Fast Internet and Firm Creation: Evidence from Italy

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Abstract

The goal of this paper is to provide new evidence on the impact of ultra-fast broadband investment on local growth, and in particular on local new business establishment. We leverage on a unique dataset collecting municipality-level fast and ultra-fast broadband deployment data for the period 2013-2018. We deal with the endogeneity of broadband diffusion by exploiting the distance between each municipality and the closest central office equipped with "last mile" device. Our preliminary results show that ultra-fast broadband positively affects the establishment of new firms, however high heterogeneity of such effects exist. We find that highly industrialized areas are those mostly affected, while regions with low level of human capital and firm presence are not significantly affected.

Keywords:

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1 Introduction

In the last decade, investments in ultra-fast broadband infrastructures has received considerable attention in the policy arena. In view of the expected benefits from those investments, the European Commission (EC) has decided to strengthen the competitiveness of Europe's economy by lunching the Digital Agenda for Europe (DAE) which specifies the goals in terms of network coverage and service adoption for the whole European population.[1] The importance of this target has been recently confirmed by the European Commission whose vision is to turn Europe into the Gigabyte society within 2025 with an estimated investment of about 500 billion euros (European Commission, 2016).

Ultra-fast broadband networks are typically considered *general purpose technologies* (Bresnahan and Trajtenberg [1995]), having the potential to trigger productivity gains and economic growth across many different sectors on a massive scale as a result of complementarities in product and process applications.[2] The deployment of ultra-fast communication infrastructure typically yields both direct and indirect positive effects on economic activities. The direct effects come from the increased employment and economic activities necessary to supply the new network infrastructure. Indirect economic benefits are instead related to the productivity gains from the adoption of the new technology. Productivity is spurred by more efficient business processes and innovation acceleration - e.g. due to larger amounts of better quality data which can be transferred and stored digitally at lower costs. Indeed, higher connection speeds would allow firms to benefit from enhanced and more efficient connection services regardless of their size or geographic location, shaping the way companies run their business, enhancing their managerial capabilities, and broadening their markets.

Notwithstanding, the magnitude of these effects have not been clearly and uniquely quantified in the economic literature, especially on local development. The goal of this

[1] The DAE seeks to ensure that, by 2020, (i) all Europeans will have access to much higher internet speeds of above 30 Mbps and (ii) 50 percent or more of European households will subscribe to internet connections above 100 Mbps (European Commission, 2010:19).

[2] Numerous other studies support the view that investment in old broadband infrastructures - and their adoption - create positive effects on the economic system as a whole and lead to an increase in GDP growth. For instance, Czernich et al. [2011] show that a 10% increase in the broadband adoption rate in OECD countries results in a 1-1.5% increase in the annual GDP per-capita.

paper is to provide a robust estimation of the impact of ultra-fast broadband investment on local growth, and in particular on new business companies creation.

To this aim we leverage on a unique dataset collecting data on broadband coverage and firm creation for every Italian municipality over the period 2013-2018. Our dataset derives from two main sources. The first one collects data on ultra-fast broadband infrastructure deployment at municipality level. For each municipality (around 8000), we have information on the percentage of coverage of the new high-speed network. We observe within-municipality coverage for DSL network together with ultra-fast fiber-based broadband (UBB). We exploit the introduction of UBB, which happened in 2015. We complement this dataset with additional data provided by the Italian Chambers of Commerce on the number of firms operating in each Italian municipality, in terms of existing firms, new businesses and closed companies in each year of observations. Our goal is to understand whether in an urban area where a more advanced technological infrastructure is preset, the likelihood to run a valuable business is higher.

When performing such an analysis, potential identification problems arise from the non-randomness of the technology diffusion process. Some urban or municipal areas are in general more attractive than others because, for example, they are more densely populated and with higher GDP per capita. Those areas are also particularly attractive for telecom operators too facilitating investments in new technologies. Hence, other unobserved demographic characteristics might affect both firm creation and broadband deployment. To account for the potential endogeneity of network investment, we use information on the distance between each municipality and its closest central office equipped with "last mile" device necessary to provide the specific service. In particular, given the set of observable demographics, we instrument ultra-fast fiber-based broadband deployment (UBB) in each municipality with the distance to the closest Optical Line Terminal (OLT). The idea is that, everything else equal, such distance proxies the deployment costs necessary to provide the service to the municipality. Hence, the higher the distance the lower broadband coverage should be. Similarly, we use distance between each municipality and the closest Digital Subscriber Line Acess Multiplexer (DSLAM) as an instrument to explain variation in ADSL coverage.

Our preliminary results show that UBB introduction positively affects firm creation. Results are highly heterogeneous among sectors and geographical location. Regions in the north of Italy seem to appropriate most of the benefits from new broadband technology introduction, while the poorer regions of the south are not significantly affected by UBB introduction. Hence, we find that highly industrialized areas are those mostly affected, while regions with low level of human capital and firm presence are not affected.

The remainder of the paper is organized as follows. Section 2 introduces the main literature and the contribution of this research to the current state of literature. Section 3 presents the econometric model and the empirical strategy. Section 4 describes the data and provides summary statistics. Section 5 presents our identification strategy, while section 6 the estimation results. Section 7 concludes.

2 Literature Review

The effect of broadband connection has received a considerable attention in the literature and has concerned a wide range of socioeconomic outcomes, including GDP growth (Czernich et al. [2011]), wage and employment growth (Forman et al. [2012], Grimes et al. [2012], Akerman et al. [2015]), house prices (Ahlfeldt et al. [2017]), educational attainment (Faber et al. [2015]), and political outcomes (Nardotto et al. [2018], Campante et al. [2017]). However, the literature on the effects of ultra-fast broadband investments on several important economic dimensions is still scant (see Abrardi and Cambini [2019] for a survey).

Most of the studies focus on the economic effects of standard broadband, in which high speed connections are intended the ones above 2Mbps. For instance, Kolko [2012] studies the impact of basic broadband investment on local growth. By combining municipality-level broadband data for connection above 2Mbps from the US federal regulator with employment data and other economic data from the U.S. Census between 1999 and 2006, he finds a positive relationship between broadband expansion and local economic growth. This relationship is stronger in industries that rely more on information technology and in areas with lower population densities. To account for the potential endogeneity of broadband investment, the author utilizes local morphological variables (i.e. the slope of terrain leans) to define the causal effect of broadband deployment on both local growth and employment. As in Kolko [2012], we rely on granular data at municipality level, but we extend the analysis to the most recent broadband technologies, including both fiber-based ultra-fast connection (above 100Mbps). Moreover, we focus on the effect of these technologies on local firm creation over different sectors, and we capture heterogeneous effects among industries and geographical areas.

A piece of research linking ultra-fast connections - i.e. with above 100 Mbps connections - with economic growth is the one of Briglauer and Gugler [2017]. In view of low ultra-fast broadband take-up rates, Briglauer and Gugler [2017] employ data on broadband adoption. By utilizing a country-based panel dataset of EU27 member states for the period 2003-2015, they analyze the impact of basic, fast and ultra-fast broadband adoption on GDP growth. The results show small but significant effects of fiber-based ultra-fast broadband on GDP: a 1 percent increase in the adoption of ultra-fast broadband leads to an incremental increase of about 0.004-0.005 percent of GDP. However, the largest growth effects come from basic broadband adoption, implying that partial but not full ultra-fast broadband coverage entails the largest net economic benefits. In our study, we rely on more granular data where broadband deployment is observed for every Italian municipality during the period 2013-2018.

