Measuring the consumer's valuation of High-Speed Internet: The Impact of FTTH deployment on the House Market in France

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Abstract

This paper examines the value that households place on broadband internet access, explicitly focusing on the impact of eligibility for Fiber to the Home (FTTH) technology on property prices. Using a Spatial Discontinuity Design based on the border of fiber eligibility zones which have significantly expanded under France's *Plan Très Haut-Débit*, I find that FTTH eligibility is a significant determinant of home prices, with an average increase of 1.8 percent. Additionally, our analysis shows that the Covid-19 pandemic has amplified households' valuation of FTTH eligibility. These findings highlight the growing importance of fast and reliable Internet access for households and have important implications for policymakers and Internet service providers.

Motivations

- The *France Très Haut Débit* (THD) Plan was unveiled by the French government on February 20, 2013, as part of a European strategy - the Digital Agenda - which aims to provide all European citizens with access to a 30 Mb/s network.
- Largely based on the deployment of FTTH technology, the French government planned to invest 20 billion euros in the following decade after the announcement of the High-Speed Internet Plan to develop very high-speed broadband access for all, with the objective of covering 100% of the population with very high-speed broadband by 2022.

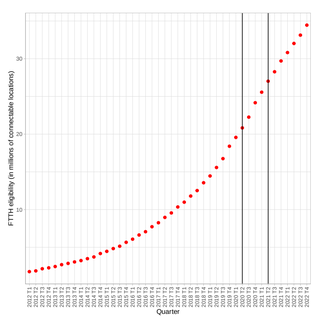

Figure 1. Evolution of FTTH Eligibility in France since 2012

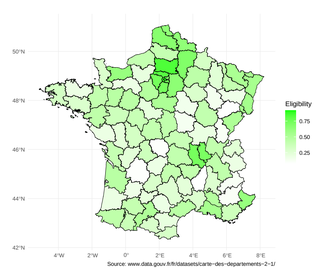

Figure 2. Map of FTTH Eligibility by District in 2020Q2

As the deployment of very high-speed Internet infrastructures continues, it is critical to evaluate their value to households. Specifically, it is important to determine whether the rapid access to diverse Internet content and services provided by these infrastructures, such as video, teleworking, online commerce, and streaming, is essential to households and to what extent this importance is context-dependent.

⇒While previous research has underscored the significance of broadband access for households [1], the value of Fiber To The Home (FTTH) access and the potential benefits of assured network quality enabled by this telecom technology remain uncertain and require further investigation.

Research objectives

The present study investigates the following objectives:

- **Objective 1:** Merge Fiber eligibility data with several French geospatial data sources.
- **Objective 2:** Provide a measure of the valuation of broadband Internet connectivity and in particular of the FTTH by households by evaluating the impact of FTTH eligibility on the property price in France.

Data

- **"Ma Connexion Internet"** data (ARCEP) [a] provides information on fiber eligibility dates at the address level ;
- **"Demande de Valeurs Foncières"** data (French General Directorate of Public Finance) gives information on property transactions that have occurred over the last five years in metropolitan France.
- **Dataset**: 1,574,962 properties sold (apartments and houses), in 79 French districts. Two periods studied: 2019Q2-2019Q4 and 2020Q2-2020Q4 with their FTTH eligibility status.

[a]https://maconnexioninternet.arcep.fr/

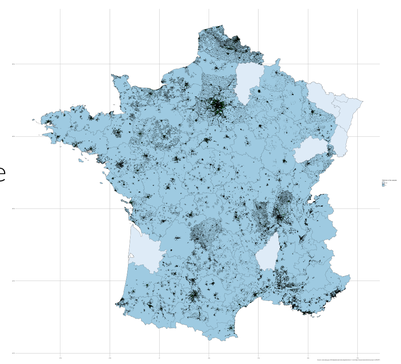

Figure 3. Districts in the sample and eligibility zones in 2020-Q2

Construction of FTTH eligibility zones and Data merging methodology

Method to join a set of exhaustive quarterly databases from Q2-2018 to Q4-2021 at the address level for the whole French metropolitan territory (currently, 79 departments are included in the analysis) for which **no common joining key exists**.

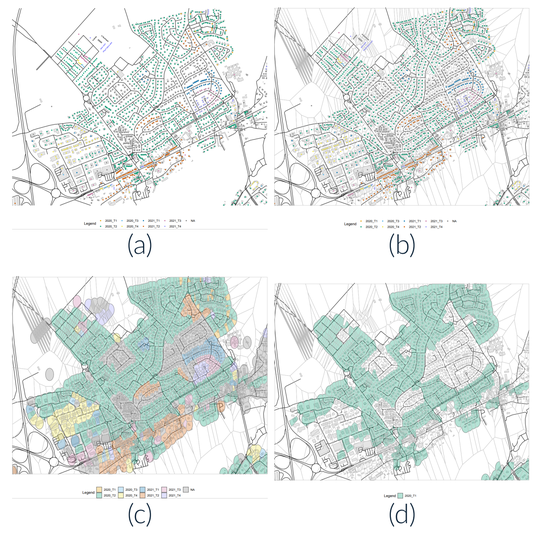

Figure 4. Method for constructing FTTH eligibility boundaries.

