# Telework and Productivity Before, During and After the COVID-19 Crisis

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**Abstract –** We use the data from a Banque de France survey, carried out among French companies about their use of telework in 2019 and during the first lockdown in the spring of 2020. Combining this with detailed information regarding their balance sheets and profit and loss accounts, we show that those that made more use of telework in 2019 were more productive on average and better withstood the crisis overall. They are also larger and relatively less capital-intensive, although they have relatively high fixed assets in the form of IT equipment and intangible assets when compared with other companies. The estimations show that a significant global increase in the use of telework in the long term could increase productivity by around 10%. The results also reveal the non-linear effects of telework on productivity. Companies that were already practising telework in 2019 were more likely than others to want to increase this in the future and those that were looking to do so were more likely to be planning an increase in their IT investment, as well as a change of premises.

JEL: E24, J24, O47
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The shock of the COVID-19 pandemic and the periods of lockdown have brought about significant changes in the ways that we work, and in particular a very decisive shift towards telework. These changes, which have contributed significantly to reducing the health risks introduced by the pandemic and boosting the resilience of the economy, were made possible by the development and roll-out of digital technologies allowing for telework (teleconferencing service, cloud, etc.). Teleworking, which is often a choice made by the employees concerned, was therefore able to continue, bringing with it some potentially significant benefits for employees and companies alike.

Prior to the COVID-19 shock, telework was not yet widespread in France or in other European countries. According to DARES, in 2017, only 3% of employees were teleworking at least one day a week (Hallépée & Mauroux, 2019). It goes without saying that there was an explosion in this type of working during the periods of lockdown implemented during the health crisis, which resulted in 25.4% of employees working remotely in December 2020 (DARES, 2021), similar to the figures observed during the strictest lockdown in spring 2020 (Guichard & Pinel, 2020). Of course, this phenomenon is not specific to France and was observed across all advanced countries. A survey conducted by Eurofound (2020) in May 2020 revealed that 35% of employees within the EU-27 reported having started working remotely during the first lockdown in spring 2020, adding to those already working in this way. However, that figure varies significantly from one country to the next depending, among other things, on the structure of economic activities, the average level of education of the population and the training of employees and managers in new technologies. It therefore varies from around 20% in Romania to 60% in Finland. The findings of an extensive OECD survey conducted in 2021 are qualitatively similar to those of the aforementioned Eurofound survey (Criscuolo *et al.*, 2021).

Looking at the longer term, the potential for the development of telework has been assessed by various studies, which arrive at figures that are fairly close to the peak in telework seen during the periods of lockdown. In the case of France, DARES has estimated that almost 4 in 10 jobs in the private sector today would be compatible with telework (DARES, 2020; Jauneau, 2022). This is fairly close to what has been calculated for other countries. Therefore, Milasi *et al.* (2020) estimate that, in Europe, this potential development could range from 27% in Romania to 56% in Luxembourg, with an average of 37% across the EU-27. As regards the United States, Dingel & Neiman (2020) estimate this proportion of potential remote workers at around 34% on average. These studies also reveal strong disparities depending on the business sectors in question, the size of the companies or the characteristics of the jobs. While rare in agriculture and construction, telework sees very heavy use in financial (banking and insurance) and consulting activities. All else being equal, the figure increases with the size of the company, the level of qualification required for the jobs and the use of information and communication technologies, as well as the level of training of the employee.

The advantages offered by telework benefit employees and companies alike. The former are able to achieve a better work-life balance and live further away from their place of work, thereby opening up access to cheaper housing and reducing the time spent commuting. Employee expectations in this regard are varied, since an improved work-life balance can take very specific forms. Surveys conducted among workers have revealed that many wish to continue working remotely after the health crisis, with their preference being for doing so two or three days per week (see for example Barrero *et al.*, 2021; Criscuolo *et al.*, 2021).

For companies, telework can have a significant impact on productivity and performance (for a literature review, see Bergeaud & Cette, 2021). A vast number of studies focus on these impacts (for France see, among others, Cette, 2020; OECD, 2020; Pora, 2020; Batut & Tabet, 2020) all of which come to different conclusions. By way of illustration, Bloom *et al.* (2015) study the switch to telework by a volunteer group of employees working at a Chinese call centre within a company equipped and prepared for working in this way. They observed that remote workers are significantly more productive – demonstrating increases in productivity of around 20% – happier and less likely to leave the company. Conversely, Morikawa (2020) recounts the experience of a Japanese research institute that suddenly switched to telework without any preparation during the spring 2020 lockdown. Productivity allegedly fell by around 40% on average. Likewise, Gibbs *et al.* (2021) observed a drop in productivity among employees of an IT service company during the COVID-19 pandemic. These differences can be explained by a number of factors, and the drops in productivity mentioned by Morikawa (2020) and Gibbs *et al.* (2021) include a lack of

preparation, inadequate technical resources, a lack of discussion between colleagues and a lack of a suitable place to work remotely, particularly where young children are present. These conflicting assessments provide the first finding shared with other analyses on this subject: the impacts of telework on productivity are much more positive and significant where it has the support of both the employees concerned and their managers, where everyone involved is prepared and trained for this way of working and where the equipment and home office environment are appropriate.

As such, the switch to telework during the 2020 lockdowns, which generally took place under the most adverse conditions, limited any positive impacts on productivity. Indeed, in most cases, this transition took place quite suddenly for sanitary reasons, without consultation and without appropriate equipment, for every day of the week and without either the employees or their employers having been prepared and trained in advance. In addition, the unprecedented nature of this experience does not allow for a general characterisation of the potential impacts of telework on productivity.

However, should we consider that, with proper preparation, an increase in telework is inextricably linked to an increase in productivity? In certain businesses, the slowing of interactions between colleagues can reduce the flow of business information. This means that if all eligible employees were to adopt full-time telework, productivity may suffer. Various analyses, such as those by the OECD (2020) and Criscuolo *et al.* (2021) therefore suggest that the relationship between improvements in performance and the intensity of telework would take on an inverse U shape; the 'optimal dosage', which is obviously dependent on the business in question, could be anywhere from two to four days spent working remotely per week.

The literature points to various different channels for the positive impacts of telework on productivity.[1] Of those that are generally mentioned, we have selected the following three, which appear to be the most important.

The first channel involves greater motivation brought about by the flexibility and autonomy afforded to remote workers as regards their place of work and their work-life balance. This is in addition to reduced fatigue as a result of the amount of time saved on commuting. Some of this time saved is then occasionally reinvested in work, which increases the apparent productivity of the remote worker (see, for example, Arntz *et al.*, 2020; Barrero *et al.*, 2021). Following the reduction in commuting time, the reduction in the number of less essential meetings and workplace distractions is also mentioned as a reason for the greater efficiency of remote workers (see, for example, Ozimek, 2020).

