

Impact of Very High-Speed Broadband on Company Creation

Empirical Evidence

Maude Hasbi

PTC'19 From Pipes to Platforms
January 20-23, 2018

Introduction

- Why governments, institutions promote investment in Next Generation Access (NGA) Network?
- Superfast broadband is seen as a key enabler for socio-economic development.
 - Positive effect on national economic growth
 - Increase the competitiveness of companies
 - But also attractiveness of territories for companies
 - Social development (e-health, e-government)
- Many countries have adopted a national broadband plan to ensure the whole coverage of their territory.
 - The US, Australia, Japan, France, Spain, Sweden and New Zealand...
- Deployment of public initiative networks to ensure the whole coverage of the territory.

Lack of Empirical Studies

- Lots of papers on :
 - The benefits of broadband for the national economy
 - Costs/ benefits analysis with different scenarii...
- No so many empirical studies, at a fine-grained level, to quantify the benefit of very high speed broadband on local economic growth
 - Especially, as regards their effects on companies creation, in particular entrepreneurship
 - Does very high-speed broadband boost company creation?
Does it has an effect on individually owned and run companies?
- I use panel data analyses with municipal- and time-fixed effects
 - Count modeling approach: use territory as the unit of analysis
 - Robustness checks: nearest neighbor matching estimator

Literature review

- Numerous macro-level studies bring empirical evidence on the positive impact of broadband adoption on economic growth.
 - Gruber et al. 2014: Economic benefits are only marginally appropriable by firms, they mostly spill over to users.
- Limited empirical evidence of the effect of broadband on economic growth at the local level:
 - Mostly studies concentrate on the impact of broadband on employment (Czernich (2014), Whitacre et al. (2014))
 - As far as firms are concerned, literature focuses on broadband impacts on productivity and firm performance (Akerman et al. (2015), Bertschek et al. (2013))
 - McCoy et al. (2016) highlights the existence of a positive impact on new business establishment.
- Studies focus on the impact of old generation broadband technologies and are realized at a more aggregated level.

Impact of superfast broadband on local economic growth

- Using data on 5,000 municipalities over 6 years (2010-2015), I estimate whether superfast broadband networks have an impact on local economic growth
- Number of establishment creation
 - 3 main types of non-farm market sectors:
 - Construction;
 - Industry;
 - Tertiary;
 - Individually owned companies (companies owned and run by one individual).
 - Tertiary sector, the one expected to benefit the most from superfast broadband deployment: divided in 3 sub-sectors
 - Commerce, service and transport; services to firms; services to households

Methodology: Data Collection

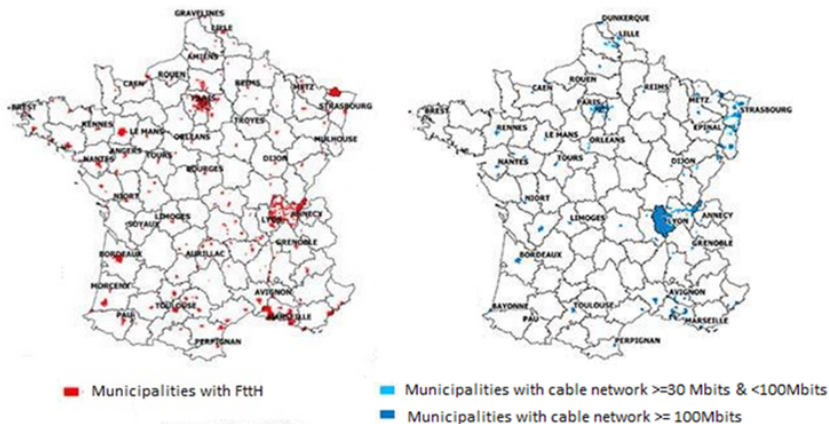
- For each municipality, I know whether:
 - A fibre (FttH) network has been deployed by Orange, SFR or Free (French three main operators in the fixed broadband market)
 - Numericable has upgraded its cable network to FttLA (or DOCSIS 3.0)
- For each municipality, I know:
 - The number of LLU operators (operators using the copper network via local loop unbundling to provide broadband services)
 - VDSL (a faster technology than ADSL) has been deployed (since 2013 in France)
- I collected from INSEE a bunch of socio-demographic characteristics (number of households, density, unemployment, income...)

Entry into fibre and upgraded cable in municipalities in France

Fibre					
	2010	2011	2012	2013	2014
Orange	117	196	299	456	589
SFR	83	150	214	347	425
Free	93	103	104	106	107
Numericable	202	202	329	699	1067

Out of 36,080 municipalities.

