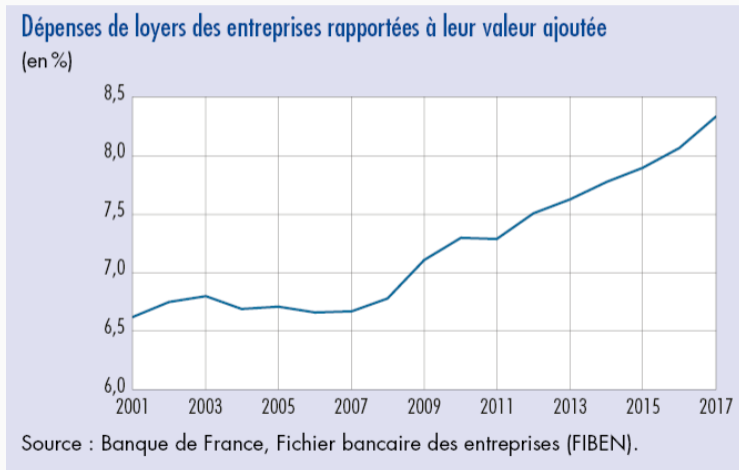


Working from home and corporate real estate

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Figure 1: Rental cost over added value in France



Does corporate real estate adjust to the development of teleworking?

Results - Summary

A county's ability to telework can be measured by three variables :

- Nature of employment
- Access to technology
- Commuting time

Compare to retail, in more teleworkable counties, office real estate has experienced since the outbreak of Covid :

- Larger construction losses
- Higher vacancy rates
- Higher probability of building price decrease

Ability to telework Dingel et Neiman 2020 ; Hensvik, Le Barbanchon et Rathelot 2020 ;
Gottlieb, Grobovsek et Poschke 2020

Lasting effects of Covid on the economy Barrero, Bloom et Davis 2021 ; Bergeaud et Cette
2021 ; Eyméoud et al. 2021

Effect of pandemics on corporate real estate Francke et Korevaar 2021 ; Xie et Milcheva
2020 ; Ling, Wang et Zhou 2020 ; Milcheva 2021

A county-level telework index

Building a county-level telework index

The county telework index is constructed using two variables :

- Dingel et Neiman 2020's index applied to french counties employment structure **DN**
- The first eigenvector of a principal component analysis performed on the following variables **PCA**
 - Share of households connected to the optical fiber
 - Share of high skill workers with a child under 18
 - Median commuting time

The index is defined as the product of the two variables :

$$\text{Teleworking} = \text{PCA} \times \text{DN}$$

Observed and predicted level of telework

The quality of our telecommuting index is tested by :

- Confronting the index with actual telecommuting measures :
 - Google mobility index in September 2020 and 2021
 - Workforce that was working from home from the equipment duration survey
- Regressing the following model to control for density :
Observed teleworking_d = $\alpha + \beta$ Teleworking_d + $\gamma \log(\text{Density}_d) + \varepsilon_d$

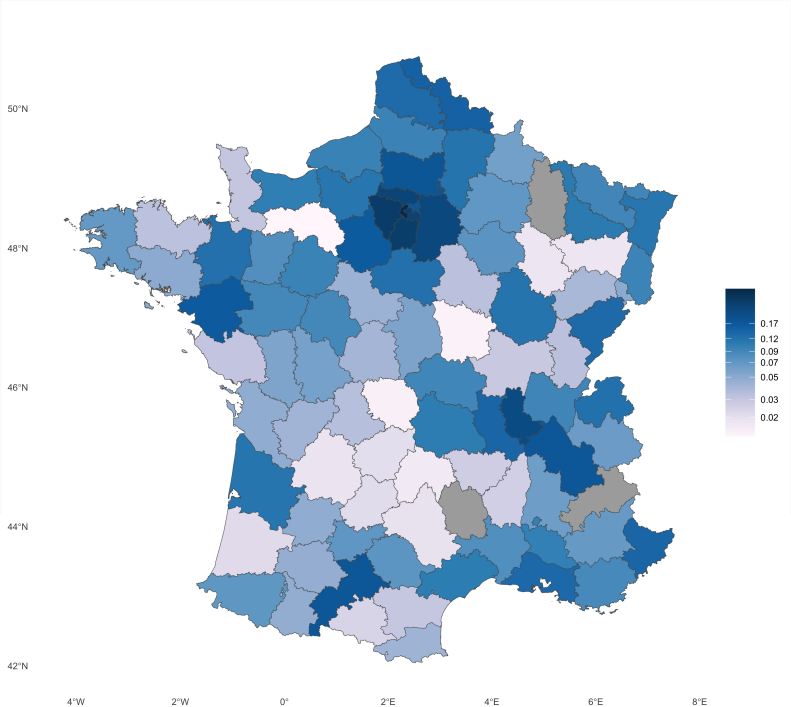
Observed and predicted level of telework

