differences between firms. They influence not only productivity, but also innovation, diffusion and the appropriation of new technologies. Numerous studies document that the large productivity gaps between firms within each sector are related to the observed skill and human resource composition of firms.

Chapter 6 focuses on the organizational and human factors that influence a firm's ability to adopt new technologies, develop and deploy innovations and evolve its organization to improve the efficiency and well-being of employees and managers.

¹ Egert B., Botev J. and Turner D. (2020), "The contribution of human capital and its policies to per capita income in Europe and the OECD", *European Economic Review*, vol. 129.

The first section of the chapter illustrates the importance of the relationship between non-cognitive skills known as *soft skills* and the process of innovation and transformation of organizations, which are at the heart of productivity gains. The concept of *soft skills* corresponds, in a nutshell, to the set of skills that are not strictly knowledge-based, nor technical or professional skills, i.e. focused on a professional practice or universe. It is also equivalent to related terms such as *savoir-être*, talents, personal skills, generic skills, multi-functional skills, relational skills, etc. *Soft skills* are learned through experience - whether or not in a formal learning setting.

Du Roscoät, Servajean-Hilst, Bauvet and Lallement (2022)¹ identify, on the basis of a psycho-sociological survey, the characteristics of the skills of people who contribute to innovation as individuals and as a social group. The analysis shows that the underlying issues are at the level of the people, the organizations that employ them and the work collectives that make them interact. Indeed, innovation is the result of a complex interaction between the individual, the teams and their work context at different organizational levels. Thus, from a human factor perspective, the ability to innovate relies to a large extent on non-cognitive skills, known as *soft skills*. Unlike technical skills, which are usually well identified and delimited, and which are the subject of specific measures in the field of education and training as well as in human resources management, these *soft skills* are more often than not poorly defined, difficult to assess, and consequently poorly controlled by public policies and managers.

The survey identifies key factors cited by innovators in innovation and organizational transformation. The innovators surveyed almost universally emphasize *soft skills*, such as curiosity, open-mindedness, teamwork, perseverance, creativity and empathy. For almost three quarters of the respondents, the answers to the question of the six most important qualities required to innovate include at least half of the cross-cutting skills, which occupy a total of 65% of the items (e.g. 'collaborative', 'curiosity', 'organisation', 'communication', 'flexible'), 23% are personality traits (e.g. 'playful', 'passionate', 'enthusiastic', 'doubtful', 'fearless') and only 12% refer to processes or business skills (e.g. 'disruptive', 'managerial', 'innovation', 'achievement', 'facilitator') The central role played by the collective and the work context for successful innovation is also widely emphasized in the survey. Innovators mention that an innovative team includes certain ingredients, including diversity and complementarity of profiles (in cultural, disciplinary and professional terms), a shared passion, a common energy and an atmosphere of trust favorable to team spirit. The

¹ du Roscoät B., Servajean-Hilst R. , Bauvet S. and Lallement R. (2022), "*Soft skills* to innovate and transform organisations", France Stratégie, Working Paper, No. 2022-02, May.

psychometric analysis highlights seven key *soft skills* for innovation: communication, collaboration, rational thinking, extraversion, perseverance, openness and cognitive empathy.

The second section of Chapter 6 presents a study by Criscuolo, Gal, Leidecker and Nicoletti (2021).¹ It is the first study based on data detailing the skills of managers and employees in companies, and covers ten countries including France. The study finds that almost one third (31%) of the labour productivity gap between frontier and median firms is explained by the human aspects of firm characteristics, while capital would explain only 20% of the gap.

The most productive firms are characterised by a higher number of skilled workers. Highly skilled employees represent on average about one third of the workforce in the most productive firms. Within each sector separately, this share is on average more than twice as high as in the least productive firms. Thus, the employment of a highly skilled workforce appears to be crucial for achieving high firm productivity. The gap between firms is particularly strong in the case of France and for highly skill-intensive sectors such as the information and communication technology sector. Thus, in companies at the productivity frontier in France, 30% of employees are considered 'high-skilled'. This compares with 18% in the middle quintile of companies. This difference of 12 percentage points is very large compared to the average observed in other countries, where the difference is on average only 7 points.