The second channel is linked to the reduced need for real estate as a result of telework (see Bergeaud & Ray, 2020, for a summary and Bergeaud *et al.*, 2021, for an evaluation in France). This potential gain increases in proportion to the savings in terms of space associated with the increase in telework and the value of the land. It results in an increase in total factor productivity at any given level of labour productivity. However, this impact can only be felt in the medium and long term. It should also be noted that a permanent increase in telework could bring about a fall in city centre real estate prices as a result of both the reduced need for space among companies and, for some workers who no longer need to commute to work (or need to do so less often), a selection of cheaper housing further afield. In addition to reducing the risk of housing bubbles, this reduction in city centre real estate prices could also have a positive impact on growth in the medium and long term.

Finally, the third channel that is often mentioned in the literature is the acceleration in the use of the digital technologies favoured by telework (see, for example, di Mauro & Syverson, 2020). This is a favourable consequence of the changes brought about by the COVID-19 crisis, which results in us reaping the productivity gains associated with the digital revolution earlier than anticipated. As was the case for the impact mentioned above, this favourable impact would be gradual and would only become significant in the medium and long term.

Overall, the net impact of the use of telework on productivity in general in the post-COVID period is fairly uncertain. Assuming that telework develops at its potential level, Barrero *et al.* (2021) estimate the figure at around 5%. However, this evaluation is based purely on the results of a survey of workers. As is the case for workers, surveys conducted among companies have revealed that many wish to make heavy use of telework after the COVID-19 crisis, with their preference also being for a maximum of two or three days per week (see, for example, Barrero

*1. We are interested here in the impacts of telework outside of the context of the COVID-19 health crisis. It is also clear that the explosion in the use of telework during the periods of health restrictions enabled us to avoid two extreme setbacks: a greater contraction of business (with the same health restrictions) and higher mortality (with fewer health restrictions).*

*et al.*, 2021; Criscuolo *et al.*, 2021). However, to the best of our knowledge, there has not yet been any evaluation of the impacts of telework on productivity using company balance sheet data as opposed to survey data alone.

The following analysis offers an evaluation of the impacts of telework on productivity. It combines data from a survey on the use of telework with fiscal data, thereby allowing indicators such as the productivity of companies to be calculated. The data on telework correspond to the responses received from industrial-sector companies during a survey conducted in France in September 2020 by Banque de France as part of its annual survey on the Use of Factors of Production (UFP) asking them about their use of telework in 2019 and 2020 and their intentions for 2021. The responses to this survey were matched with the data from the FIBEN Banking Database on Companies corresponding to their tax returns; this made it possible in particular to construct indicators for the characteristics and performance of companies and in particular for labour productivity and Total Factor Productivity (TFP). The original file resulting from the matching of these two sources of information covers almost 1,500 companies in the manufacturing sector and provides information on both their characteristics and their performance, as well as on their use of telework in 2019 and 2020 and their future intentions.

Based on these data, we estimate various models with a view to explaining the use of telework and the consequences of that use on productive performance. As far as we are aware, this is the first analysis to provide such an insight into individual company data.

The estimations made in 2019, when the use of telework was not dictated by health requirements, indicate that companies using it have smaller premises in terms of space per employee and that the share of IT and intangible assets is higher than in other companies. The estimations suggest that telework has a relatively significant impact: one additional percentage point (p.p.) of the workforce working remotely would increase TFP by around 0.6%. When extrapolated across the French economy as a whole, this suggests that the increase in the proportion of remote workers from around 5% pre-COVID to 20% to 25% on a long-term basis during the post-COVID period would bring about an increase of around 10% in TFP. The results also confirm that the impacts of telework on productivity would be non-linear, as suggested by Criscuolo *et al.* (2021). Telework would have an increasing and then decreasing positive impact on productivity, suggesting an inverse U-shaped relationship. In addition, it also appears that companies that were already using telework in 2019 experienced less of a downturn in business in 2020. Finally, those companies that were already practising telework in 2019 are more likely than others to want to increase this in the future, and companies that are planning to increase their use of telework in the future are more likely than others to increase their IT investments and move to different premises.

The rest of the article is structured as follows. Section 1 presents the data and offers a simple comparison of companies according to their use of telework in 2019. Section 2 focuses on differences in productivity related to telework. Section 3 provides additional results and offers an evaluation of the aggregated impacts and the longer-term consequences of telework.

## 1. Data, Sample, Variables of Interest and First Descriptive Statistics

### 1.1. Data and Sample

The analysis makes use of two separate databases: the FIBEN Banking Database on Companies and the *Utilisation des Facteurs de Production* [Use of Factors of Production] (UFP) survey conducted by Banque de France in September 2020. The two are matched *via* the SIREN IDs of the companies.

FIBEN includes the annual accounting data of companies with a turnover of more than EUR 750,000 or with credits in excess of EUR 380,000. These data cover around 200,000 companies and group together many associated characteristics, such as business sector, workforce, productivity, turnover and accounting variables, which make it possible to calculate labour productivity or total factor productivity.

The UFP survey has been conducted annually by Banque de France since 1989 (previously as the *Durée d'Utilisation des Équipements* [Duration of Use of Equipment] survey). It provides data on the use of capital and labour factors of production by establishments in the manufacturing industry (excluding the mining and petroleum industries) with at least 20 employees. Establishments are asked about their workforce, their production capacity utilisation rate, the working hours of their employees and past and present variations in the duration of use of their equipment. A new section was added to this survey in 2015, which questions establishments on a specific and topical subject. In 2020, establishments were questioned with regard to their past and

present telework practices and the way in which they plan to use telework in the future (a more detailed description of this survey and its initial descriptive results on the use of telework are provided by Gerardin *et al.*, 2021).

The questions asked in the survey on the subject of telework that are used in this analysis are as follows:

- What proportion (as a %) of your workforce was working remotely before lockdown, at peak utilisation during lockdown and during the week of 7 to 11 September 2020?
- In the case of remote workers, how many days on average did they work remotely per week before lockdown, at peak utilisation during lockdown and after lockdown (during the week of 7 to 11 September 2020)?
- When compared with the pre-lockdown situation, do you expect future telework practices at your establishment to be: 'Permanently increased', 'The same as before lockdown', 'Permanently reduced'?
- For each of the following departments or roles (if applicable) provide an approximate indication of the proportion (as a %) of your workforce working remotely during the week of 7 to 11 September 2020: 'Management and General Administration', 'Finance and Accounting', 'Human Resources', 'Logistics', 'Purchasing', 'Production', 'R&D', 'Marketing and Sales'.
- To what extent do you plan to invest in hardware and software in the next five years to increase the use of telework?
- Do you expect to change your occupancy of offices or premises as a result of telework practices within your establishment?

1,703 completed questionnaires were collected. Following processing,[2] the UFP and FIBEN databases were merged to form a single database containing information about telework and company characteristics. Only those establishments (or groups of establishments) representing at least 50% of their company were retained to ensure that the practical measurement of telework is indeed representative of the company and its characteristics. The final sample contains 1,493 observations that can be used for the analysis.