Table 1: Teleworking at the county-level - regression results

	GM 2020 (1)	GM 2021 (2)	Manuf 2019 (3)	Manuf 2020 (4)	GM 2020 (5)	GM 2021 (6)	Manuf 2019 (7)	Manuf 2020 (8)
Teleworking	-33.260*** (5.480)	-40.563*** (11.469)	0.041* (0.023)	0.154* (0.080)	-30.743*** (5.079)	-35.336*** (7.694)	0.042* (0.021)	0.157* (0.093)
Density (log)	-1.105*** (0.366)	-1.550** (0.743)	0.001 (0.001)	0.003 (0.004)	-1.464*** (0.343)	-2.266*** (0.443)	0.000 (0.001)	0.002 (0.005)
R^2	0.757	0.513	0.138	0.235	0.845	0.725	0.150	0.202
N	91	91	88	88	91	91	88	88

Notes : Columns 1, 2, 5 and 6 use a measure of workplace occupancy from the Google Mobility (GM) data as a dependent variable while other columns use the share of teleworkers in manufacturing firms from Gerardin et al. (2021). Telework denotes the synthetic proxy for the potential for teleworking. Columns 5 to 9 use a weighted GLS with weights equal to population in 2019. Other columns use the OLS estimator. Standard errors are corrected for heteroskedasticity. "Département" 2, 4 and 9 are excluded from the sample as there are no manufacturing firms surveyed. ***, ** and * respectively indicate p-values below 1, 5 and 10% for the Student test of the nullity of coefficients.

Figure 2: Telework index by county



Adjustment of the corporate real estate market

The adjustment of the professional real estate market is analyzed from three angles :

- Construction : individual database of building permit applications Sit@del2
- Vacancy : MSCI database of indices at county level
- Property prices : individual database of French real estate funds' balance sheets from regulatory data

Loss in the construction sector

The construction loss is calculated as a deviation from the trend with the following model :

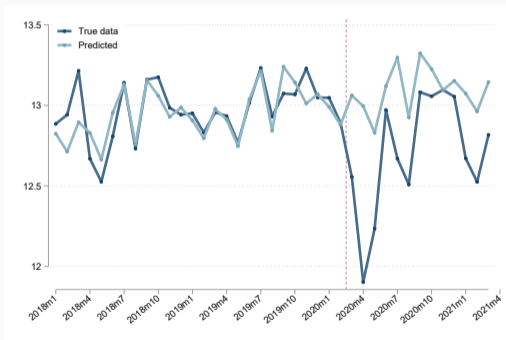
$$\log(\text{office space built}_{i,t}) = \alpha + \beta_i t + v_{m_t} + \gamma_i + X_{i,t} + \varepsilon_{i,t}.$$

- $\text{office space built}_t$ is office space built in period t in county i
- $\beta_i t$ a county specific trend
- v_{m_t} a month fixed effect
- γ_i a county fixed effect
- $X_{i,t}$ time-varying observable characteristics (unemployment, density)
- $\varepsilon_{i,t}$ the error term

Construction loss and telework

Figure 3: Correlation between office space construction and telework

(a) Dynamics of construction



(b) Loss in office building and telework

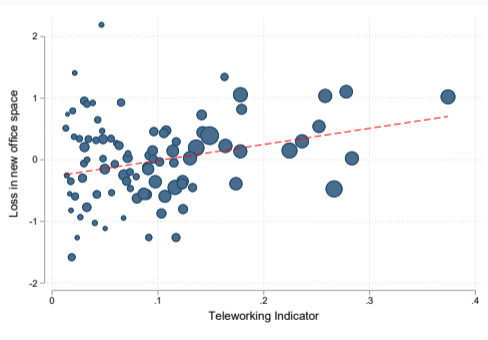


Table 2: Impact of teleworking on county-level office and retail loss

	Office			Retail		
	(1)	(2)	(3)	(4)	(5)	(6)
Teleworking	2.089** (0.916)	2.607*** (0.905)		0.993 (1.139)	2.045*** (0.736)	
$T_{i,t}$			-1.729* (0.935)			-0.440 (0.944)
R^2	0.050	0.136	0.577	0.478	0.007	0.065
N	91	91	7,917	91	91	7,917
Model	Cross section	Cross section	Panel	Cross section	Cross section	Panel

Notes : Columns 1 and 4 use an OLS estimators and columns 2 and 5 use the GLS with weights equal to the level of population in 2019. Columns 3 and 6 add a variable $T_{i,t}$ which is the interaction of a dummy variable equal to 1 after May 2020 and the teleworking indicator.

Vacancy of corporate building

Vacancies are studied with a panel model :

$$Vacancy_{c,t} = \alpha + \beta T_c 1_{2020} + \gamma_1 T_c + \gamma_2 1_{2020} + \gamma_3 \Delta U_{c,t} + \gamma_4 Vacancy_{c,t-1} + \varepsilon_{ct},$$

- $Vacancy_{c,t}$ is the vacancy rate in county c on year t
- T_c teleworking variable
- $\Delta U_{c,t}$ yearly variation in unemployment in percentage points
- $\varepsilon_{c,t}$ the error term