In most countries, the concentration of the most skilled workers in the best performing firms has increased. On average, in all countries, the share of high-skilled workers increased by about 0.3 percentage points per year faster in firms at the frontier than in firms at the median in terms of productivity. This increase in the share of the most skilled in the most productive firms was achieved at the expense of the share of medium and low-skilled employees, which fell by about 0.2 and 0.1 percentage points respectively. However, medium and low-skilled employees are still indispensable for the most successful companies. On average, in all countries, medium-skilled employees account for about half of the workforce in the most productive companies, and low-skilled employees still account for about one fifth. Thus, even at the productivity frontier, the bulk of the workforce is made up of non-highly skilled employees. This suggests that efforts must also focus on the supply and quality of medium and low skills in order to improve productivity. This is confirmed by the situation in Germany, where the most productive German firms rely to a greater extent

¹ Criscuolo C., Gal P., Leidecker T. and Nicoletti G. (2021), "[The Human Side of Productivity: Uncovering the role of skills and diversity for firm productivity](#)", OECD Productivity Working Papers, No 29, December.

on medium-skilled workers than other countries. This may reflect a greater effectiveness of its education and training system in providing a higher quality medium-skilled workforce.

The analysis also confirms the importance of managers as a crucial factor in firm productivity, a result also highlighted by a study by Bloom *et al.* (2019).¹ The analysis of workforce composition further reveals that frontier firms are more diverse along three dimensions: they are closer to gender parity; they have a more heterogeneous cultural background, which is captured by the diversity of employees' countries of origin or nationalities; and they have a greater diversity of employees' ages. Having a mix of employees of different ages can increase productivity as it allows better use of the knowledge of more experienced employees and improves the skills of younger employees through learning by doing. The results presented in the study suggest that young people are more productive when a larger proportion of older employees are present, and vice versa. Many companies may lose these productivity gains associated with diversity because they are not aware of the potential benefits of a more diverse workforce. Thus, awareness-raising policies should be aimed particularly at companies well below the productivity frontier.

Figure 5 shows the contribution of the different human components to productivity differences between firms. In total, almost 40% of the productivity differences between firms at the frontier and those at the median could be explained by these factors, even though the causal link between the two is not demonstrated.

An important part of the unexplained productivity gap between firms is likely to be related to differences in other intangible assets that are more difficult to measure, and to interactions between different types of capital (physical, intangible and human). For example, new machinery often brings new skill requirements with it. Furthermore, developing a brand, its design or the culture of a company, which are also part of intangible capital, is strongly linked to the skills of the people inside the company in charge of these aspects, for example managers, engineers or marketing experts.

¹ Bloom N., Brynjolfsson E., Foster L., Jarmin R., Patnaik M., Saporta-Eksten I. and van Reenen J. (2019), "[What drives differences in management practices?](#)", *American Economic Review*, vol. 109(5), May.

Figure 5 - Productivity differences between firms at the frontier and those at the median, possible contribution of each effect



Source: Criscuolo et al (2021)

In terms of lessons learned, the two analyses developed in this chapter confirm the crucial importance of increasing the supply of human capital, its quality and its use to improve the productivity of companies. In particular, it is a matter of i) improving the quality of initial education; ii) increasing the use of lifelong learning, apprenticeships and raising their quality; iii) better training for managers; iv) promoting diversity; v) facilitating both residential and professional mobility.

It is also a question of better recognizing the importance of *soft skills* in promoting successful innovation and transformation of organizations, which are themselves at the heart of productivity gains. To achieve this, it would be necessary to i) train and support individuals in the awareness, mobilisation and legitimization of *soft skills* acquired in the context of training and previous or extra-professional projects; ii) support management and work groups in the process of integrating a diversity of profiles and recognizing the associated cross-cutting skills; iii) help the organization develop a work context and an organizational environment that allow the development of cross-cutting skills.

Competitiveness: the role of attractiveness factors for productive activities

France's current account deficit is about 1 percentage point below the reference level determined by the structural characteristics of its economy. This gap is a measure of the country's competitiveness deficit. This has been reflected in a sharp decline in France's market share in merchandise trade since the early 2000s at a rate of over 2% per year. France's market share of global merchandise exports has thus fallen from 5.1% in 2000 to 3.0% in 2019 with a relative stabilization since 2012. Over the same period, Germany's market share has remained almost stable, going from 8.5% to 7.9%. While the decline in developed countries can be explained by the rise in the share of emerging countries, it should be noted that France has lost more export market share than many euro zone countries, thus suffering a decline in its relative weight in the exports of euro zone countries.