Table 1 provides a description of the sample by establishment size (5 size classification) and industrial sector (4 industrial sectors according to the Banque de France classification: C1

*2. Merging of questionnaires from several establishments representing a single company. The overseas territories and Corsica are excluded from the sample.*

Table 1 – **Description of the sample by size and industrial sector** [(a)]

| Sector / Size | C1 | C3 | C4 | C5 | Total |
|---|---|---|---|---|---|
| | All establishments | | | | |
| 20-49 | 3.0 | 6.2 | 1.5 | 27.4 | 38.1 |
| 50-99 | 2.2 | 4.2 | 0.9 | 16.4 | 23.7 |
| 100-199 | 2.3 | 3.1 | 1.1 | 11.9 | 18.4 |
| 200-499 | 1.8 | 3.1 | 1.3 | 8.1 | 14.3 |
| 500+ | 0.7 | 1.1 | 1.0 | 2.7 | 5.5 |
| Total | 10.0 | 17.7 | 5.8 | 66.5 | 100.0 |
| | Companies not using telework | | | | |
| 20-49 | 2.7 | 5.3 | 1.3 | 24.6 | 33.9 |
| 50-99 | 1.9 | 3.2 | 0.7 | 13.7 | 19.5 |
| 100-199 | 1.9 | 2.1 | 0.9 | 8.2 | 13.1 |
| 200-499 | 1.5 | 1.5 | 1.0 | 5.7 | 9.7 |
| 500+ | 0.5 | 0.2 | 0.2 | 0.8 | 1.6 |
| Total | 8.4 | 12.3 | 4.1 | 53.0 | 77.8 |
| | Companies using telework | | | | |
| 20-49 | 0.3 | 0.9 | 0.1 | 2.8 | 4.1 |
| 50-99 | 0.3 | 1.1 | 0.1 | 2.7 | 4.2 |
| 100-199 | 0.5 | 1.0 | 0.3 | 3.6 | 5.4 |
| 200-499 | 0.3 | 1.6 | 0.3 | 2.4 | 4.6 |
| 500+ | 0.3 | 0.9 | 0.8 | 1.9 | 3.9 |
| Total | 1.7 | 5.5 | 1.6 | 13.4 | 22.2 |

[(a)] According to the Banque de France classification (Cf. *supra*).
Notes: Each cell shows the percentage from the cross-referencing of size × sector within the sample. The number of observations in each cell is shown in Table A1 in the Appendix. The use of telework corresponds to the situation in 2019 here.
Sources: Banque de France UFP survey (2021) and FIBEN.

'Food, beverages and tobacco products'; C3 'Electrical, electronic and computer equipment and machinery'; C4 'Transport equipment'; C5 'Other industrial products'). The majority of establishments (66%) belong to sector C5. Across the sample as a whole, the majority of companies have between 20 and 99 employees. In 2019, 22% of the establishments in our sample practised telework (332 establishments, see Table A1 in the Appendix).

As the sample covers a limited portion of the establishments in the manufacturing industry (excluding the mining and petroleum industries) employing at least 20 people, weighting coefficients have been applied to each establishment to better reflect the reality of the manufacturing industry. These coefficients take account of the size and industrial sector of each observation and will be used systematically during regressions.

### 1.2. Main Variables of Interest

*- Total Factor Productivity (TFP)*

The TFP of each of the companies is calculated using FIBEN data, based on an estimated production function. Other methods can be used to calculate the TFP.[3] The results are similar for the most part.

More specifically, the TFP of a company *i* represents a quantity that reduces the value produced to a certain combination of factors of production:

$$TFP_i = \frac{Y_i}{K_i^{\alpha_K} H_i^{\alpha_L}}$$

where $Y$ is the value added in terms of volume (value added in nominal terms divided by a sectoral value added price index calculated at the level of the NAF division and published by INSEE), $K$ is the stock of productive capital and $H$ is a measure of the human capital.

The capital stock is calculated by adding together estimates of the actual value of the capital stock in the form of buildings, transport equipment, other physical equipment and intangible capital. These values are derived from the value of the gross fixed assets for each asset class together with an estimate of their age based on the amortised share and an estimate of the standard life of that asset.[4] The value of the capital for each asset is then deflated using a national price index for each type of investment. The human capital $H$ is approximated on the basis of employment within the company. The parameters $\alpha_L$ and $\alpha_K$ are estimated on the basis of a production function obtained using the ACF method (Ackerberg *et al.,* 2015).[5]

*- Telework Variables*

The UFP survey provides two measures of telework: the proportion of remote workers (ratio of remote workers to the workforce as a whole) and the average number of days spent working remotely (for employees who have worked remotely). The latter is used to calculate the proportion of days worked remotely by dividing the number of days worked remotely by the total number of working days.

Table 2 provides some statistics on the growth of TFP between 2018 and 2019 and then between 2019 and 2020, as well as on the use of telework, measured *via* the proportion of employees working remotely and the proportion or number of days worked remotely, together with several other indicators. TFP can be measured for almost 95% of our sample and 100% of the establishments provided answers concerning their telework practices.

A slight increase in TFP is observed between 2018 and 2019, averaging 1.5%. As expected, the health crisis had a negative impact on productivity: TFP fell sharply between 2019 and 2020, averaging 5.9% for the companies in our sample.

In 2019, a significant proportion of companies (22%) were practising telework, but the number of people involved was small, as this primarily concerned employees fulfilling support activities (marketing, research, purchasing, accounting, human resources or logistics), who are not directly involved in production. A significant increase was seen in telework during lockdown when compared with pre-lockdown practices, followed by a fall once the lockdown was lifted, but remaining higher than in 2019. In 2019, the average proportion of employees working remotely within the establishments was 1.2%, accounting for 0.4% of working time. In September 2020, those proportions were 4.4% and 2.1%, respectively. The number of remote workers increased, as did the intensity of telework practice: one day a week on average in 2020, double the 2019 figure.

Overall, telework is relatively less widespread in industrial establishments than the rest of

*3. See Table A2 in the Appendix for a description of alternative productivity measures.*

*4. With average life expectancy assumptions of 15 years for buildings, 5 years for transport equipment, 8 years for other equipment and 6 years for intangible assets.*

*5. The ACF method is based on an estimation of the production function proposed by Levinsohn & Petrin (2003), but corrects an identification issue linked to the fact that one of the inputs (such as labour) is selected based on unobserved productivity.*

Table 2 – **Descriptive statistics of the main variables used in the analysis**

| | Period | Mean | Standard error | P25 | Median | P75 |
|---|---|---|---|---|---|---|
| Growth in TFP | 2019/2018 | 0.015 | 0.186 | −0.080 | −0.003 | 0.090 |
| | 2020/2019 | −0.059 | 0.199 | −0.170 | −0.058 | 0.056 |
| Proportion of remote workers | 2019 | 0.012 | 0.036 | 0.000 | 0.000 | 0.000 |
| | Lockdown | 0.182 | 0.202 | 0.040 | 0.114 | 0.250 |
| | 2020 | 0.044 | 0.10 | 0.000 | 0.000 | 0.040 |
| Average number of days of telework | 2019 | 0.45 | 1.12 | 0.00 | 0.00 | 0.00 |
| | Lockdown | 3.60 | 3.21 | 2.50 | 4.00 | 5.00 |
| | 2020 | 1.01 | 1.50 | 0.00 | 0.00 | 2.00 |
| Proportion of days of telework | 2019 | 0.004 | 0.012 | 0.000 | 0.000 | 0.000 |
| | Lockdown | 0.170 | 0.550 | 0.024 | 0.090 | 0.210 |
| | 2020 | 0.021 | 0.055 | 0.000 | 0.000 | 0.015 |
| Workforce FTE[(a)] | 2018 | 159 | 301 | 38 | 71 | 163 |
| Average wage | 2018 | 34.7 | 8.0 | 29.3 | 33.4 | 39.1 |
| PCU[(b)] | 2019 | 0.801 | 0.177 | 0.700 | 0.818 | 0.950 |
| Hours worked | 2019 | 36.3 | 2.26 | 35 | 35 | 38 |
| SC[(c)] | 2019 | 0.2969 | 0.1782 | 0.1622 | 0.2818 | 0.4095 |
| Number of observations: 1,493 | | | | | | |