Few other papers address the impact of broadband on firms' establishment by explicitly including data on high-speed connections. McCoy et al. [2016] focuses on the impact of fiber broadband infrastructure on new business establishments. The dataset includes urban field-level data over the period 2002-2011, and covers the entire history of broadband development in Ireland. Endogeneity is mitigated by restricting the analysis to new firms in each year, rather than considering the stock of firms, and by controlling for the pre-existing employment levels. They control for unobserved characteristics by area and time fixed effects. The authors find that availability of fiber-based broadband infrastructure has a positive impact on the establishment of new firms, particularly in the high-tech sector. Moreover, this effect is greater in areas with higher educational attainment, while it is not significant in areas where education levels are low, suggesting that broadband is a necessary but not sufficient condition for creating new firms.

A very closely related paper to ours is the one by Hasbi [2017] who uses granular data on more than 36,000 French municipalities over the period 2010 - 2015, and studies the impact of high-speed broadband network deployment on local economic growth. In particular she focus on the number of firms operating locally, on the creation of new businesses, and on unemployment. A dummy variable indicates whether a high-speed broadband network has been deployed in a given municipality and time. The study controls for time and municipality fixed effects. In order to deal with endogeneity issues, the author estimates the impact of high-speed network on both the number of companies and the number of new companies, based on the argument that endogeneity is more likely to affect the stock of existing companies than the flow of new companies. Moreover, to deal with the reverse causality problem into the local labor market, the she uses two-years lagged variables. The author finds that the presence of a very high-speed broadband network increases by 2.7 percent the number of companies operating locally. In terms of company creation, the presence of very high-speed network has a significant impact only on the creation of new businesses operating in the tertiary sector, but it is not significant for the establishment of new firms in the construction and industry sectors. Besides, the study finds a positive effect on sole ownership, i.e. on the creation of companies owned by one individual and a decrease on unemployment. Though similar in principle, our paper differs from this in several direction. First, we do not only rely on a dummy describing the presence of ultra-fast broadband, since we have a direct measure of coverage, i.e a continuous variable measuring the percentage of households connected to the ultra-fast network in an urban area. Last but not least, we implement a more robust identification strategy relying not on lagged variables but rather on instrumental variables.

Finally, Canzian et al. [2019] analyzes the impact of advanced (up to 20 Mbps download, up to 1 Mbps upload) broadband accessibility on firm performance by exploiting a unique local policy of a staggered broadband infrastructure upgrade across rural municipalities in a Northern region of Italy (Trentino Alto Adige). In a difference-in-differences framework based on longitudinal balance sheet data for limited companies, they show that basic broadband availability, i.e. a connection above 2 Mbps, is associated with increased firms revenues and total factor productivity (by on average 14.8 and 9.1 percent cumulatively over two years), but not with significant changes in personnel cost or employment. Our paper differs from this analysis since we do not analyze firm performance but rather the probability of business creation in a certain. Moreover we have data on the whole Italian country while their analysis relies only in a Regional dataset. Overall, these studies thus confirm that investing in fiber infrastructures would spur economic activities through the creation of new firms, but also that the presence of a faster connections per se may not be sufficient to obtain such a result, since other components (such as education and skill) are important factor to account for.

3 Institutional Background & Empirical Evidence

The introduction of fiber-based UBB in the Italian municipalities started in 2015 as result of the implementation of the Italian Strategy for high-speed broadband, which incorporates the main objectives of DAE. The project establishes the following goals to be reached by 2020: (i) 85% of the population having access to connection speeds above 100Mbps, (ii) the whole population having access to at least 30Mbps connection speed, (iii) 100Mbps connection speed for offices and public buildings, and (iv) provide high-speed broadband in industrial areas.

We can think of broadband deployment in terms of *extensive* and *intensive* margins. The former refers to the number of cities where the specific technology is available, while the latest alludes to the within-municipality broadband coverage. Figure 1 shows the municipalities where UBB is available in the first year of introduction (Panel a) and in the latest year available in our dataset (Panel b). Despite the apparent widespread diffusion of UBB, by 2018 only 50% of municipalities are reached by UBB, as shown by Figure 2. The figure is also informative about the availability of DSL technologies. During the period of our analysis, almost all municipalities have access to ADSL connections up to 7Mbps, while the diffusion of more advanced ADSL 20Mbps connections move from 70% to 90%, suggesting that DLS technologies are in the mature phase of their diffusion. Figure 3 displays instead two examples of within-municipalities variation in coverage for each each broadband technologies. As we can see DSL-connections do not vary over time, and they are very closed to cover all households in a given municipalities. UBB intensive margin trends displays the S-shaped form which is well-known in the literature on technology diffusion (Geroski [2000], Czernich et al. [2011]). Once introduced, UBB reaches the majority of households in a given municipalities, then it diffuses slowly to reach less profitable neighborhoods, going on the limit to the coverage of older broadband technologies.

The service provider needs to install specific devices in its Central Offices in order to supply the service to final consumers. Such devices are upgrades to pre-existing infrastructures, hence their installation is restricted to the existing Central Offices throughout Italy. In particular, to supply UBB connections, the service provider has to install an Optical Line Terminal (OLT) in one of the existing CO and then deploy the fiber line from the CO and the nearby municipalities. Therefore, the higher the distance between each municipality and the closest OLT, the higher are the deployment costs necessary to provide the network. We use these distances in our econometric model to explain heterogeneity in broadband coverage among municipalities.

4 Empirical Strategy

In this section we investigate the effect of super fast internet coverage on firm creation. The basic econometric model is the following equation:

$$y_{i,t} = \beta_0 + \beta_1 BB_{i,t} + \beta_2 X_{i,t} + \alpha_I + \tau_t + \epsilon_{i,t} \tag{1}$$

where $BB_{i,t}$ is a vector collecting broadband technologies' information for municipality i in year t; $X_{i,t}$ is a vector of controls including demographic together with time-invariant geographic. In particular we include log-population, log-percapita gdp in the previous year, altitude, a collection of dummies identifying province or Labour Local System (LLS) capitals, municipalities lying on the seaside or belonging to rural or industrial areas. We also include

information on the existing telecom infrastructure in each municipality, such as an identifier for municipalities with a high order central office named Urban Group Stage (UGS), which is informative on the degree of broadband literacy of a specific location. α_I are fixed effects associated to the LLS in which municipality i is located, and τ_t are year fixed effects.
Our outcomes of interest are the number of new and expired firms in municipality i, and time t for roughly 20 industrial sectors. As our dependent variables are counting data with many zeros, we apply the following monotonic increasing transformation $y = ln(x + 1)$, where x is one of the outcomes of interest.

The inclusion of LLS fixed effects α_I imply that we identify the effect of broadband deployment on firm creation exclusively by exploiting local variation across municipalities within the same LLS. We do not include municipality fixed-effects because we do not have enough within-municipality variation both in our dependent and independent variables.

The variable BB collects the coverage rates of different broadband technologies available in municipality i and year t. The main focus of our study is to asses the causal impact of UBB introduction on firm creation conditional on the existing ADSL coverage rate. Since basically all municipalities have access to DSL 7Mbps connections, we add only ADSL 20Mbps coverage in (1).

5 Data

Our empirical strategy leverages on a unique dataset collecting data on broadband deployment and firm creation for every Italian municipality over the period 2013-2018. Our dataset derives from two main sources. The first one collects data on ultra-fast broadband infrastructure deployment, from which we get information on both UBB and ADSL broadband coverage. Summary statistics are provided in Table 1.

The second source of data comes from the Italian Chambers of Commerce, and collects information on the number of operating firms for each Italian municipality. In particular, we observe the number of operating firms, together with the number of new and closed business for 20 sectors in each year of observations. Summary statistics are displayed in Tables 2 and

3.