Independently of the price of energy, which has a heavy impact on French foreign trade depending on its fluctuations at the international level, the structural widening of the French trade deficit was linked more particularly over the last two decades to the fall in industrial production: France is, among the major players in the world economy, one of those that have deindustrialized the most.

As indicated in the first report of the National Productivity Council,¹ France's low competitiveness is not due to unfavorable sectoral or geographical specialization. Indeed, the declines in export market share of companies producing in France are not due to a growth deficit in the markets in which they are positioned. The transition from a surplus in the balance of industrial goods at the end of the 1990s to a chronic deficit is rather the result of poor competitiveness in terms of production costs and insufficient non-price competitiveness. Faced with rising production costs, industry has chosen to preserve its price competitiveness by squeezing its margins to the detriment of its up-market and therefore non-price competitiveness. In order to maintain their global competitiveness, large French companies have become champions of locating their production sites abroad, to the detriment of industrial employment in France. Thus, compared with its European neighbours, France has been more heavily affected by the relocation of production sites, to the extent that employment in the foreign industrial subsidiaries of French groups corresponds to 68% of employment in the industrial

¹ CNP (2019), [Productivity and competitiveness: where does France stand in the euro area ?](#) first report, July, 144 pages.

sector in France, compared with 44% in the UK, 35% in Germany, 27% in Italy and 10% in Spain.

When the country's cost competitiveness declined, the number of employees and turnover abroad in French multinationals increased by almost 60% between 2007 and 2014, a rate twice as high as German or Italian multinationals'.¹ French multinationals employed nearly 6 million employees abroad in 2014, whereas German multinationals employed just over 5 million, Italians 1.8 million and Spanish less than 1 million. The automotive sector provides an illustration of the potential influence of multinationals' location choices. The share of French brands' production towards the domestic market located in countries with incomes lower than France's has risen from less than 10% in the early 2000s to almost 50% in 2016. At the same time, this share has only increased from 15% to 25% for German brands.²

In order to understand what the main factors that led to the loss of attractiveness of the French territory for production sites are, especially in the 2000s, chapters 7 and 8 present the results of two original studies that measure the importance of the determinants of production locations. Chapter 7 focuses on the extensive margin, i.e. the creation of new production sites. While the second chapter focuses on the intensive margin, i.e. the determination of production volumes in existing sites, based on the analysis of the automotive sector and the determinants of production location. Chapter 9 finally identifies automation as a possible way to regain cost competitiveness.

Attractiveness factors: extensive margin

This chapter identifies the determining factors that influence multinationals' location decisions of production sites. The analysis focuses on three functions of the sites of multinational firms that are the most mobile and therefore the most influenced by production costs, the quality of the business environment and public policies. These functions are production units, innovation centres and headquarters. The analysis does not consider other functions of outward investment, such as logistics or personal services, as these are primarily determined by proximity to local demand. In their case, the size of the market is then the main consideration and it is an element on which public policies have little control in the short term.

¹ CNP (2019), [Productivity and competitiveness: where does France stand in the euro area?](#) first report, July, 144 pages.

² Head K. and Mayer T. (2018), "[Misfits in the car industry: Offshore Assembly Decisions at the Variety Level](#)", CEPII Working Paper, No. 2018-22, December.

Given the limitations of the data on outward investment, the analysis is not carried out on the location decisions of French companies, but on investments in Europe by non-European companies. It is highly likely that the determinants of investment location are similar at the aggregate level for all multinationals regardless of their country of origin.

The analysis confirms the importance of the attractiveness factors widely identified in the economic literature on the location of these three functions: production units, innovation centres and head offices. A 10% reduction in labour costs in France would thus lead to a 10% increase in the share of production investments received by France. Furthermore, companies tend to locate their production units and innovation centres within the same territory, because of the synergies generated between the two. Indeed, for a company, the existence of a production centre in France increases the probability of setting up an innovation centre there by around 74%. In return, the existence of an innovation centre in France increases the probability of setting up a production centre there by around 62%. These co-location effects probably also play a role in the direct investments made abroad by French multinationals: if the shift in their value chain towards China began with production units, it has also continued over the last fifteen years or so in terms of R&D centres.