The present study adopted the following step-by-step methodology to achieve the research objectives:

1. Project the points from ARCEP, each home is associated with a quarter of eligibility for fiber;
2. Build Voronoi polygons limited by a 30m radius around all dwellings;
3. Join layers by fiber eligibility status and by eligibility period;
4. Project the points of the alternative database (sales) whose coordinates are not identical;
5. Determine the eligibility status of the property at the time of the transaction

Methodology

The use of fiber eligibility zones makes it possible to use a **Spatial Discontinuity Design**. Since the assignment rule is deterministic, this regression discontinuity adopts a sharp design (the treatment probability changes from 0 to 1 at the cutoff).

- Running variable Z: distance to the FTTH deployment boundary at the time of the study;
- Treatment variable D: Being eligible to FTTH;
- Outcome variable Y: Log of the price of the property at the time of its sale;
- **Hedonic regression model** [2]: it aims at explaining the price of a good based on its intrinsic and situational characteristics.

⇒Non-parametric estimation (Naive and arbitrary distance)

Figure 5. Map illustrating the methodology - Focus on eligibility zone in Bretteville-sur-Odon (14760)

Estimated model

$$Y_{ijt} = \alpha + \beta FTTH_{ij} + \delta X_i + \gamma_t + \eta_j + \epsilon_{ijt} \quad (1)$$

- Y_{ijt} is the log of the price of the property i at time t associated with the boundary j;
- $FTTH_{ij}$ is a dummy indicating whether the property sold i associated with the boundary j is in the FTTH "eligible" zone;
- X_i is a vector of property and location characteristics (number of rooms, building area, lot size...);
- γ_t is the time fixed-effects argument (quarter);
- η_j is the location fixed-effect argument (nearest boundary of deployment);
- ϵ_{ijt} is the error term.

Results and discussion

Graphical Analysis

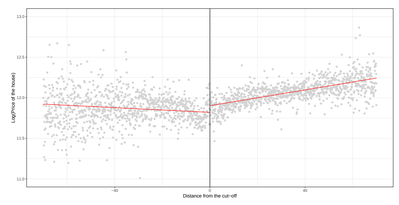

Figure 6. Boundary discontinuities in FTTH eligibility in property prices (2020Q2 Boundary)

Graphically analyzing the relationship between the log of the property price and FTTH eligibility. The RD plot show that, within a narrow window around the eligibility threshold, there is a clear jump in the mean price of properties located in the eligibility zone.

Model Estimates - A Covid-19 crisis effect?

Table 1. Pricing results - 2019

	Log(price)							
	All Sales				House Sales Only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FTTH	0.011**	0.011**	-0.001	-0.001	0.033***	0.034***	0.018***	0.018***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Postal Code FE	Yes	Yes	-	-	Yes	Yes	-	-
Boundary FE	-	-	Yes	Yes	-	-	Yes	Yes
Controls	Yes	-	Yes	-	Yes	-	Yes	-
Controls × Quarter FE	-	Yes	-	Yes	-	Yes	-	Yes
Boundary window (m)	-	-	70	70	-	-	70	70
Num.Obs.	832743	832743	401491	401491	395092	395092	107151	107151
R2	0.605	0.605	0.658	0.658	0.607	0.607	0.710	0.710

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2. Pricing results - 2020

	Log(price)							
	All Sales				House Sales Only			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FTTH	0.019***	0.019***	0.019***	0.019***	0.029***	0.029***	0.017***	0.017***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Postal Code FE	Yes	Yes	-	-	Yes	Yes	-	-
Boundary FE	-	-	Yes	Yes	-	-	Yes	Yes
Controls	Yes	-	Yes	-	Yes	-	Yes	-
Controls × Quarter FE	-	Yes	-	Yes	-	Yes	-	Yes
Boundary window (m)	-	-	70	70	-	-	70	70
Num.Obs.	769775	769775	382425	382425	389350	389350	113644	113644
R2	0.615	0.615	0.664	0.664	0.617	0.617	0.704	0.706

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

- For both periods (2019, 2020), FTTH eligibility appears to be an important determinant of property prices for homes.
- But during the Covid period (2020), results indicate a positive effect on all property prices within FTTH zones.

Robustness

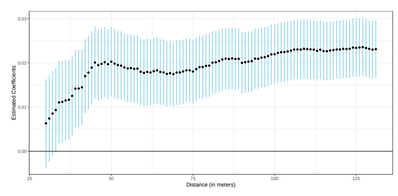

Figure 7. Sensitivity test by varying the distance of bandwidth around the threshold.

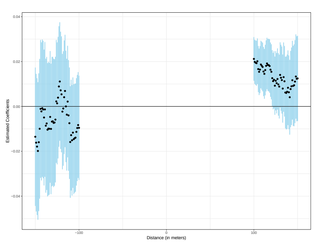

Figure 8. Placebo test

Conclusions

- Households place a high value on having access to this type of high-speed internet connection;
- This study suggests pandemic has heightened the importance of high-quality internet access for households.
- To further investigate the relationship between FTTH eligibility and property prices, additional tests and analysis could be performed.

References

[1] Gabriel Ahlfeldt, Pantelis Koutroumpis, and Tommaso Valletti. Speed 2.0: Evaluating access to universal digital highways. 15(3):586–625.

[2] Sherwin Rosen. Hedonic prices and implicit markets: Product differentiation in pure competition. 82(1):34–55.

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