By merging the two datasets we are able to link at the municipality level broadband deployment and firm creation over different sectors, allowing to estimate both mean and differential effects of the introduction of ultra-fast broadband infrastructure on the number of new and closing business in the period considered. We complement our dataset with information taken from the Italian Statistical Office, including demographic characteristics as well as time invariant features such as altitude, whether a municipality lies on the seaside, in a rural area; whether it is a province or LLS capital; whether it belongs to an industrial area. We also generate from these demographics additional covariates that add information about the surrounding area of each municipality through a contiguity matrix. In particular we generate the average per-capita gdp and the total population in the contiguous area, as well as a dummy taking value 1 if the municipality is contiguous to the province capital. Summary statistics are provided in Table 4.

Finally, we add information on the existing throughout Italy broadband infrastructures by including identifiers for municipalities having and SGU or at least one Central Office. Among the available Central Offices, we know which one are equipped with OLT or DSLAM over time. While we observe variation in the installment of OLT over time, DSLAM have been installed in the past, and we do not observe any variation consistently with ADSL broadband diffusion being in its mature phase. From this information we can derive the distances we use in our instrumental variable estimation. Table 5 collects summary statistics.

6 Identification Strategy

The main challenge in estimating equation (1) refers to the potential correlation between broadband deployment and unobservable municipality-level factors that might affect firm establishment. Broadband coverage is positively correlated with observable municipality's demographics such as population density and per capita income. This would be true also for other characteristics we are not controlling for, which in turn might affect firms establishment. The endogeneneity problem arising would confound our results, making the OLS estimates biased and inconsistent.

Our identification strategy leverages on information on the existing telecom infrastructure. We have information on the full set of Central Offices throughout the National territory. These are an heritage of the old voice telephone network, thus they are exogenous with respect to current contingencies.

Telecom operator needs to install specific devices in the Central Offices in order to provide the service to final consumers. In particular, to supply UBB network, the service provider must equip Central Offices with Optical Line Terminals (OLT). These are "last mile" devices, in that they are the service provider's endpoint in a Passive Optical Network (PON). Therefore OLTs are the starting point of the last mile connecting subscribers and service providers. The connection is made through an optical fiber line that needs to be deployed underground, implying high costs of installment. The higher such distance, the lower the profitability of an area will be *ceteris paribus*, as it implies higher costs of deployment. Hence we should expect municipalities relatively closer to OLT having early access to the new technology, and higher intensive margin coverage. Figure 4 displays the evolution of UBB introduction in the Turin province in Italy. Panel (a) shows with blue dots the municipalities with Central Offices equipped with OLT in the last year of the period of our analysis. Panels (b), (c), and (d) show through yellow dots, the municipalities with UBB access for 2016, 2017, and 2018 respectively. Going from Panel (b) to (c) it is evident that UBB is first introduced in municipalities with Central Offices equipped with OLT, or in the immediate proximity. Figure 5 provides more evidence of the negative relation between distance from OLTs and UBB coverage by visualizing coverages over time for three municipalities characterizing by different distances with the closest OLT. Blue line refers to the UBB intensive margin for a municipality with (at least) a Central Office equipped with OLT. The red line is UBB coverage for a municipality with median OLT distance, while green line is related to a municipality far away from the closest OLT. Coverage is relatively higher in municipalities in the proximity of an OLT compared to a municipality which is distant from an OLT.

The same sort of argument applies for the other endogenous covariate, namely ADSL 20Mbps coverage. We use as instrument the distance between each municipality and closest

Central Office equipped with Digital Subscriber Line Access Multiplex (DSLAM). This is the "last mile" device necessary to provide ADSL services to final subscribers via copper line, and it acts as a converter of electric signals between service provider's premises and consumer's line. Here the distance between a municipality and its closest DSLAM proxies the quality of the service supplied to the final consumer, as the higher the distance, the lower the connection speed will be.[3] Figure 7 replicates the main message of Figure 6 but now it compares ADSL coverage of three municipalities with different distances from the closest DSLAM. The Figure confirms the negative relation between DSLAM distance and ADSL coverage.

6.1 Exclusion Restriction

The distance between municipality and its closest Central Office equipped with "last mile" device is a valid instrument if it is not correlated with unobservable factors affecting firm establishment. That is, our instruments should be uncorrelated with the number of new and expired firms given the set of controls in (1).

In the econometric model (1) we include as controls time-variant municipality demographics, as well as time-invariant geographic characteristics and broadband infrastructure information. However, OLT installment might also depend on firm presence in a given area. In particular, one would expect OLT to be installed in the proximity of industrial areas in order to provide the service to existing businesses, thereby increasing their productivity. This would make our instrument invalid, since OLT and DSLAM installment from which distances derive is itself endogenous.

Our exclusion restriction assumption is that OLT and DSLAM installment does not depend on the *flow* of new firms. That is, we allow such decision to be correlated with the *stock* level of firms operating in given area, but not on the entry/exit dynamics of the industry. Hence, by including the stock number of operating firms in (1) as control we ensure our identifying assumption to be satisfied.

We run a series of robustness checks in support of our exlusion restriction assumption

[3] This relation is well documented in the economic literature (see [cite]).

[To be added...]

7 Preliminary Results

Table 6 displays preliminary results of equation (1) when the dependent variable is $log(x+1)$, where x is the mean number of new firms over sectors. Hence we attempt to estimate the mean effect on firm creation from the introduction of UBB conditional on ADSL 20Mbps coverage. All specifications include LLS fixed effects. Column (1) and (2) shows OLS estimates with year, and province-year fixed effects respectively. We find a positive effect from the introduction of UBB on new firm establishment. Results greatly depend on the presence of differential time trend across provinces. When we do not control for differential trends (columns 1 and 4) the small positive effect suggested by OLS estimate becomes negative when we instrument the endogenous variables. However, when we include province-year fixed effects, we find positive effect both in OLS and 2SLS. The magnitude increases when we correct the bias from endogeneity, suggesting that OLS estimates bias toward zero the true effect. The introduction of 4th polynomial time trend interacted with our time-invariant variables moves UBB coefficient farther away from zero, suggesting not correcting for any pre-existing time trend affecting firm creation would understate the true effect of UBB. When we focus on ADSL 20Mbps coefficient we find either no effect or negative one. Therefore, conditioned on the presence of a new broadband technology, increasing ADSL coverage might affect firm creation negatively.

First-stage results are in line with what we expected (Table 7). We use two instruments: the distance from the closest OLT interacted with a dummy taking value one from 2015 onward, and the distance from the closest DSLAM. We interact OLT distance with a time dummy in order to account for the year of introduction of UBB which started in 2015. First-stage coefficients are negative and statistically significant, implying a negative relation between broadband coverage and distance with "last mile" devices. The reported F-test of the excluded instruments are very large, suggesting that this set of instrument is extremely powerful.

In Table 8 we show 2SLS estimates for UBB and ADSL 20Mbps when we drop large cities from our samples, and when we focus on specific geographical areas. Columns (1) and (2) display estimated coefficients of broadband coverage when we exclude province capitals and LLS main cities respectively. Results do not change drastically compared with those of Table 6 column (6), implying that large city contingencies are not driving our results. In columns (3)-(5) we show 2SLS results when we run our regression on regions in the North, Center, and South of Italy respectively. We find that the effect of UBB introduction is larger in the north, which includes the regions with higher number of firms, higher per-capita gdp and human capital. UBB effect decreases when we move to the Center of Italy, and non-statistically significant when we move to the South of Italy, where the poorest regions lie.

In Tables 9-12 we show UBB and ADSL 20Mbps estiamted coefficients over the several industrial sectors we observe in our dataset. Results are highly heterogeneous among sectors, and in line with one would expect. We do not find any significant effect in those sectors that are mainly public (such as those in Table 11). Table 10 shows results of sectors that are high ICT intensive, such as banking and finance, ICT, and technical and scientific activities. UBB effects are always positive and strongly statistically significant when we include province-year fixed effect and time-trends interaction with our demographics. Interestingly enough, UBB is positively affecting also more traditional sectors such as agricolture, manufacturing, and real estate as show in Table 9. We show the implications of the estimated results by computing the number of new firm establishments for each sector in Table 13.