[(a)] full time equivalent; [(b)] production capacity utilisation rate in 2019; [(c)] proportion of external labour employed by the company in 2019.
Sources: Banque de France UFP survey (2021) and FIBEN.

the economy as certain functions (particularly those linked to production *stricto sensu*) cannot be fulfilled remotely. Nevertheless, as we will see, the gains in productivity brought about by telework are related to back-office functions (administration, accounting or human resources) and can be extrapolated to other sectors.

### 1.3. Pronounced Contrasts

Table 1 shows that companies practising telework in 2019 (based on information obtained with regard to their establishments) are larger on average: they employ an average of 360 employees compared with 110 for those that did not practise telework. Nevertheless, size is not the only difference between these two groups of companies and differences can also be seen in other variables (Figure A1 in the Appendix shows the densities of several variables of interest, including employment, according to the use of telework in 2019).

We can take this even further by looking at the balance sheet data available to us. To start with, companies that made use of telework in 2019 pay higher wages. They also differ in terms of capital, more specifically their capital stock structure. In order to test this formally, we set up a simple estimation of the following model for each company $i$:

$$\frac{K_i^{(k)}}{L_i} = \alpha + \beta TW_i + \gamma \log\left(w_i\right) + \nu_{s(i)} + \varepsilon_i \qquad (1)$$

where $K_i^{(k)}$ is the capital stock corresponding to asset $k$, $L_i$ is employment and $TW$ is a binary variable equal to 1 if the company has at least one employee working remotely and 0 if not. These three variables were measured in 2019. The coefficient $\beta$ captures the difference in the capital to employment ratio between the two groups of companies. In order to take account of wage differences and potential differences in practices from one sector to the next, we add a control for the logarithm of the average wage in 2018 and a sector fixed effect $\nu_{s(i)}$.

We start by considering the total tangible capital stock and then the real estate stock (Table 3, columns 1 and 2). In both cases, the coefficient $\beta$ is close to 0. It should be noted, however, that the real estate stock is measured in terms of value here, but there is a great deal of spatial heterogeneity when it comes to price per unit of area.

Also, in order to arrive at a more accurate measurement of the volume of real estate, we estimate the number of square metres per employee using a departmental price index (for a description of the method used, see Bergeaud & Ray, 2021). A new estimation is made of the model using this new measure of the real estate capital stock. This time, the coefficient $\beta$ is negative and significant (Table 3, column 3). The coefficient suggests that the real estate belonging to a company practising telework is around three square metres smaller per employee.[6] Finally, we look specifically at

*6. This difference could be explained by the fact that companies within the industrial sector make very diverse use of the space at their premises (offices, factories, etc.), which can vary significantly depending on the feasibility of telework. Nevertheless, the introduction of fixed effects defined at a more detailed level (NAF sub-class, 218 sectors) has little impact on this coefficient.*

Table 3 – **Composition of capital and telework**

| Dependent variable: | Tangible capital | Real estate capital | | IT capital | Intangible capital |
|---|---|---|---|---|---|
| | | value | area ($m^2$) | | |
| | (1) | (2) | (3) | (4) | (5) |
| Telework | 0.862(9.482) | 2.628(3.710) | −3.154***(0.394) | 0.514**(0.242) | 3.467**(1.527) |
| Sector Fixed Effects (NAF) | Yes | Yes | Yes | Yes | Yes |
| $R^2$ Adjusted | 0.399 | 0.334 | 0.162 | 0.375 | 0.247 |
| Number of observations | 1,459 | 1,459 | 1,459 | 1,459 | 1,459 |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Result of the estimation of equation (1) with an OLS estimator. Each column represents a different dependent variable. The capital stock components were all calculated in 2019 and linked to employment in 2019. Each regression includes a control for the average wage (as a log) in 2018. The standard errors indicated in brackets are estimated by allowing for autocorrelation within the same department. The observations are weighted using the survey weights (Gerardin *et al.*, 2021).
Sources: Banque de France UFP survey (2021) and FIBEN.

the IT capital stock and the intangible capital stock, which includes in particular software and intellectual property. In both cases, the companies that were practising telework in 2019 had significantly higher capital stock per employee than other companies (Table 3, columns 4 and 5).

## 2. Impacts of Telework on Productivity

In this section, we will present the initial results of the estimations of the impacts of telework on productivity, followed by a robustness analysis of the results obtained.

### 2.1. Use of Telework and Productivity

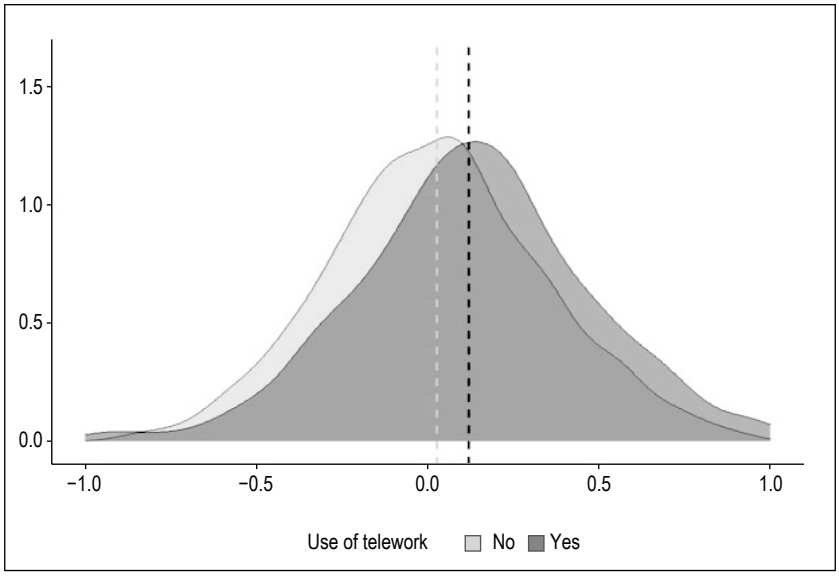
Several of the elements set out in the introduction suggest that the use of telework could have a positive impact on the productivity of companies. The individual database that we have just described will allow this assumption to be tested and the impact evaluated. For this, we will look at the use of telework in 2019, i.e. not dictated by health requirements. This means that telework has been chosen for purely economic reasons and essentially results from specific agreements between the employers and employees concerned.

Figure I shows the distribution of the productivity of the companies in the sample according to whether or not they practised telework. A comparison of the two distributions suggests that the use of telework goes hand in hand with a higher level of TFP: the median TFP of companies practising telework is around 10% higher than that of companies that do not practise telework.