Another determinant of location choices identified is the fiscal environment. Overall, tax incentives for R&D positively influence the location of innovation activities, while head offices are attracted to regions with low corporate taxes, while taxes on production have a repulsive effect on both production activities and head offices. Until recently, France was not only the country with the highest corporate tax burden but also its highest production tax burden in Europe. The reduction in corporate taxes has brought France closer to the European average. The reduction in production taxes under the stimulus package has also brought France up to the top of the European distribution in this respect. France offers significant tax incentives for R&D through a generous research tax credit system.

The analysis concludes that if France had the same level of production taxes as its partners, its share of total production site creation by non-EU multinationals in Europe would increase by 17%. If France were to match the level of production taxes in Germany, the share would increase by about 25%. If corporate tax rates were harmonized in Europe, France's share of head office locations would more than double to 20% of the total. Conversely, its share of innovation centers set up by foreign multinationals could fall by 12% if all European countries adopted the same level of R&D tax support.

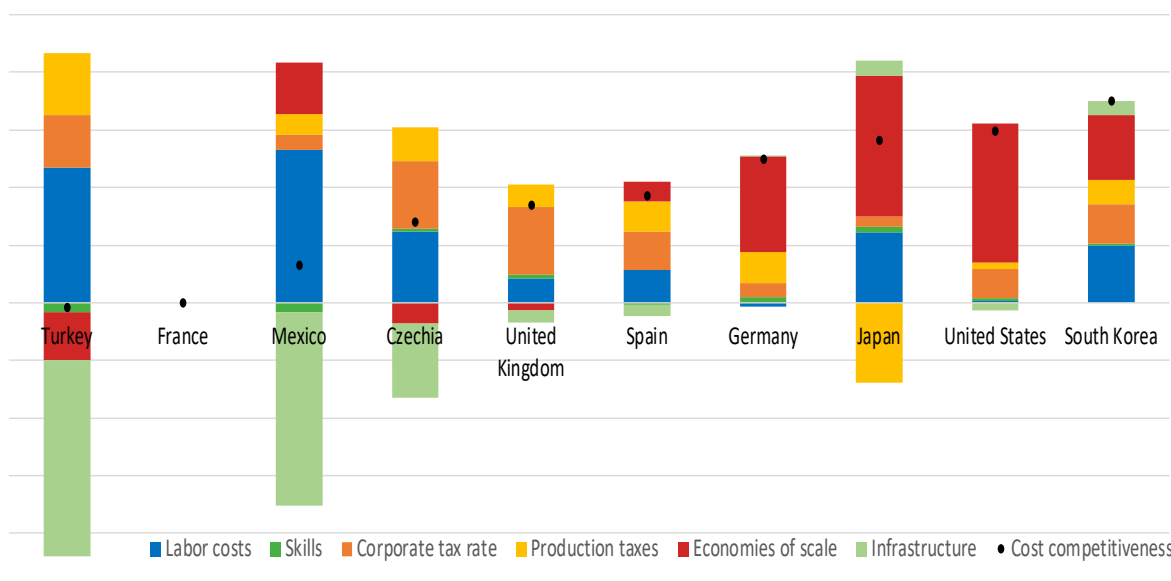
The recent dynamic has placed France at the top of the list of host countries for foreign investment in Europe, probably due to the improvement in the cost of labour and the fiscal and regulatory environment. Without demonstrating this point, this could however prejudge a reversal of the trend towards the relocation of production sites by French industrial multinationals. Because of the very specific situation linked to the pandemic, it is still too early to be able to verify this empirically. As France continues to be characterized by a tax structure that weighs more heavily on the factors of production than other countries, which particularly impedes its competitiveness in an open world where the factors of production are mobile, it would be necessary to continue to develop it so that it weighs less on the factors of production (labour and productive capital).

Attractiveness factors: intensive margin

In order to identify the factors that have contributed to a more pronounced decline in industrial production in France than in comparable countries, the analysis developed in Chapter 8 complements that of the previous chapter by focusing on the assessment of the factors that influence the choice of multinationals to increase or reduce their production volume in their existing industrial sites, spread over several countries. The analysis is conducted on the automotive sector because it explains almost half of the widening of France's manufacturing deficit since 2000 and a large part of the deindustrialization that the country has experienced over this period. This decline is not so much about the competitiveness of French car manufacturers, whose production has increased significantly abroad, as it is about the loss of attractiveness of the national territory for the location of car production. Moreover, it is likely that the factors influencing the choice of allocation of car production volumes between different sites belonging to the same company play similar important roles in other manufacturing sectors subject to intense international competition.