8 Conclusions

[To be added...]

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Tables and Figures

Table 1: Broadband Data

Variable	N	mean	sd	min	max
UBB Coverage					
2013	7523	0	0	0	0
2014	7526	0	0	0	0
2015	7527	.083	.242	0	.95
2016	7527	.184	.338	0	.95
2017	7523	.208	.349	0	.96
2018	7461	.407	.433	0	.98
Total	45087	.1469137	.3168581	0	.98
ADSL 20Mbps Coverage					
2013	7523	.566	.467	0	1
2014	7526	.612	.460	0	1
2015	7527	.709	.428	0	1
2016	7527	.762	.403	0	1
2017	7523	.807	.374	0	1
2018	7461	.831	.355	0	1
Total	45087	.7148493	.4282315	0	1

The table shows summary statistics of UBB and ADSL 20Mbps coverage. Source: Telecom Italia.

Table 2: Firm Data

Variable	N	mean	sd	min	max
Operating Firms	45085	36.58351	209.8517	0	13240.63
New Firms	45084	3.532923	24.54759	0	1312.895
Expiring Firms	43887	2.647212	14.74733	0	1069.842

The table shows summary statistics of mean values across sectors of the number of operating, new, and expiring firms. Source: Italian Chamber of Commerce.

Table 3: Industrial Sectors

Sector	Data	N	mean	sd	min	max
Agricolture, Hunting, and Fishing	New Firms	44941	7.567	55.578	0	2734
	Operating Firms	44964	90.574	166.962	0	4237
Service Activities	New Firms	39226	2.269	17.061	0	1043
	Operating Firms	40537	31.908	213.957	0	14314
Public Administration	New Firms	1323	.0128	.113	0	1
	Operating Firms	2220	.222	1.236	0	47
Sport & Entertainment	New Firms	31466	.817	6.022	0	390
	Operating Firms	32644	11.212	77.305	0	4698
Accommodation & Restaurants	New Firms	43199	3.384	23.611	0	1714
	Operating Firms	44596	47.656	329.026	0	24057
Banking & Finance	New Firms	35107	1.601	11.853	0	670
	Operating Firms	36288	18.196	147.935	0	7753
Real Estate	New Firms	33479	1.082	10.608	0	592
	Operating Firms	34935	39.533	397.922	0	22596
Manufacturing	New Firms	44131	3.584	27.763	0	2040
	Operating Firms	44279	64.271	292.306	0	14041
Technical & Scientific Activities	New Firms	36203	2.223	19.555	0	1183
	Operating Firms	37432	27.756	321.983	0	20471
Retail	New Firms	44733	14.209	133.780	0	10914
	Operating Firms	44820	176.838	1259.056	0	77503
Construction	New Firms	44819	6.702	41.431	0	2175
	Operating Firms	44923	95.923	514.395	0	33097
Mineral Extraction	New Firms	11876	.078	.689	0	25
	Operating Firms	12875	1.366	3.710	0	111
Water Supply	New Firms	18836	.156	1.615	0	83
	Operating Firms	19967	2.737	10.207	0	463
Energy Supply	New Firms	15049	.245	2.173	0	127
	Operating Firms	16165	3.703	24.554	0	1031
Education	New Firms	21694	.538	4.870	0	278
	Operating Firms	22790	6.347	43.769	0	2078
Rental & Travel Agencies	New Firms	37936	2.554	26.745	0	2306
	Operating Firms	39217	24.452	279.718	0	20751
Health Services	New Firms	26721	.519	5.637	0	395
	Operating Firms	27912	6.995	44.439	0	2343
ICT	New Firms	32260	1.606	14.323	0	728
	Operating Firms	33424	19.948	231.932	0	13478
Storing & Transportation	New Firms	38390	1.041	12.576	0	925
	Operating Firms	39779	21.631	174.853	0	11045
Not Classified	New Firms	40250	18.679	197.882	0	13979
	Operating Firms	40152	.585	6.096	0	487

The table shows the ATECO industrial sectors included in our analysis. Column Data includes the (stock) number of operating firms and the (flow) number of new firms. Statistics are for each sectors. Source: Italian Chamber of Commerce.

Table 4: Demographics

Variable	N	mean	sd	min	max
Population	45,087	7772.323	43601.22	29	2873494
Lagged Per-Capita GDP	45,063	16881.04	3574.756	5017.907	51403.21
Altitude (meters)	45,087	358.742	299.510	0	2035
Seaside	45,087	.076	.265	0	1
Province Capital	45,087	.013	.115	0	1
Rural	45,087	.665	.472	0	1
Industrial District	45,087	.270	.444	0	1
GSU	45,087	.027	.163	0	1
Central Office	45,087	.667	.471	0	1
LLS Capital	45,087	.075	.264	0	1
W Lagged Per-Capita GDP	44,979	17671.51	3296.675	8281.513	31142.97
W Province Capital	45,087	.139	.346	0	1

The table shows summary statistics of demographics included in equation (1). Data comes from the Italian Statistical Office and Telecom Italia. Data with W are generate via contiguity matrix.

Table 5: Distance From "last mile" Device

Variable	N	mean	sd	min	max
Distance from OLT					
2013	7523	47.600	28.489	0	297.725
2014	7526	30.486	19.347	0	218.822
2015	7527	16.929	11.992	0	218.822
2016	7527	9.163	7.923	0	67.326
2017	7523	9.034	7.856	0	67.326
2018	7461	9.001	7.851	0	67.326
Total	45087	20.384	21.434	0	297.725
Distance From DSLAM					
2013	7523	2.480	3.618	0	56.747
2014	7526	2.480	3.618	0	56.747
2015	7527	2.480	3.618	0	56.747
2016	7527	2.480	3.618	0	56.747
2017	7523	2.480	3.618	0	56.747
2018	7461	2.472	3.608	0	56.747
Total	45087	2.478	3.616	0	56.747

The tables shows summary statistics of distances from municipalities and the closest OLT and DSLAM. Source: Telecom Italia.

Table 6: New Firm Establishment: Mean Results

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
UBB	0.035**	0.087***	0.098***	-0.115**	0.184***	0.252***
	(0.014)	(0.011)	(0.009)	(0.050)	(0.045)	(0.048)
ADSL 20Mbps	-0.017	-0.013*	-0.015**	-0.105***	-0.033*	-0.033*
	(0.011)	(0.007)	(0.007)	(0.038)	(0.020)	(0.020)
log(Operating+1)	0.027	0.577***	0.575***	0.038	0.571***	0.564***
	(0.075)	(0.027)	(0.027)	(0.074)	(0.027)	(0.027)
Lag log(Percapita gdp)	-0.195***	0.087**	0.086**	-0.174***	0.089**	0.084**
	(0.053)	(0.037)	(0.037)	(0.052)	(0.036)	(0.036)
log(Population)	0.318***	-0.061***	-0.061***	0.331***	-0.061***	-0.062***
	(0.051)	(0.013)	(0.013)	(0.052)	(0.013)	(0.012)
W log(Population)	0.002***	0.001***	0.001***	0.002***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
W Lag log(Percapita gdp)	-0.152***	-0.044	-0.047	-0.147**	-0.050	-0.057
	(0.058)	(0.036)	(0.036)	(0.058)	(0.036)	(0.035)
Altitude	0.000***	0.000		0.000***	0.000	
	(0.000)	(0.000)		(0.000)	(0.000)	
Seaside	0.273***	0.161***		0.277***	0.156***	
	(0.027)	(0.018)		(0.028)	(0.017)	
Province Capital	0.722***	0.537***		0.704***	0.537***	
	(0.061)	(0.045)		(0.059)	(0.045)	
Rural	-0.100***	-0.064***		-0.117***	-0.059***	
	(0.018)	(0.012)		(0.020)	(0.012)	
Industrial District	0.477***	-3.544***		0.537***	0.740***	
	(0.033)	(0.112)		(0.036)	(0.213)	
UGS	0.348***	0.232***		0.355***	0.227***	
	(0.038)	(0.030)		(0.038)	(0.029)	
Central Office	-0.030***	-0.036***		-0.048***	-0.037***	
	(0.007)	(0.006)		(0.010)	(0.007)	
LLS Main City	0.271***	0.166***		0.282***	0.160***	
	(0.033)	(0.020)		(0.033)	(0.020)	
W Province Capital	0.102***	0.060***		0.108***	0.057***	
	(0.021)	(0.013)		(0.021)	(0.013)	
AP F-test UBB				268.68	235.23	136.04
AP F-test ADSL 20Mbps				357.06	351.35	343.14
Year FE	YES			YES		
Year-Province FE		YES	YES		YES	YES
Trend X Demographics			YES			YES
Observations	44,976	44,976	44,976	44,976	44,976	44,976
Adj R^2	0.707	0.853	0.854	0.701	0.851	0.850