This crude relationship between productivity and the use of telework calls for a more precise assessment that will allow us to control for the many observable differences between the companies that practise telework and those that do not. We therefore estimate the following simple linear relationship:

$$tfp_i = \alpha + \beta \cdot PTW_i + X_i \cdot \gamma + \nu_{s(i)} + \varepsilon_i \qquad (2)$$

Figure I – **Density of the log of TFP following the use of telework in 2019**




Notes: The vertical lines represent the median of the log of TFP for each of the two groups.
Sources: Banque de France UFP survey (2021) and FIBEN.

The index $i$ is the company. Here, *tfp* is the logarithm of TFP, *PTW* is the proportion of employees working remotely, $X$ is a vector of control variables taken from both the FIBEN data and the UFP survey that will allow us to capture the effects of these variables on TFP, $\nu_{s(i)}$ is a sector fixed effect and $\varepsilon$ is the error term. The coefficient $\alpha$ therefore measures the conditional correlation between telework and TFP. This relationship was estimated using the ordinary least squares (OLS) method and was estimated for 2019, before the COVID crisis and the lockdown periods.

The estimation of this relationship (2) shows that telework has a significant positive impact on TFP (Table 4). The estimation without control variables shows that one additional percentage point (p.p.) of the workforce of industrial companies working remotely would be associated with an improvement in TFP of 1.09% (column 1). However, we saw above that the use of telework increases with the size of the company and TFP itself differs according to size. On the other hand, the economic literature indicates that telework is more frequently practised the more qualified the workforce is, and therefore the better paid they are and the more productive they are (see, for example, OECD, 2021). It therefore seems relevant to add two control variables to the estimation of relationship (1): the size of the company, measured here by the logarithm of its workforce (denoted by *l*), and the average level of qualification of the company's workforce, measured by the logarithm of the average wage cost (denoted by *w*). The coefficients estimated on the basis of these two control variables are significant, and the estimated impact of telework is consequently reduced: one additional percentage point of the workforce working remotely would be associated with a 0.61% improvement in TFP (column 2). The reduction in the impact of telework on productivity when we control for the average wage could be explained by the fact that the most highly qualified employees and those who are better paid are also those who occupy positions that are most likely to be fulfilled remotely and who achieve higher productivity than the average employee. Finally, three other control variables have been added to take account of potential measurement errors in the use of factors of production. First of all, the production capacity utilisation rate (PCU), for which we expect (all else being equal) to see a positive effect on TFP. Next, the average working time (as a logarithm, denoted by *h*), for which we envisage a negative impact on productivity as a result of diminishing returns on working time (linked, for example, to the effects of fatigue), and finally the extent to which external labour is called in (SC, measured *via* the proportion of the workforce present in the company as a result of subcontracting, for example temporary work), the impact of which is unclear. Of these three additional control variables, only the estimated coefficient for the production capacity utilisation rate appears significant and indicates that, all else being equal, a 1 p.p. increase in this rate would increase TFP by around 0.177% (column 3). The addition of these controls only slightly affects the estimated impact of the use of telework on TFP: one additional percentage point of the workforce working remotely would be associated with a 0.65% improvement in TFP. The estimated impact of the use of telework on work productivity alone (in this case the ratio of value added in terms of volume to work) is positive, but still close to zero (column 4). This finding indicates that the savings that can be made in connection with telework in terms of premises, which are taken into account in the total factor productivity indicator, are a deciding factor in the impact of the use of telework on the productive performance of the company.

Table 4 – **Estimation of the impacts of telework on productivity**

| Variable explained (as a log): | TFP (1) | TFP (2) | TFP (3) | PT (4) |
|---|---|---|---|---|
| PTW | 1.058*** (0.223) | 0.612*** (0.197) | 0.643*** (0.207) | 0.206 (0.212) |
| Average wage in 2018 (log) | | 0.818*** (0.069) | 0.824*** (0.070) | 1.123*** (0.085) |
| Employment in 2018 (log) | | −0.072*** (0.010) | −0.073*** (0.010) | 0.012 (0.010) |
| Number of hours worked (log) | | | −0.005 (0.017) | 0.042** (0.016) |
| SC | | | 0.088 (0.076) | 0.065 (0.071) |
| PCU | | | 0.002** (0.001) | 0.001 (0.001) |
| Sector fixed effects | Yes | Yes | Yes | Yes |
| Adjusted $R^2$ | 0.273 | 0.466 | 0.472 | 0.634 |
| Number of observations | 1,375 | 1,375 | 1,375 | 1,375 |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Result of the estimation of relationship (2) using the OLS method. The standard errors indicated in brackets are estimated by allowing for autocorrelation within the same department. The observations are weighted using the survey weights.
Sources: Banque de France UFP survey (2021) and FIBEN.

## 2.2. Robustness and Extension

The sample used is composed solely of establishments belonging to companies in the industrial sector. However, the majority of them also practise telework for some jobs that are common to all companies (support functions, HR, administration, etc.). Nevertheless, this may not apply to all companies and, indeed, a small number of those in our sample (200) did not declare any remote workers during the height of the lockdown, a time when telework was very strongly encouraged. The results of the estimations are very close when these companies, which appear to be less conducive to this method of working, are excluded.

Nevertheless, the questions asked in the survey allow us to go into a little more detail. Telework is not feasible for all categories of workers, and where it is possible, it does not necessarily have the same impact on productivity across all of the categories of workers concerned. In the UFP survey, companies were asked to give details of the proportion of remote workers across eight different departments within the company in September 2020: 'Management and General Administration', 'Marketing', 'Research & Development' (R&D), 'Production', 'Purchasing', 'Finance and Accounting', 'Human Resources' (HR), 'Logistics'. The estimation of relationship (2) was made (with the same control variables as in the third column of Table 4) by taking each proportion of remote workers in turn to act as an explanatory variable. The results of this estimation are shown in Table 5. The estimated coefficients cannot be directly combined to arrive at those previously commented on because the survey does not provide any information on the relative proportion of these different jobs within the overall workforce of the companies. The estimations are also made based on 2020 data, since the question relates to September 2020.[7] A further regression including all of these proportions simultaneously highlights a significantly positive impact in the 'Human Resources' department. The coefficients associated with the proportion of telework in the other departments are not significant. This latter finding can be explained by the loss of statistical power brought about by the strong correlation between these variables (between 0.3 and 0.5).