Table 3: Correlation between real estate markets and teleworking

	Office			Retail		
	Vacancy rate (1)	Rent growth (2)	Price growth (3)	Vacancy rate (4)	Rent growth (5)	Price growth (6)
Telework	-14.594 (16.325)	4.775 (5.158)	12.713* (6.661)	-15.604* (8.274)	17.616*** (5.816)	28.652*** (5.610)
Year 2020 dummy	-4.472* (2.508)	0.251 (0.664)	2.367 (1.508)	2.994** (1.303)	-2.903*** (1.112)	-4.825*** (1.433)
Δ Unemployment	0.942 (0.600)	-0.673 (0.418)	-2.703*** (0.388)	-0.416 (0.282)	0.526 (0.339)	-2.460*** (0.329)
Lag Dep Var	0.221*** (0.051)	0.100** (0.048)	0.351*** (0.031)	0.273*** (0.059)	0.113** (0.057)	0.475*** (0.032)
Teleworking post 2020	59.890* (36.334)	-0.918 (8.557)	-52.268*** (17.272)	13.117 (25.634)	-0.628 (18.363)	-72.039*** (23.813)
Observations	522	363	534	889	585	846
R ²	0.048	0.033	0.301	0.141	0.035	0.303

Real estate funds are legally required to provide details of the properties in their portfolio

Within a given fund, we analyze the probability of decreasing the price of an office property compare to retail :

$$D_{i,t} = \beta_t C_i T_{c(i)} + \delta X_{i,t} + \nu_{c(i),t} + \mu_i + \kappa_{j(i)} + \varepsilon_{i,t}$$

- $D_{i,t}$ a dummy equal to 1 if the valuation of building i has been revised downward during quarter t compared to quarters $t - 1$
- $c(i)$ the county, $j(i)$ the fund
- C_i is a binary variable equal to 1 if the building is used for offices
- $T_c(i)$ the measure of local exposure to teleworking

Figure 4: Marginal effect of teleworking on the probability to revise price downwards Retail

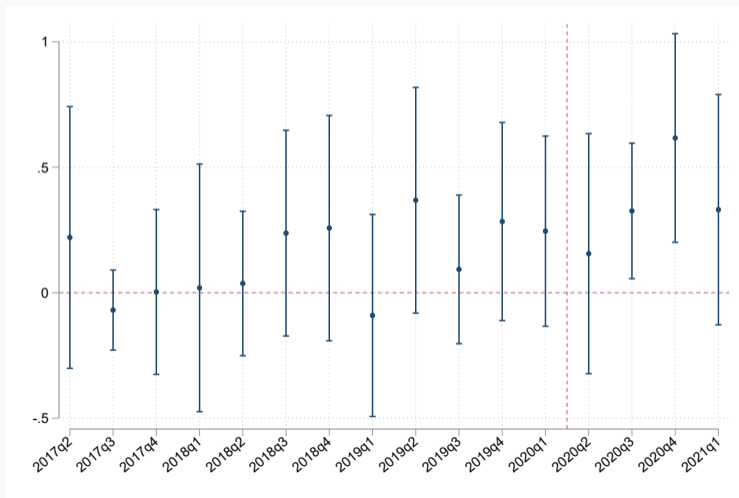


Table 4: Building-level regression - sum of coefficients

	Office (1)	Retail (2)
Post pandemic coefficients	1.273*** (0.388)	-0.246 (0.557)
Pre-trends (all)	1.605 (1.663)	-4.034 (2.747)
Pre-trends (2019)	0.622 (0.443)	-0.954 (0.612)

Conclusion - Magnitude of the effects

To check if the effects are long-lasting, we examine whether it has already been integrated into the capitalization of assets at the aggregate level using the following asset pricing model :

$$P(v) = \sum_{t=1}^{20} \frac{l * (1 - v_t) * (1 + g)^t}{(1 + r)^t}$$

Empirically, a one standard deviation increase in teleworking, would translate in a 4.3pp increase in vacancy rates

- In the model, if the increase is
 - temporary, prices should decline by -0.3%
 - permanent, prices should decline by -4.7%

In the data, prices in the areas most exposed to telework fell by -3.8% \Rightarrow the effect seems permanent

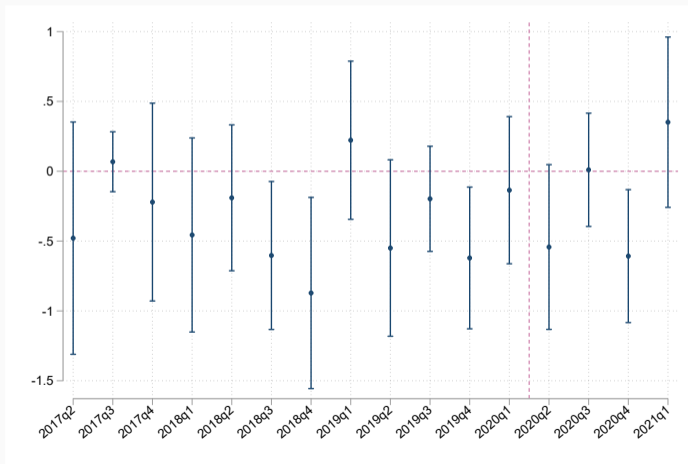
Thank you for your attention

Backup slides

Event study for retail

Figure 5: Marginal effect of teleworking on the probability to revise price downwards - retail

BACK



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