The table shows estimated results of equation (1) with different sets of controls. Dependent variable is $\log(x+1)$ where x is the mean number of new firm establishments. Covariates denoted with W are spatial lagged variables through contiguity matrix. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 7: First Stage of Table 4 Column 5

	(1) UBB	(2) ADSL 20Mbps
$Post \times OLT$	-0.010***	0.002***
	(0.001)	(0.000)
DSLAM	0.002*	-0.057***
	(0.001)	(0.003)
log(Operating+1)	0.069***	0.046**
	(0.010)	(0.016)
Lag log(Percapita gdp)	0.010	0.129***
	(0.017)	(0.036)
log(Population)	0.015*	0.027*
	(0.007)	(0.012)
W log(Population)	-0.000***	-0.001***
	(0.000)	(0.000)
W Lag log(Percapita gdp)	-0.028	-0.118*
	(0.029)	(0.047)
Altitude	0.000***	0.000**
	(0.000)	(0.000)
Seaside	0.045***	-0.015
	(0.011)	(0.018)
Province Capital	-0.050**	-0.058*
	(0.017)	(0.024)
Rural	-0.061***	-0.063***
	(0.007)	(0.011)
Industrial District	0.086	-0.355
	(0.080)	(0.227)
GSU	0.040**	-0.016
	(0.013)	(0.016)
Central Office	-0.014***	-0.132***
	(0.004)	(0.008)
LLS Main City	0.060***	0.000
	(0.009)	(0.013)
W Province Capital	0.026**	0.043***
	(0.009)	(0.011)
N	44976	44976

The table shows the first stage from 2SLS of Table 4 column (5). The first column shows estimates and standard errors for UBB coverage, while column (2) shows first-stage results for ADSL 20Mbps coverage. Variable $Post \times OLT$ is given by the interaction between OLT distance and a post dummy taking value 1 from 2015 onward. DSLAM is the distance between a municipality and its closest DSLAM. Distances are in Kilometers. Covariates denoted with W are spatial lagged variables through contiguity matrix. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 8: New Firm Establishment: Geographical Selection

	(1)	(2)	(3)	(4)	(5)
VARIABLES	No Prov Capital	No LLS Main City	North	Center	South
UBB	0.283***	0.275***	0.427***	0.263***	-0.073
	(0.049)	(0.059)	(0.067)	(0.070)	(0.130)
ADSL 20Mbps	-0.020	-0.019	-0.059**	-0.050	0.042
	(0.018)	(0.018)	(0.024)	(0.051)	(0.030)
Observations	44,370	41,578	26,287	5,724	12,965
Adj R^2	0.799	0.739	0.825	0.909	0.866

This table shows estimated results of specification (6) in Table 4 when we eliminate province capitals or LLS main cities (Column 1 and 2 respectively), and when we run the regression on northern, center, and southern regions only (Columns 3-5). Dependent variable is $\log(x+1)$ where x is the mean number of new firm establishments. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 9: New Firm Establishment: Results on Traditional Sectors

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
Agricolture, Hunting, and Fishing						
UBB	-0.097***	0.052***	0.039***	-0.213***	0.204***	0.161*
	(0.025)	(0.013)	(0.014)	(0.076)	(0.055)	(0.091)
ADSL 20Mbps	-0.020	0.003	0.004	0.007	0.037	0.035
	(0.013)	(0.010)	(0.010)	(0.033)	(0.025)	(0.025)
Observations	44,832	44,832	44,832	44,832	44,832	44,832
Adj R^2	0.324	0.462	0.463	0.322	0.459	0.461
Manufacturing						
UBB	0.010	0.108***	0.120***	-0.079	0.288***	0.413***
	(0.024)	(0.018)	(0.018)	(0.060)	(0.062)	(0.086)
ADSL 20Mbps	-0.004	-0.003	-0.005	-0.088**	-0.051*	-0.050*
Observations	44,017	44,017	44,017	44,017	44,017	44,017
Adj R^2	0.421	0.501	0.502	0.418	0.496	0.493
Construction						
UBB	0.036*	0.139***	0.158***	-0.132*	0.225***	0.277***
	(0.022)	(0.019)	(0.019)	(0.071)	(0.074)	(0.095)
ADSL 20Mbps	0.007	0.010	0.009	-0.050	-0.036	-0.036
	(0.013)	(0.011)	(0.011)	(0.049)	(0.039)	(0.039)
Observations	44,711	44,711	44,711	44,711	44,711	44,711
Adj R^2	0.536	0.611	0.612	0.533	0.610	0.610
Storing & Transportation						
UBB	-0.066***	-0.036***	0.002	-0.197***	-0.101***	0.016
	(0.019)	(0.011)	(0.011)	(0.047)	(0.039)	(0.060)
ADSL 20Mbps	-0.034***	-0.028***	-0.035***	-0.101***	-0.078***	-0.077***
	(0.011)	(0.010)	(0.010)	(0.029)	(0.026)	(0.026)
Observations	38,262	38,262	38,262	38,262	38,262	38,262
Adj R^2	0.252	0.325	0.328	0.245	0.323	0.327
Real Estate						
UBB	-0.018	0.017	0.064***	-0.114**	-0.055	0.200***
	(0.013)	(0.011)	(0.013)	(0.046)	(0.043)	(0.068)
ADSL 20Mbps	-0.028***	-0.039***	-0.048***	-0.153***	-0.152***	-0.142***
	(0.011)	(0.010)	(0.010)	(0.029)	(0.027)	(0.027)
Observations	33,346	33,346	33,346	33,346	33,346	33,346
Adj R^2	0.441	0.478	0.481	0.434	0.473	0.475
Year FE	YES			YES		
Year-Province FE		YES	YES		YES	YES
Trend X Demographics			YES			YES

The table shows estimated results of equation (1) with different sets of controls. Dependent variable is $\log(x+1)$ where x is the number of new firm establishments in each industrial sector. Sectors are identified in bold. Controls are the same as those of Table 4. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 10: New Firm Establishment: Results on ICT-Intensive Sectors