These estimations show that the use of telework would have significant impacts on productivity where it is arranged in the 'Management and General Administration', 'Purchasing', 'Accounting' and 'Human Resources' departments, with insignificant effects in the others. These results appear reassuring from the point of view of their extension to non-industrial sectors.[8]

Finally, the results of the estimation shown in Table 4 and obtained based on the TFP indicator favoured by this analysis (i.e. the one established based on the method employed by Ackerberg *et al.*, 2015) stand up to the use of other productivity measures (see Figure A2 and Table A2 in

*7. In order to make these results as comparable as possible, we have added the results obtained when equation (2) is estimated with 2020 data (September 2020 for the telework measurement) in Table 5. The results are very close to those obtained for 2019.*

*8. These results may, however, be affected by a measurement issue: indeed, there is a positive correlation between the use of telework in different activities within the same company and there is not always a clear delineation between these activities. However, the evidence that it is telework that has a positive impact on productivity for support functions is robust, but these results cannot claim to identify gaps in the specific impact on productivity of the use of telework in each of the support functions.*

Table 5 – **The impacts of the use of telework on productivity by company department**

| | Coefficients | (Standard error) | Average proportion of remote workers (%) |
|---|---|---|---|
| Management and general administration | 0.200 *** | (0.059) | 5.3 |
| Marketing | 0.057 | (0.056) | 11.6 |
| R&D | −0.022 | (0.077) | 5.7 |
| Production | −0.150 | (0.300) | 0.9 |
| Purchasing | 0.096 * | (0.057) | 7.6 |
| Finance and accounting | 0.120 * | (0.072) | 9.6 |
| HR | 0.158 ** | (0.072) | 7.0 |
| Logistics | −0.140 | (0.122) | 2.6 |
| Total | 0.511 * | (0.263) | 4.3 |
| Sector fixed effects | Yes | | |
| Controls | Yes | | |
| Number of observations | 1,396 | | |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Each row corresponds to an estimation of model (2) with the same control variables as those set out in column 3 of Table 4 to provide a measurement of telework for a specific type of activity. The dependent variable is the logarithm of TFP. All of the variables are from 2020.
Sources: Banque de France UFP survey (2021) and FIBEN.

the Appendix for a description of alternative productivity indicators).

## 3. Additional Results

We will conclude by examining the impact of the use of telework on the resilience of companies during the COVID crisis.

### 3.1. Telework and the Impact of the Crisis on Companies

Spring 2020 was marked by the mass use of telework, often implemented on an improvised basis, bringing about significant disorganisation within many companies. However, Consolo *et al.* (2021) show that the countries that were best prepared for telework (because it was already in place before the pandemic or because they were better equipped in terms of IT equipment) withstood the first phase of the crisis better, at least in terms of changes in GDP.

Following the same logic, in this section, we will compare the economic resilience of companies in 2020 according to the intensity with which they practised telework in 2019. More specifically, we will estimate the following linear model for each company *i*:

$$\Delta Y_i = \alpha + \beta TW_i + X_i\gamma + I_{s(i)} + \varepsilon_i \qquad (3)$$

where $\Delta Y_i$ measures the variation in variable $Y$ between 2020 and 2019, where Y represents, in turn, the duration of use of equipment (DUE), value added, production and investment. $TW$ is a measure of the use of telework in 2019 (alternating between a binary variable, the proportion of employees working remotely or the proportion of days worked remotely). As was the case in equation (2), $X$ is a vector of the control variable and $I$ is a sector fixed effect. The coefficient $\beta$ measures the variation in Y that may be associated with $TW$, the use of telework.

As expected, the companies that were already practising telework in 2019 experienced a less marked slowdown in business (evidenced by the variation in the DUE) in 2020 than others (Table 6, column 1). Where the intensity of telework is considered (proportion of employees working remotely or proportion of days worked remotely), the results also reveal that this experience of telework in 2019 allowed companies to limit the fall in their value added, their production and their investment (Table 6, columns 2, 3 and 4).

### 3.2. A Non-Linear Impact

The information concerning the proportion of days worked remotely during an average week by employees working remotely also allows us to test the assumption of a possible non-linearity in the intensive margin of telework and its impact on productivity, as suggested by Criscuolo *et al.* (2021) or Bergeaud & Cette (2021), for example. These studies assume that there is an optimal duration for telework, which is neither 0% nor 100%, that would maximise productivity gains. In order to test whether this relationship was already present in 2019, we will re-estimate equation (2) with the addition of four indicators corresponding to the four quartiles of telework intensity (by ascending order of intensity on the condition that it differs from 0).

The results reveal that the intensity of telework has a significant impact on productivity: one additional percentage point in the intensity of use of telework would be associated with a 2.6% increase in TFP (Table 7, column 1). Since the average (weighted) number of days worked off site by a remote worker is between one and two per week, this estimated impact is consistent with the previous estimation of the impact of the proportion of remote workers. In addition, non-linear impacts of the intensity of telework on

Table 6 – **Telework and economic resilience during the health crisis**

| Dependent variable: | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Variation in DUE (%) | Value added (Δlog) | Production (Δlog) | Investment (Δlog) |
| Use of telework (0/1) | 2.573 * (1.349) | 0.121 (0.023) | 0.019 (0.014) | 0.132 * (0.074) |
| Proportion of employees teleworking | 19.096 ** (8.922) | 0.657 *** (0.193) | 0.457 ** (0.229) | 0.908 * (0.414) |
| Proportion of days of telework | 63.835 * (35.052) | 1.819 *** (0.623) | 1.343 (0.994) | 5.026 *** (1.451) |
| Sector fixed effects (NAF 24) | Yes | Yes | Yes | Yes |
| Controls | Yes | Yes | Yes | Yes |
| Number of observations | 1,430 | 1,395 | 1,379 | 1,404 |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Each column and each row correspond to an estimation of model (3) using the OLS method with the rows showing different ways of measuring telework. The control variables are the same as in column (3) of Table 4. Each regression includes a control for the logarithm of the average wage in 2018. The standard errors indicated in brackets are estimated by allowing for autocorrelation within the same department. The observations are weighted using the survey weights.
Sources: Banque de France UFP survey (2021) and FIBEN.

Table 7 – **Estimation of non-linear impacts of telework on productivity**

| | (1) | (2) |
|---|---|---|
| Proportion of days of telework in 2019 | 2.599*** (0.625) | |
| Intensity of telework (*Ref.:* No telework) | | |
| First quartile | | −0.053 (0.052) |
| Second quartile | | −0.062 (0.047) |
| Third quartile | | 0.111 ** (0.051) |
| Fourth quartile | | 0.091 ** (0.037) |
| Sector fixed effects (NAF 24) | Yes | Yes |
| Controls | Yes | Yes |
| Number of observations | 1,382 | 1,382 |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Results of the estimation of equation (2) using the OLS method. The other variables are those in column 3 of Table 4.
Sources: Banque de France UFP survey (2021) and FIBEN.

productivity are confirmed by the results of the quartile estimation (column 2): when compared with a situation in which there is no telework, a low intensity of telework does not have any significant impact on productivity. Positive impacts appear in the third quartile, but they are less pronounced in the last quartile, though the difference is not statistically significant. It is an inverse J-shaped relationship that emerges here. This finding backs up the assumption that the positive impacts of telework on productivity are non-linear. Indeed, the economic literature has highlighted the possibility of a negative impact of excessive use of telework, which would largely eliminate the informal discussions, exchanging of ideas and pooling of skills that are essential to the development of new ideas (e.g. Behrens *et al.*, 2021). However, it may take some time before such negative impacts become apparent, so this possibility will need to be confirmed once telework has been practised widely for several years.