Deployment of fibre and upgraded cable in France



Situation on 30/09/2015

Econometric Setting

- I assess whether superfast broadband networks have a causal effect on the creation of new businesses.
 - Paris, Lyon and Marseille are excluded.
 - Keep municipalities with at least 2,000 inhabitants to define relevant control groups
 - Unlikely to have a superfast broadband by private operators in smaller municipalities
- Technology neutral approach $superfastbb_{it}$ includes FttH and upgraded cable (30Mbps and over)
- What could drive business location decisions?
 - Costs factors: tax regime, availability of infrastructures, cost and availability of human capital
 - Potential demand in the market for their products or services

Econometric Modeling

- Panel data analysis with fixed effects
 - Count modeling approach

$$Y_{it+1} = \text{superfastbb}_{it} + X_{it-2} + Z_{it-2} + \text{year} + \eta_i + \epsilon_{it}. \quad (1)$$

Where :

$$Y_{it+1} = 0, 1, 2, \dots \quad (2)$$

- X_{it-2} is a matrix of location characteristics for municipality i at time $t - 2$
- Z_{it-2} is a matrix of local labor characteristics
- year time fixed effects
- η_i time-unvarying fixed effects
- ϵ_{it} iid error term clustered at the municipal level

- Panel data analysis with fixed effects
 - Log-transformation for better interpretation

$$\begin{aligned} \log_{-}Y_{it+1} = & \textit{superfastbb}_{it} + \textit{establishment}_{it-2} \\ & + \textit{log_households}_{it-2} + \textit{density}_{it-2} + \textit{unempl}_{it-2}, \\ & + \textit{income}_{it-2} + \textit{perc_uni_diploma}_{it-2} \\ & + \textit{socio_professional_groups}_{it-2} + \textit{year} + \eta_i + \epsilon_{it}. \end{aligned} \quad (3)$$

Potential endogeneity

- Potential endogenous relationship between economic activity, number of companies operating locally, and the roll-out of superfast broadband network: **reverse causality**
 - Follow McCoy et al. argument: reverse causality more likely to affect the stock of companies, rather than the flow of company creation.
 - Use of lag variables of 2 years
- Omitted variable potential source of endogeneity
 - Use of fixed effects and region or department specific time trends
- Though mitigate, estimation results are likely to suffer from endogeneity and be biased upward

Estimation Results

Table: Summary of effects

	Panel FE (1)	Panel FE (2)	Panel FE (3)
Geographic time trend	No	region	department
new estab	2.8%	1.6%	X
new industry	X	X	X
new construction	X	X	X
new comm serv transp	6.1%	3.9%	3.5%
new service firms	X	X	X
new service households	X	X	X
new individual_comp	1.8%	1.7%	1.4%

X: results are not significant

Impact of superfast broadband

- Positive effect on establishment creation (+2.8%)
- Positive effect only establishments creation in the commerce, service and transportation sector (+6%)
 - Uses ICTs the most to operate
- Positive impact of the creation of individually owned businesses (+2%)
- Effects are reduced with introduction of geographic specific time trends
- Firms are more likely to settle in
 - Areas with larger market size and higher population density
 - Richer areas and areas with a lower unemployment rate
 - On average: negative effect of the number of establishments operating locally ($t - 2$)

Robustness checks: matching estimator

- Necessitate to determine the relevant set of matches (key parameter)
- Run a balance test for covariates between the treated group and the control group

Then, the set of relevant matches is:

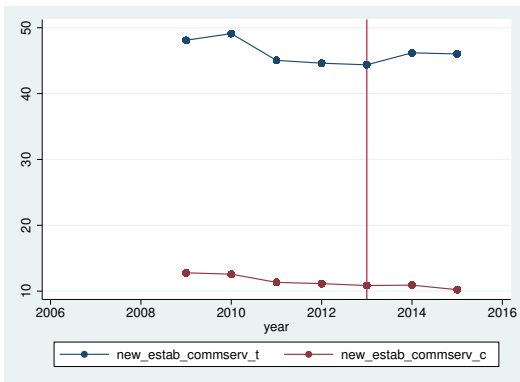
$$\log_households_{it-2}, density_{it-2}, income_{it-2}, unempl_{it-2}, perc_estab_commserv_{it}, year. \quad (4)$$

Table: Covariate for Balance Test

	Treated			Control			Balance	
	Mean	Variance	Skewness	Mean	Variance	Skewness	Std-diff	Var-ratio
estab_commserv_perc	65.25541	790.6751	-1.614831	62.59701	753.4786	-1.452932	.0956731	1.049366
density	1.543979	6.630078	4.605992	.2911635	.1078143	3.584272	.6825586	61.49535
households	1.193238	1.146193	.7648062	.4263445	.2899609	1.004472	.9050019	3.952924
income	26.73325	67.20517	2.088331	23.41929	32.74699	2.063607	.4687773	2.052255
unemployment	7.989886	9.152099	.7750062	7.835331	7.979583	.7992121	.052808	1.14694
no diploma	32.56171	66.95298	.2259355	37.06293	78.57766	.1195719	-.5276765	.8520612
diploma superior	26.32544	101.283	.9109169	19.99361	55.76456	1.113804	.7145427	1.816261

Parallel line assumption

Figure: Parallel lines assumption: number of new establishments from the commerce, service and transportation sector



Impact of superfast broadband

Table: Summary of effects

	Panel FE (1)	Panel FE (2)	Panel FE (3)	ATT
Geographic time trend	No	region	department	N/A
new estab	2.8%	1.6%	X	4.9%
new industry	X	X	X	9%
new construction	X	X	X	X
new comm serv transp	6.1%	3.9%	3.5%	4.6%
new service firms	X	X	X	5.2%
new service households	X	X	X	X
new individual_comp	1.8%	1.7%	1.4%	3.6%

X: results are not significant

Thank you
Any questions?

PTC'19 From Pipes to Platforms
January 20-23, 2018