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
ICT						
UBB	-0.039***	-0.008	0.009	-0.051	0.081*	0.223***
	(0.015)	(0.012)	(0.013)	(0.045)	(0.045)	(0.068)
ADSL 20Mbps	-0.048***	-0.045***	-0.050***	-0.128***	-0.123***	-0.122***
	(0.011)	(0.011)	(0.011)	(0.030)	(0.030)	(0.029)
Observations	32,151	32,151	32,151	32,151	32,151	32,151
Adj R^2	0.497	0.550	0.550	0.496	0.547	0.542
Banking & Finance						
UBB	-0.043***	-0.017	0.016	-0.109**	0.003	0.225***
	(0.014)	(0.012)	(0.012)	(0.043)	(0.039)	(0.065)
ADSL 20Mbps	-0.022**	-0.019*	-0.025***	-0.082***	-0.072***	-0.070***
	(0.010)	(0.010)	(0.010)	(0.025)	(0.023)	(0.023)
Observations	35,011	35,011	35,011	35,011	35,011	35,011
Adj R^2	0.474	0.524	0.525	0.472	0.524	0.519
Technical & Scientific Activities						
UBB	0.030**	0.049***	0.054***	0.023	0.165***	0.326***
	(0.015)	(0.011)	(0.012)	(0.050)	(0.046)	(0.076)
ADSL 20Mbps	-0.038***	-0.034***	-0.037***	-0.118***	-0.099***	-0.098***
	(0.011)	(0.010)	(0.010)	(0.030)	(0.028)	(0.028)
Observations	36,087	36,087	36,087	36,087	36,087	36,087
Adj R^2	0.518	0.572	0.571	0.517	0.569	0.563
Retail						
UBB	0.068***	0.186***	0.223***	-0.148*	0.289***	0.425***
	(0.020)	(0.019)	(0.016)	(0.079)	(0.087)	(0.097)
ADSL 20Mbps	-0.004	-0.015	-0.018	-0.132**	-0.080*	-0.080*
	(0.014)	(0.012)	(0.012)	(0.056)	(0.043)	(0.043)
Observations	44,629	44,629	44,629	44,629	44,629	44,629
Adj R^2	0.629	0.702	0.703	0.624	0.700	0.700
Service Activities						
UBB	0.053***	0.084***	0.103***	-0.056	0.160***	0.300***
	(0.016)	(0.013)	(0.015)	(0.054)	(0.047)	(0.070)
ADSL 20Mbps	-0.037***	-0.038***	-0.040***	-0.123***	-0.097***	-0.095***
Observations	39,122	39,122	39,122	39,122	39,122	39,122
Adj R^2	0.501	0.568	0.568	0.498	0.566	0.563
Year FE	YES			YES		
Year-Province FE		YES	YES		YES	YES
Trend X Demographics			YES			YES

The table shows estimated results of equation (1) with different sets of controls. Dependent variable is $\log(x+1)$ where x is the number of new firm establishments in each industrial sector. Sectors are identified in bold. Controls are the same as those of Table 4. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 11: New Firm Establishment: Other Sectors I

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
Mineral Extraction						
UBB	-0.021**	-0.004	-0.000	-0.041**	-0.011	-0.018
	(0.008)	(0.006)	(0.005)	(0.019)	(0.016)	(0.028)
ADSL 20Mbps	0.002	0.003	0.002	0.009	0.016	0.016
	(0.006)	(0.004)	(0.004)	(0.014)	(0.013)	(0.013)
Observations	11,793	11,793	11,793	11,793	11,793	11,793
Adj R^2	-0.0155	-0.0787	-0.0764	-0.0168	-0.0801	-0.0787
Energy Supply						
UBB	-0.054***	-0.029**	-0.026**	-0.085***	-0.021	0.011
	(0.012)	(0.012)	(0.012)	(0.030)	(0.036)	(0.052)
ADSL 20Mbps	-0.020**	-0.015*	-0.018**	-0.092***	-0.090***	-0.090***
	(0.008)	(0.009)	(0.009)	(0.023)	(0.023)	(0.023)
Observations	14,997	14,997	14,997	14,997	14,997	14,997
Adj R^2	0.136	0.175	0.178	0.130	0.168	0.172
Water Supply						
UBB	-0.037***	-0.020***	-0.007	-0.091***	-0.025	0.033
	(0.011)	(0.006)	(0.006)	(0.025)	(0.021)	(0.033)
ADSL 20Mbps	-0.009*	-0.001	-0.006	-0.043***	-0.032**	-0.031**
	(0.006)	(0.005)	(0.005)	(0.015)	(0.014)	(0.014)
Observations	18,744	18,744	18,744	18,744	18,744	18,744
Adj R^2	0.0514	0.0421	0.0472	0.0458	0.0399	0.0434
Public Administration						
UBB	0.010	0.001	0.005	0.027	-0.001	0.012
	(0.013)	(0.011)	(0.010)	(0.036)	(0.015)	(0.024)
ADSL 20Mbps	-0.003	-0.000	-0.001	-0.002	-0.002	-0.002
	(0.004)	(0.001)	(0.001)	(0.003)	(0.002)	(0.003)
Observations	1,319	1,319	1,319	1,319	1,319	1,319
Adj R^2	-0.0403	-0.142	-0.121	-0.0426	-0.142	-0.122
Education						
UBB	-0.030***	-0.018**	-0.020**	-0.072*	-0.020	-0.021
	(0.011)	(0.009)	(0.009)	(0.037)	(0.037)	(0.053)
ADSL 20Mbps	-0.026***	-0.017*	-0.018**	-0.065**	-0.037	-0.037
	(0.008)	(0.009)	(0.009)	(0.027)	(0.026)	(0.026)
Observations	21,596	21,596	21,596	21,596	21,596	21,596
Adj R^2	0.304	0.370	0.369	0.302	0.369	0.369
Year FE	YES			YES		
Year-Province FE		YES	YES		YES	YES
Trend X Demographics			YES			YES

The table shows estimated results of equation (1) with different sets of controls. Dependent variable is $\log(x+1)$ where x is the number of new firm establishments in each industrial sector. Sectors are identified in bold. Controls are the same as those of Table 4. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 12: New Firm Establishment: Other Sectors II

VARIABLES	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS	(5) 2SLS	(6) 2SLS
Health Services						
UBB	-0.032***	-0.027***	-0.015*	-0.129***	-0.020	0.013
	(0.009)	(0.008)	(0.008)	(0.036)	(0.031)	(0.047)
ADSL 20Mbps	-0.019**	-0.002	-0.005	-0.047**	-0.020	-0.021
	(0.008)	(0.007)	(0.007)	(0.023)	(0.020)	(0.020)
Observations	26,625	26,625	26,625	26,625	26,625	26,625
Adj R^2	0.225	0.282	0.285	0.220	0.282	0.285
Accomodation & Restaurants						
UBB	0.006	0.047***	0.100***	-0.225***	0.028	0.248***
	(0.016)	(0.013)	(0.014)	(0.063)	(0.053)	(0.080)
ADSL 20Mbps	-0.006	-0.017*	-0.022**	-0.063*	-0.020	-0.017
	(0.012)	(0.010)	(0.010)	(0.033)	(0.025)	(0.024)
Observations	43,086	43,086	43,086	43,086	43,086	43,086
Adj R^2	0.512	0.587	0.589	0.505	0.587	0.587
Rental & Travel Agencies						
UBB	0.005	0.041***	0.069***	-0.050	0.089*	0.269***
	(0.015)	(0.014)	(0.015)	(0.052)	(0.052)	(0.078)
ADSL 20Mbps	-0.033***	-0.031**	-0.036***	-0.117***	-0.097***	-0.094***
	(0.013)	(0.012)	(0.012)	(0.034)	(0.031)	(0.031)
Observations	37,798	37,798	37,798	37,798	37,798	37,798
Adj R^2	0.507	0.561	0.562	0.506	0.560	0.557
Sport & Entertainment						
UBB	-0.048***	-0.017*	0.003	-0.158***	-0.006	0.081
	(0.014)	(0.009)	(0.010)	(0.039)	(0.036)	(0.056)
ADSL 20Mbps	-0.029***	-0.024***	-0.029***	-0.083***	-0.064***	-0.063***
	(0.009)	(0.008)	(0.008)	(0.023)	(0.021)	(0.021)
Observations	31,329	31,329	31,329	31,329	31,329	31,329
Adj R^2	0.361	0.412	0.413	0.357	0.411	0.411
Not Classified						
UBB	0.203***	0.194***	0.221***	0.116*	-0.068	-0.030
	(0.019)	(0.017)	(0.019)	(0.069)	(0.093)	(0.135)
ADSL 20Mbps	0.027*	0.023	0.021	-0.154**	-0.144**	-0.141**
	(0.015)	(0.015)	(0.015)	(0.066)	(0.066)	(0.065)
Observations	38,941	38,941	38,941	38,941	38,941	38,941
Adj R^2	0.707	0.734	0.734	0.704	0.727	0.728
Year FE	YES			YES		
Year-Province FE		YES	YES		YES	YES
Trend X Demographics			YES			YES