### 3.3. What Impacts Does Telework Have at Global Level?

The results presented in Section 2 can be used to assess a plausible order of magnitude of the impact that a significant and stable shift towards telework could have in the long term (and in particular outside of the context of the health crisis). The positions in the industrial sector and in our sample of establishments that are suitable for telework are largely comprised of support functions: marketing, research, purchasing, accounting, human resources and logistics. These are not roles directly involved in production, but service roles that are indispensable to the activities of companies in the manufacturing sector. These service roles are similar to those performed by companies in the service sector. We will now risk transposing the results of estimation obtained with our sample of companies to the economy as a whole. This transposition must, however, be viewed with caution and purely serves to provide an order of magnitude for the potential impacts of a mass shift towards telework after the health crisis.

Assuming that the balance in the use of telework is around 20% to 25% of labour, in line with the studies conducted by Dingel & Neiman (2020) in particular, a mass shift towards telework in the long time could involve an increase in the proportion of employees working remotely on a regular basis of around 15 to 20 percentage points when compared with 2019. Using the coefficients in columns 2 and 3 of Table 4, this change would imply an increase in average productivity of around 10% at the level of the economy as a whole.[9]

This calculation results in an estimated long-term impact around 5% higher than that estimated by Barrero *et al.* (2021). There are three possible explanations for this discrepancy. First, the assessment by Barrero *et al.* (2021) was carried out on the basis of an extensive survey of workers whose assessment of the impacts of telework on their productivity is undoubtedly partly subjective. Next, this individual assessment struggles to take account of certain aspects of improvements to TFP such as savings made in connection with buildings and offices. Finally, the survey used by Barrero *et al.* (2021) was conducted in the context of the

*9. This is the coefficient in column 3 of Table 4, 0.6, multiplied by the difference between the telework rate before the crisis and in the long term. The results in Table 4 that have been used here may be affected by endogeneity bias: the most successful companies may benefit from better managerial quality or the employers may have greater confidence in their employees. Such managerial practices may increase the productivity of companies through a number of channels, potentially including the use of telework, as well as others that could bias the coefficients obtained with the estimation performed using the ordinary least squares method. The estimates would then attribute the effects of other managerial practices that could increase productivity to telework alone. The results of these estimation must therefore be viewed with caution when used and only as an order of magnitude of these impacts.*

Table 8 – **Future of telework and investment**

| Dependent variable: | Desire to increase telework in the future | | Desire to increase investment | Planned relocation of the company |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Telework in 2019 | 0.245*** (0.049) | | | |
| Change (2018-2019) in the number of days teleworked | | 0.383*** (0.068) | | |
| Desire to increase telework in the future | | | 0.349*** (0.097) | 0.141*** (0.046) |
| Sector fixed effects | Yes | Yes | Yes | Yes |
| Control for average wage in 2019 (log) | Yes | Yes | Yes | Yes |
| Number of observations | 1,445 | 1,238 | 1,426 | 1,439 |

Significant at the threshold of: 1% ***, 5% **, 10% *.
Notes: Estimation of a linear probability model using the OLS method. Telework in 2019 is a binary variable equal to 1 if the company had at least one employee working remotely in 2019. The standard errors indicated in brackets are estimated by allowing for autocorrelation within the same department. The observations are weighted using the survey weights.
Sources: Banque de France UFP survey (2021) and FIBEN.

COVID crisis, during which telework was taking place under sub-optimal conditions, whereas the assessment proposed here is based on the use of telework in 2019, during the pre-COVID period where the use of telework was not dictated by health requirements. In addition, this 9% improvement in productivity over the long term includes expected gains from the digitisation of the economy.

To conclude, we provide details of the responses provided by companies to the questions in the UFP survey regarding the adjustments that they are planning to make in connection with telework. In particular, they were asked about their desire to increase, maintain or reduce their use of this type of working in the future and about how they predict that their IT equipment and real estate will be adjusted as a result. Using a linear probability model (with the same control variables as in equation (2) and sector fixed effects), the estimation reveals that: *(i)* companies that already had experience of telework in 2019 are more likely to increase its use in the future (Table 8, column 1); *(ii)* companies that increased their use of telework in 2020 are more likely to declare that they wish to increase this practice (column 2); *(iii)* compared with others, companies planning to further develop telework are 35 p.p. more likely to invest in IT equipment and *(iv)* 14 p.p. more likely to move to different premises.

* *
*

The above analysis is based on individual data from around 1,500 French manufacturing industry establishments combining data from the Banque de France survey on telework and balance sheet data, which makes it possible to calculate numerous economic ratios, including total factor productivity (TFP). To the best of our knowledge, this is the first analysis to be carried out using data of this type.

The results of estimations made in 2019, at a time when the use of telework was not dictated by health requirements, indicate that companies practising telework have smaller premises in terms of space per employee and that the share of IT and intangible assets is higher than in other companies. The estimations suggest that telework has a relatively significant impact: a one percentage point increase in the proportion of the workforce working remotely would increase TFP by around 0.6%. When transposed across the French economy as a whole, this means that the increase in the proportion of remote workers from around 5% before COVID to 20% to 25% on a long-term basis during the post-COVID period would bring about an increase of around 10% in TFP.

The results also confirm that the effects of telework on productivity would be non-linear, as noted by Criscuolo *et al.* (2021). Telework would have an increasing and then decreasing positive impact on productivity, corresponding to an inverse J-shaped relationship. In addition, it also appears that the activity of companies that had been practising telework since 2019 was less negatively affected by the health crisis. Finally, those companies that already practised telework in 2019 are more likely than others to want to increase this in the future, and those that are planning to increase their use of telework in the future are more likely than others to increase their IT investments and move to different premises.

These results do of course need to be confirmed by other analyses of individual company data. At this stage, they suggest that telework offers

strong potential in terms of the impacts on the productive performance of companies. Telework forms part of the digital revolution, without which it could not prosper. It is one of the components that make it possible to simultaneously boost productive performance and employee satisfaction, since it allows the latter to strike a better work-life balance. □

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## APPENDIX

Table A1 – **Number of observations in the sample by size and industrial sector**