Empirical analysis of the production and sale of 156 million cars worldwide in 2017 and 2018 measures the importance of the determinants of the attractiveness of countries for car assembly sites. The results indicate that labour costs and production and corporate taxes account for almost all of France's attractiveness deficit vis-à-vis the UK, Spain and the Czech Republic. They also represent impediments against Germany, Japan and the United States, but contribute less to the attractiveness deficit than the drop in costs linked to higher volumes produced. The production volume of each country depends on a large number of factors, including the size of the domestic market but also production costs. An initial cost advantage can trigger a virtuous circle by leading to an increase in volumes, which in turn leads to a decrease in costs in a cumulative process.

Figure 6 - Attractiveness of production sites in relation to France



Note: This graph shows the attractiveness and its determinants for the ten most competitive economies for automotive production. This attractiveness is "pure" as it does not take into account the proximity of firms and markets other than through their effect on costs *via* economies of scale. The contribution of each factor is based on the coefficients of the estimation of the determinants of country attractiveness and the corresponding variables for the year 2018. The result is then subtracted from the value corresponding to France (as all these countries are members of the OECD, the contribution of this variable does not appear). For the scale, we use the fact that $\ln(1+x) \approx x$ because $x \approx 0$ is used for the scaling, so that the sum of the contributions is equal to the attractiveness.

Source: Lachaux A. (2021), "*Localisation de la production automobile : quels enseignements sur l'attractivité des pays et la compétitivité des entreprises ?*", Working Paper, n° 2021-4, France Stratégie

In France, the recent and announced policies favoring the competitiveness of the automotive sector could have a significant short-term impact on production (+20% compared to a situation without these measures), potentially dividing the sector's trade deficit by three¹. The reduction in the corporate tax rate from 33% to 25% should contribute to more than half of these effects and the reduction in production taxes under the Recovery Plan could result in a 4% increase in French car production.

Policies stimulating innovation also have a positive impact, but this benefits mainly the factories of French manufacturers abroad. This is also the case for productivity gains. Thus, in the French case, the effectiveness of innovation policies seems to be largely reduced by the lack of attractiveness of the territory for production activities.

However, the electric vehicle revolution will upset the relative performance of the various producers and some could find themselves entirely marginalized. The fact

¹ Lachaux (2021), *op. cit.*

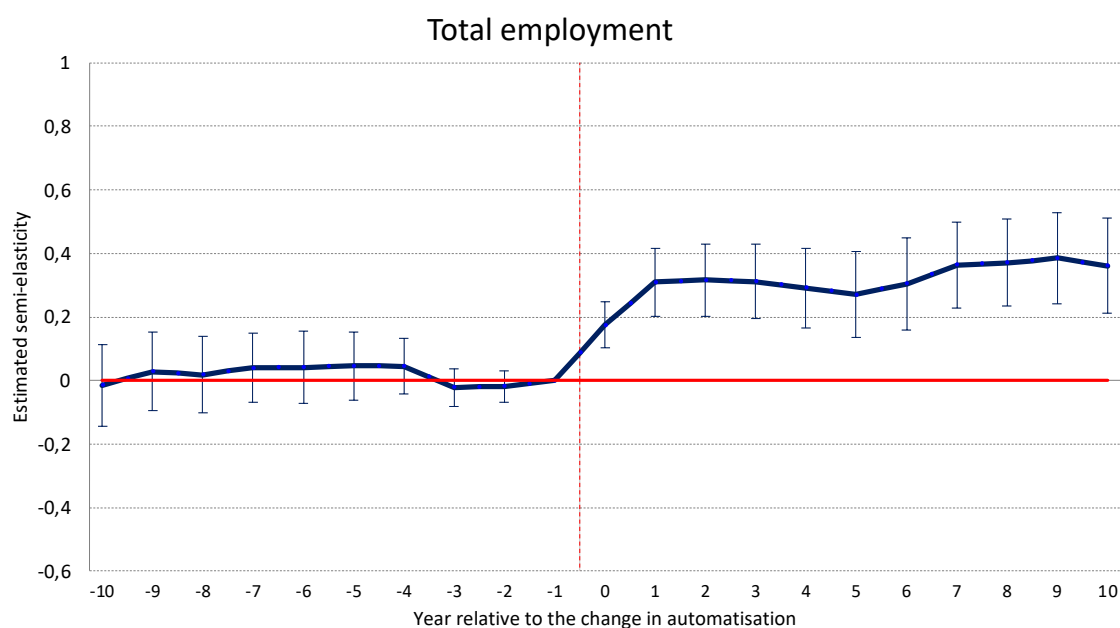
remains that the location of electric vehicle assembly plants appears, until now, to be largely governed by the same determinants in terms of the attractiveness of territories and the competitiveness of companies. Clearly, the rise of the electric vehicle will have a negative impact on employment in the automotive sector, but the simulations in the analysis should be interpreted as a departure from the trend scenario. Moreover, only direct jobs are taken into account in the analysis, whereas automotive production has a significant positive impact on employment in other sectors such as plastics, rubber, steel and business services. The same applies to the added value of assembly operations, which will certainly be negatively affected by the rise of electric vehicles. Here again, the impact of an increase in domestic production on other sectors of the economy in terms of added value can largely compensate for this effect linked to electric vehicles.

