

Telework: Impact on productivity

Workshop BdF – OECD

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Antonin Bergeaud, Gilbert Cette and Simon Drapala

1. Introduction

- **Large telework (TW) increase during the COVID lockdown periods in advanced countries** (Eurofound, 2020; Criscuolo *et al.*, 2021; ...)
 - In France, from less than 5% to almost 25% of workers (DARES, 2020, 2021 ...)
- **After COVID, TW could remain an extensive practice** (Dingel & Neiman, 2020; Milasi *et al.*, 2020; Eurofound 2020; ...)
 - Benefits for firms (productivity gains, less office space, ...)
 - Benefits for workers (wellbeing, reduced transport time and housing costs, ...)
- **Potential long term country TW level: 25% to 35% of workers**
- **Workers and firms preferred TW intensity: 2/3 days per week** (OECD, 2020; Barrero *et al.*, 2021; Criscuolo *et al.*, 2021; ...)
 - Need for interaction between workers
 - Non-linear TW productivity impact: inverted U curve

1. Introduction

➤ **Abundant literature on the productivity impact of TW** (see Criscuolo *et al.*, 2021; Bergeaud & Cette, 2021)

○ **This impact may differ.** At the two extremes:

- Case of a call center (Bloom *et al.*, 2015): $\approx +20\%$
- Case of a research center (Morikawa, 2020): $\approx -40\%$

○ **This impact depends on numerous dimensions and aspects.** Among the most discussed in the literature:

- The activity (not all positions are possibly worked from home)
- The benefit for workers (better balance between personal and professional lives, lower housing costs, less transport time from home to work, ...) (see Arntz *et al.*, 2020; Barrero *et al.*, 2021; ...)
- Less unproductive interaction between workers (Ozimek, 2020; ...)
- Management methods (not the same for work from the firm or from home)
- Adapted material and software, worker preparation for TW
- Adapted home work conditions and context (for instance children at home, ...)
- Real estate prices (Bergeaud & Ray, 2020; ...)
- TW intensity and need for interaction between workers. Non-linear impact: inverted U curve (OECD, 2020; Barrero *et al.*, 2021; Criscuolo *et al.*, 2021; ...)
- ...

○ **Worse TW conditions during COVID lockdown periods**

1. Introduction

➤ Aim of the paper

- **Analyses the impact of TW, mainly on productivity**
- **Uses a firm level dataset of French firms**
 - ≈1,400 firms with at least 20 employees in the manufacturing sector in 2020
 - From two BdF datasets: survey on factor utilization (FUD) and firm level annual financial statements (FIBEN)
- **Estimates relations** explaining different variables, and for instance Total Factor Productivity (TFP) by the use of TW
- **OLS and IV methods**
 - Instruments for the IV method: **Bartik (1991) method**
 - Leave-one-out mean at the industry level
- **Weighted estimates to correspond better to the exhaustive manufacturing firm population**
 - 5 size classes x 4 industries
- **Between-firm approach**

2. Data

➤ Two firm level datasets

- **FIBEN:** Accounting data from fiscal documents
 - All French firms with annual turnover > €750,000 or with outstanding credit > €380,000
 - ≈ 200,000 firms
 - Information on size, age, industry, wages, investment, employment, ... of the firm
 - **Allows us to calculate *TFP*.** Akenberg *et al.* (2015) method, based on value added
- **FUD:** Survey on Factor Utilisation Degrees
 - Manufacturing industries
 - Plants with more than 20 employees
 - Information on Capital Utilization Rate (CUR), ...
 - **Specific questions in 2020 on the use of TW**
 - ≈ 1,700 complete answers to these questions
- **Final dataset**
 - Merger and cleaning of these two datasets (FIBEN and FUD)
 - **≈ 1,400 French firms / obs**
 - More than 20 employees
 - Manufacturing industries

2. Data

➤ **Specific questions on TW in the FUD survey:**

- What was the proportion of teleworkers in your firm before the lockdown, at the maximum during the lockdown, and during the week from 7 to 11 September 2020?
- Concerning TW workers, what was on average the number of TW days per week in your firm before the lockdown, at the maximum during the lockdown, and during the week from 7 to 11 September 2020?
- Compared to the pre-lockdown situation, do you plan that your use of TW will be in the long term: higher, equivalent, lower?
- Over the 5 next years, do you expect to invest more in IT and software to increase your use of TW?
- Do you expect to change your use of real estate because of TW?