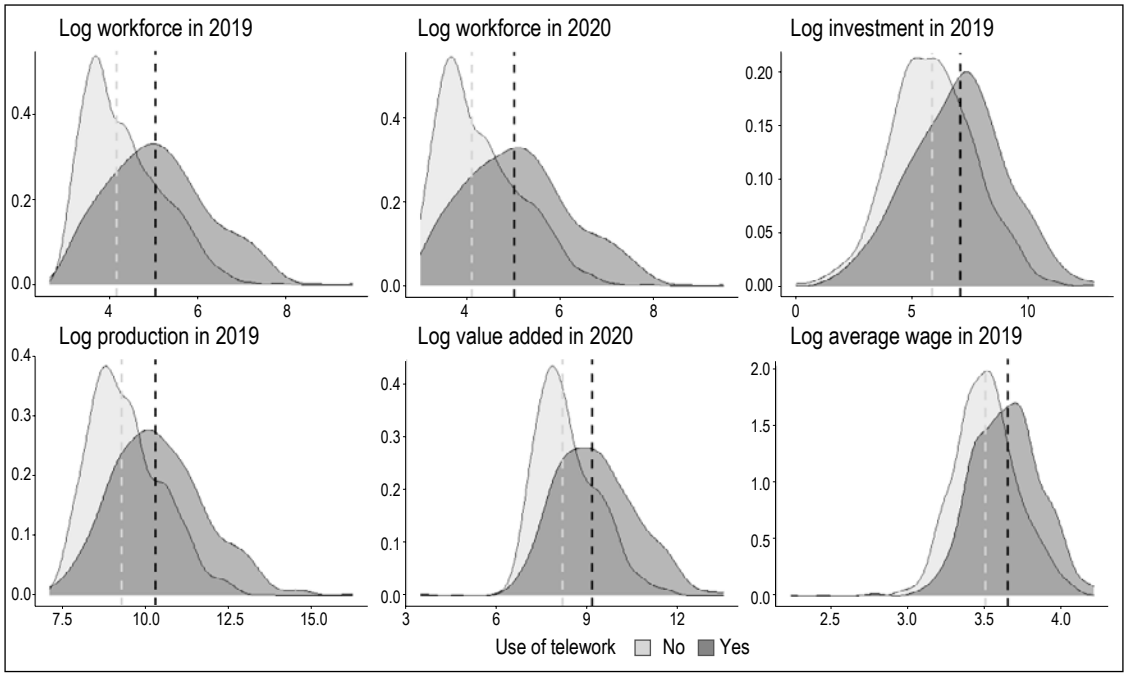
| Sector / Size | C1 | C3 | C4 | C5 | Total |
|---|---|---|---|---|---|
| | All establishments | | | | |
| 20-49 | 44 | 93 | 22 | 409 | 568 |
| 50-99 | 33 | 63 | 13 | 245 | 354 |
| 100-199 | 35 | 46 | 17 | 177 | 275 |
| 200-499 | 27 | 46 | 20 | 121 | 214 |
| 500+ | 11 | 16 | 15 | 40 | 82 |
| Total | 150 | 264 | 87 | 992 | 1,493 |
| | Companies that do not use telework | | | | |
| 20-49 | 40 | 79 | 20 | 367 | 506 |
| 50-99 | 29 | 47 | 11 | 204 | 291 |
| 100-199 | 28 | 31 | 13 | 123 | 195 |
| 200-499 | 23 | 22 | 15 | 85 | 145 |
| 500+ | 7 | 3 | 3 | 11 | 24 |
| Total | 127 | 182 | 62 | 790 | 1,161 |
| | Companies that use telework | | | | |
| 20-49 | 4 | 14 | 2 | 42 | 62 |
| 50-99 | 4 | 16 | 2 | 41 | 63 |
| 100-199 | 7 | 15 | 4 | 54 | 80 |
| 200-499 | 4 | 24 | 5 | 36 | 69 |
| 500+ | 4 | 13 | 12 | 29 | 58 |
| Total | 23 | 82 | 25 | 202 | 332 |

Note: Each cell shows the number of observations by size × sector within the sample.
The use of telework corresponds to the situation in 2019 here.
Sources: Banque de France UFP survey (2021) and FIBEN.

Table A2 – **Measures of productivity**

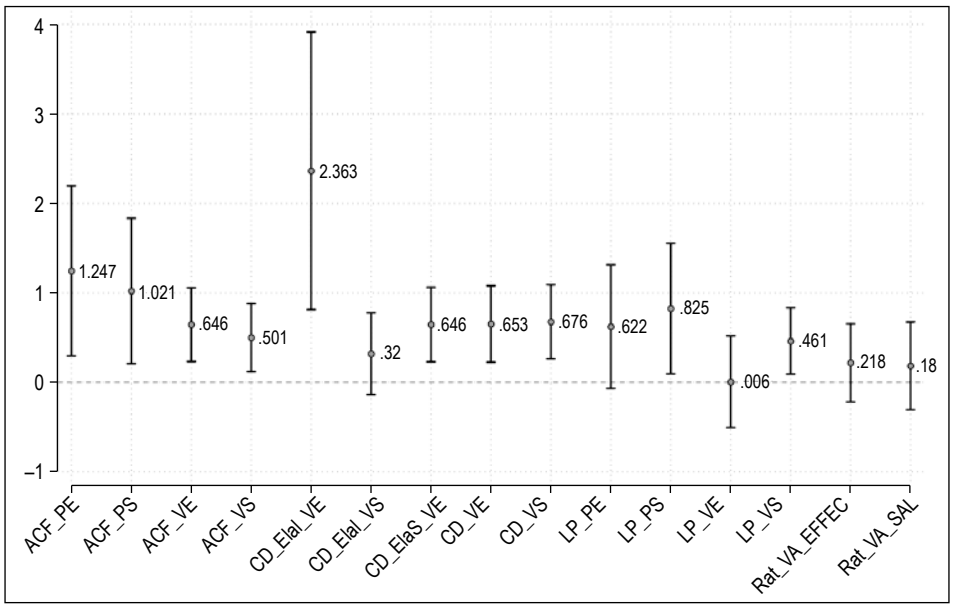
| Name | Description |
|---|---|
| | Ackerberg *et al.* method (2015) |
| ACF_PE | Production function measuring labour by employment and production approach |
| ACF_PS | Production function measuring labour by wages and production approach |
| ACF_VE | Production function measuring labour by employment and value added approach |
| ACF_VS | Production function measuring labour by wages and value added approach |
| | Direct estimation of a Cobb-Douglas function using value added by estimating the labour and capital elasticities on the basis of the proportion of labour in the value added of the company and by assuming constant economies of scale. |
| CD_ElaI_VE | Labour measured by employment |
| CD_ElaI_VS | Labour measured by wages |
| | Direct estimation of a Cobb-Douglas function using value added; labour and capital elasticities estimated on the basis of the proportion of labour in the average value added of the sector and by assuming constant economies of scale. |
| CD_ElaS_VE | Labour measured by employment |
| CD_ElaS_VS | Labour measured by wages |
| | Direct estimation of a Cobb-Douglas function using value added; labour elasticity of 0.7. |
| CD_VE | Labour measured by employment |
| CD_VS | Labour measured by wages |
| | Levinsohn & Petrin (2003) method |
| LP_PE | Production function measuring labour by employment and production approach |
| LP_PS | Production function measuring labour by wages and production approach |
| LP_VE | Production function measuring labour by employment and value added approach |
| LP_VS | Production function measuring wages by employment and value added approach |
| Rat_VA_EFFEC | Ratio of value added to employment |
| Rat_VA_SAL | Ratio of value added to the total wage bill |

Figure A1 – **Density of the different variables of interest according to the use of telework**




Notes: The use of telework is measured by the fact of having at least one employee working remotely in 2019. The dotted lines represent the median of the variable shown for each of the two groups.
Sources: Banque de France UFP survey (2021) and FIBEN.

Figure A2 – **Estimation of the impacts of telework on productivity for alternative measure of TFP**




Notes: Each point corresponds to an estimation, using the OLS method, of equation (2) with the control variables shown in column 3 of Table 4 for each of the TFP measurements defined in Table A2. The values indicated are those of the coefficients associated with the proportion of telework in 2019 (95% confidence intervals).
Sources: Banque de France UFP survey, 2021 and FIBEN.