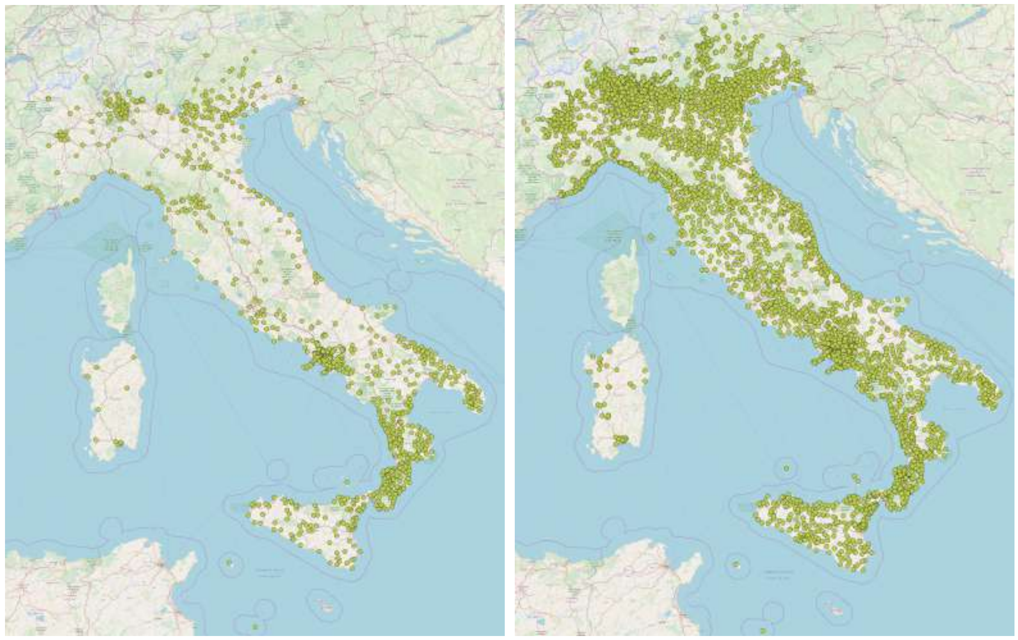
The table shows estimated results of equation (1) with different sets of controls. Dependent variable is $\log(x+1)$ where x is the number of new firm establishments in each industrial sector. Sectors are identified in bold. Controls are the same as those of Table 4. Robust standard errors clustered at the LLS level in parenthesis. *** p<0.01, ** p<0.05, * p<0.1

Table 13: Results in Levels by Industrial Sector

Sector	New Firms (1)	(2)
Agricolture, Hunting, and Fishing	1.75	1.38
Service Activities	0.52	0.98
Public Administration	0	0
Sport & Entertainment	0	0
Accommodation & Restaurants	0	1.09
Banking & Finance	0	0.59
Real Estate	0	0.42
Manufacturing	1.32	1.89
Technical & Scientific Activities	0.53	1.05
Retail	4.40	6.46
Construction	1.73	2.13
Mineral Extraction	0	0
Water Supply	0	0
Energy Supply	0	0
Education	0	0
Rental & Travel Agencies	0.32	0.96
Health Services	0	0
ICT	0.21	0.58
Storing & Transportation	-0.21	0
Not Classified	0	0
Trend X Demographics		YES

The table shows the (mean) number of new firm establishment induced by the introduction of UBB. Data are derived from estimated coefficients Tables 10-12. Data in column (1) are derived using estimated coefficients of column (5), while data in column (2) is derived from estimated coefficients of column (6).

Figure 1: UBB Diffusion



(a) 2015 (b) 2018

Figure 2: Dynamics over Time of Broadband Introduction

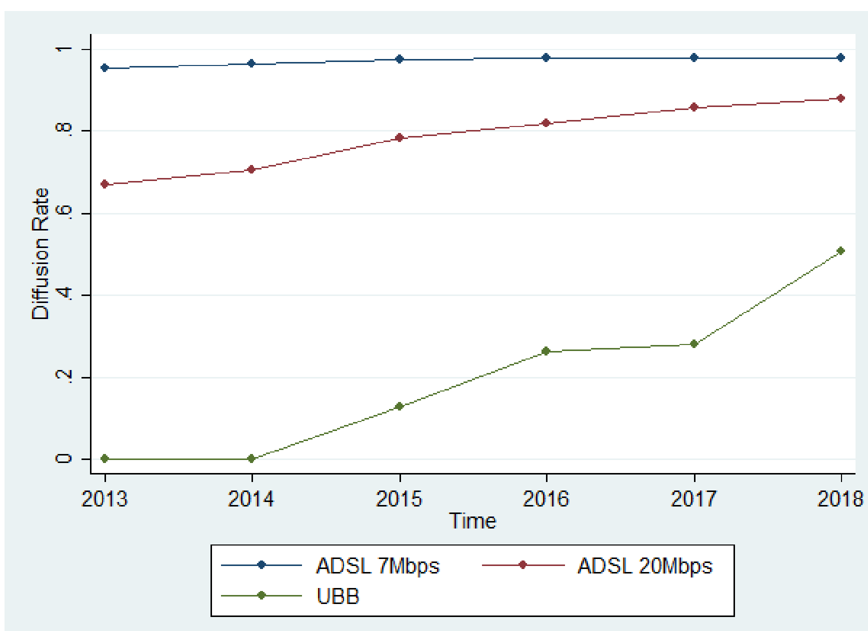
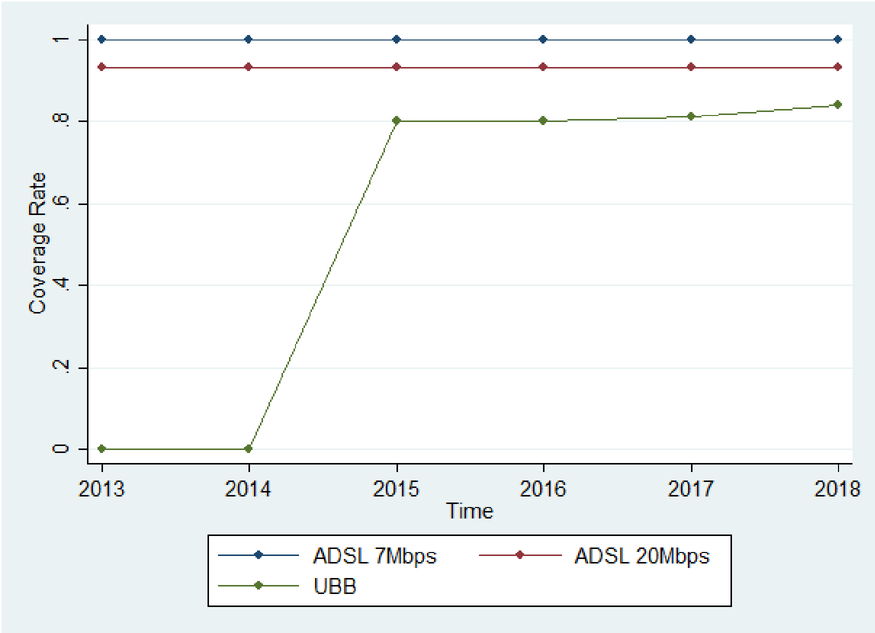