2. Data

➤ Some descriptive statistics

- 22% of the firms in our dataset practiced *TW* in 2019

Over the all dataset	Date	Mean	Stand. Deviat.	P25	Median	P75
Proportion of teleworkers	. 2019	0.012	0.036	0.000	0.000	0.000
	. Lockdown 2020	0.182	0.202	0.040	0.114	0.250
	. September 2020	0.044	0.10.	0.000	0.000	0.040

- Huge increase of telework in 2020
- Large disparities in *TW* development and intensity

3. Results

➤ **Estimate results of the relation (1):** $\frac{K_i^{(k)}}{L_i} = \alpha + \beta TW_i + \gamma \log(w_i) + \nu_{s(i)} + \varepsilon_i$

K: capital indicator in 2019; *L*: employment in 2019; *TW*: Telework in 2019; *W*: average wage in 2018
 OLS estimate

Capital indicator	(1) Corporal	(2) Buildings	(3) Square meters	(4) IT	(5) Intangible
Telework (0 or 1)	0.862 (9.482)	2.628 (3.710)	-3.154*** (0.394)	0.514** (0.242)	3.467** (1.527)
Fixed effects	Industry	Industry	Industry	Industry	Industry
Ajusted R²	0.399	0.334	0.162	0.375	0.247
Nb Obs	1459	1459	1459	1459	1459

- Firms with telework...
 - Have more corporal capital per worker (col. 1)
 - Have a higher capital immobilisation per worker (col. 2) but ...
 - Have fewer square meters per worker (col. 3)
 - Have more IT capital per worker (col. 4)
 - Have more intangible capital per worker (col. 5)

3. Results

➤ **Estimate results of the relation (2):** $tfp_i = \alpha + \beta \cdot PTW_i + X_i \cdot \gamma + v_{s(i)} + \varepsilon_i$

tfp: log(TFP) in 2019; *PTW*: Proportion of teleworkers in total employment in 2019; *X*: control variables: Log(employment 2018); Log(average wage 2018); Log(average working time 2019); Capacity utilisation rate 2019; Subcontracting rate 2019

IV: Bartik (1991) method

Estimation method	(1) OLS	(2) OLS	(3) OLS	(4) IV
PWT	1.090*** (0.222)	0.612*** (0.197)	0.648*** (0.203)	0.453* (0.262)
Log Employment		-0.072*** (0.010)	-0.073*** (0.009)	-0.071*** (0.010)
Log Average wage		0.821*** (0.069)	0.817*** (0.069)	0.831*** (0.069)
Log average working time			-0.005 (0.017)	-0.006 (0.018)
Capacity utilisation rate			0.167** (0.082)	0.165** (0.082)
Subcontracting rate			0.076 (0.074)	0.079 (0.075)
Fixed effects	Industry	Industry	Industry	Industry
Adjusted R²	0.277	0.468	0.477	0.472
Nb. Obs	1 402	1 393	1 383	1 375

- 1 percentage point more teleworkers ...
Increases the TFP by 0.45%

3. Results

➤ **Estimate results of the relation (2):** $tfp_i = \alpha + \beta.PTW_i + X_i.\gamma + v_{s(i)} + \varepsilon_i$

tfp: log(TFP) in 2019; *PTW*: proportion of telework days (col. 1) or quartile (0, 1) of *TW* days in firms which practice *TW*, in 2019; *X*: Control variables: Log(employment 2018); Log(average wage 2018); Log(average working time 2019); Capacity utilisation rate 2019; Subcontracting rate 2019

OLS estimates

	(1)	(2)
Proportion of telework days	2.599*** (0.625)	
TW Int Q1		-0.053 (0.052)
TW Int Q2		-0.062 (0.047)
TW Int Q3		0.111** (0.051)
TW Int Q4		0.091** (0,037)
Fixed effects	Industry	Industry
Control variables	Yes	Yes
Nb. Obs	1382	1382

- Impact of TW intensity on TFP:
 - Non-linear
 - Inverted U curve

3. Results

➤ **Estimate results of a relation explaining some changes from TW practice**

Control variable: Control variables: Log(employment 2018); Log(average wage 2018); Log(average working time 2019); Capacity utilisation rate 2019; Subcontracting rate 2019

OLS estimates

	TW increase in the future (1)	TW increase in the future (2)	Investment increase in the future (3)	Possible relocation in the future (4)
Teleworker prop. 2019	0.245*** (0.049)			
Variation 2020-2019 of teleworker proportion Expected increase of TW in the future		0.383*** (0.068)	0.349***	0,141***
Fixed effects	Industry	Industry	Industry	Industry
Control variables	Yes	Yes	Yes	Yes
Nb. obs	1445	1238	1426	1439

- Firms with TW practice in 2019 want more than others to increase TW practice in the future (col. 1)
- Firms with TW practice increase in 2020 want more than others to increase TW practice in the future (col. 2)
- Firms expecting to increase their TW practice expect more than others to increase their investment in the future (col. 3)
- Firms expecting to increase their TW practice expect more than others to relocate (col. 4)

4. Conclusion

➤ **Main results:**

○ **Large estimated impact of TW on TFP**

A 1pp increase of the teleworker proportion would increase TFP by 0.45%

○ **At a global level, teleworker proportion increase from 5% to 25% would increase TFP by 9%**

○ **Non-linear impact of TW on productivity**

Inverted U curve

➤ **These results are estimated on an original dataset** (first time to our knowledge on this type of data)

➤ **Need confirmation from other research**

➤ **TW is part of the digital revolution**