Automation as a competitive factor

In order to determine which economic policies are better able to promote competitiveness and employment, the chapter focuses on an assessment of the link between automation of industrial processes and employment at the firm and industry level, based on the empirical work of Aghion *et al* (2021).¹ On the one hand, automation can lead to a recomposition of employment, as some tasks previously performed by individuals are now performed by machines, and to an increase in technological unemployment. On the other hand, automation can lead to productivity gains, which can lower prices, increase demand and thus output, and increase employment. Through prices, these productivity gains could benefit consumers, or through profits, companies. Both mechanisms can be applied to other technological developments.

The results of the study tend to show that companies that invest heavily in automation see an increase in employment (Figure 7). A 1% increase in automation leads to a 0.4% increase in employment five years later. This is true for both skilled and unskilled employment, with little effect on wages and intra-firm wage inequality. The increase in both job creation and destruction in these companies indicates that automation does, however, imply a job re-composition effect. These same companies also see their turnover increase by 0.2% in the same year and by 0.3% after ten years, which is consistent with the increase in their employment, according to the productivity channel described above.

¹ Aghion, P., Antonin C., Bunel S. and Jaravel X. (2021), "[What are the labor and product market effects of automation? New evidence from France](#)", Working Paper, Harvard University.

Figure 7 – Impact of automation on total employment at firm level

Note: This graph presents the results considering as treated the 10% of firms with the highest relative annual investment in industrial equipment. Controls: sector-year and firm fixed effects.

Source: Aghion P., Antonin C., Bunel S. and Jaravel X. (2021), *op. cit.*

The increase in employment in firms that automate may lead to a decrease in employment in competing firms that do not automate. In order to see which overall effect at the sectoral level prevails, the authors conduct the analysis at the level of each industry. On average, the impact of automation on employment remains positive, although there is substantial heterogeneity between sectors, depending on their openness to international trade, measured by the import penetration rate. In sectors highly exposed to international competition, a 1% increase in automation leads to a 0.3% increase in employment over twenty years, with significant productivity gains and price reductions. The automation implemented by French producers allows them to lower their prices and gain market share at the expense of their foreign competitors, thus increasing employment and turnover at the sectoral level in France. Conversely, in sectors with little exposure to international competition, automation does not have a significant impact on aggregate employment. In fact, the market shares gained by companies that have automated are at the expense of their French competitors, implying a drop in employment among the latter, and an aggregate effect that is not statistically different from zero on employment at the level of industry as a whole.

Furthermore, the study concludes that productivity gains from automation benefit (i) companies through increased turnover and profits, (ii) employees through increased employment and (iii) consumers through lower prices.

Thus, after adopting automation technologies, firms become more productive and, as a result, increase their profits and lower their prices. This leads to an increase in consumer demand and, consequently, an increase in firm size, leading to higher labour demand and higher domestic employment, at the expense of foreign competitors. Attempts to curb automation in order to protect domestic employment may therefore be counterproductive due to international competition.

In conclusion, given that the cost of employment is relatively high in France compared to countries with low labour costs, including within the European Union, automation can represent a major vector for restoring French competitiveness by improving the attractiveness of the country for production activities in sectors exposed to international competition.