Figure 3: Within-Municipality Variation



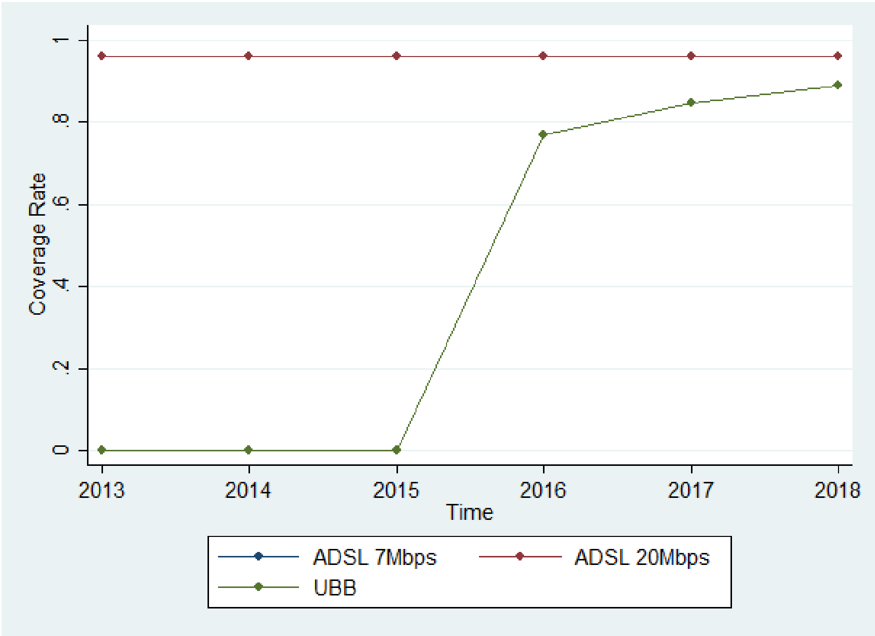
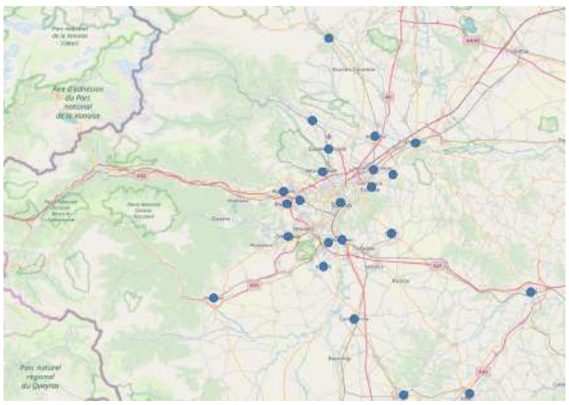
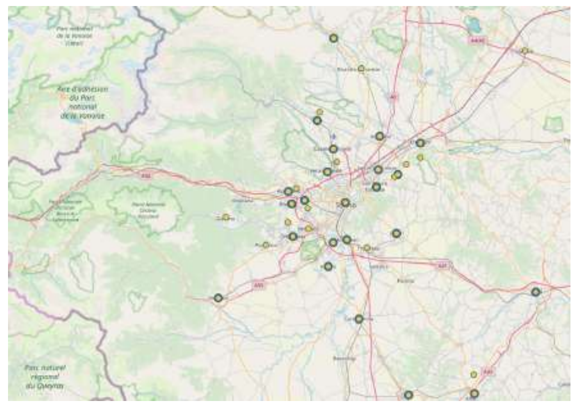


Figure 4: Within-Municipality Coverage over Time

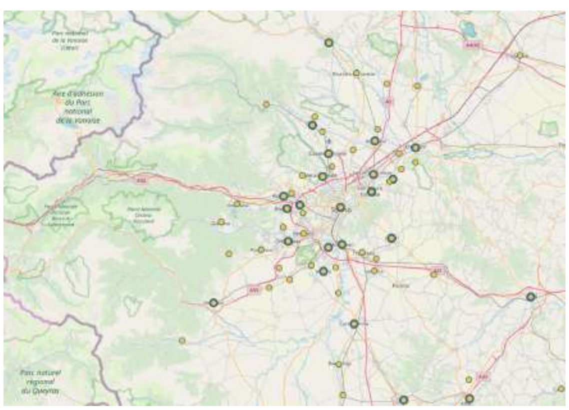
Figure 5: OLT and UBB Introduction



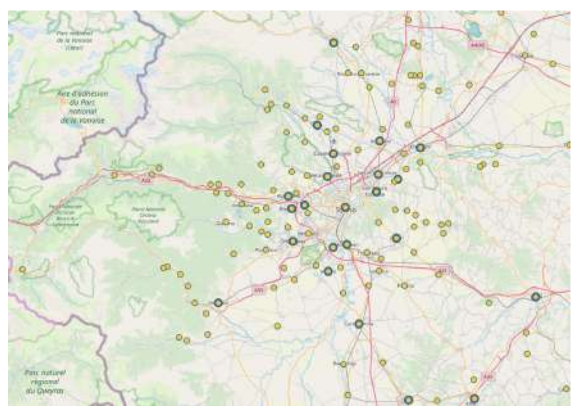
(a) OLT 2018



(b) UBB 2016



(c) UBB 2017



(d) UBB 2018

Figure 6: UBB Coverage and OLT Distance

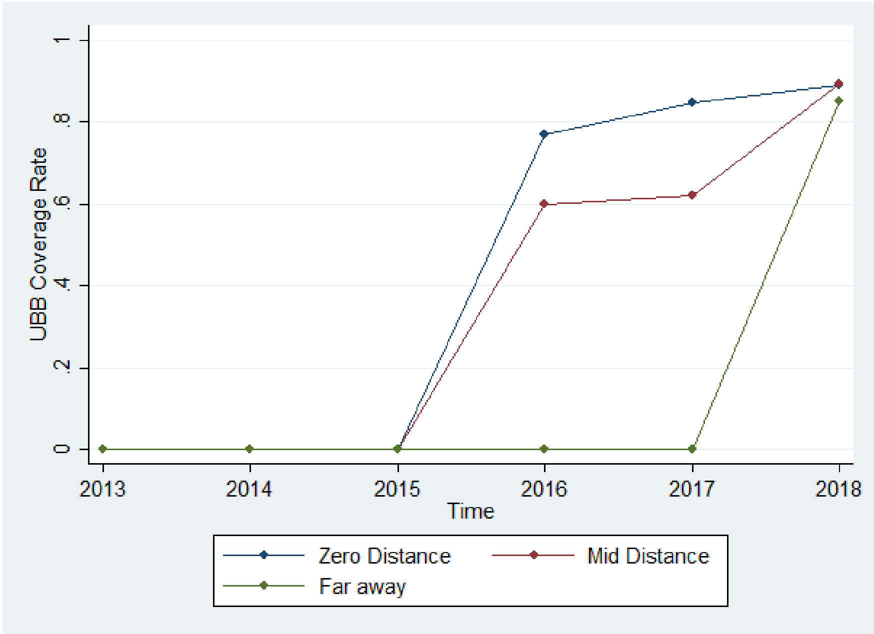


Figure 7: ADSL Coverage and DSLAM Distance