Politics 2.0: The Multifaceted Effect of Broadband Internet on Political Participation

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ABSTRACT

We investigate the impact of the diffusion of high-speed Internet on different forms of political participation, using data from Italy. We exploit differences in the availability of ADSL broadband technology across municipalities, using the exogenous variation induced by the fact that the cost of providing ADSL-based Internet services in a given municipality depends on its relative position in the pre-existing voice telecommunications infrastructure. We first show that broadband Internet had a substantial negative effect on turnout in parliamentary elections between 1996 and 2008. However, we also find that it was positively associated with other forms of political participation, both online and offline: the emergence of local online grassroots protest movements, and turnout in national referenda (largely opposed by mainstream parties). We then show that the negative effect of Internet on turnout in parliamentary elections is essentially reversed after 2008, when the local grassroots movements coalesce into the Five-Star Movement (M5S) electoral list. Our findings are consistent with the view that: 1) the effect of Internet availability on political participation changes across different forms of engagement; 2) it also changes over time, as new political actors emerge who can take advantage of the new technology to tap into the existence of a disenchanted or demobilized contingent of voters; and 3) these new forms of mobilization eventually feed back into the mainstream electoral process, converting "exit" back into "voice".

Keywords: Internet; Broadband; Voter Turnout; Online Political Participation; Social Media; Disenchantment; Exit; Voice.

JEL Codes: D72, L82, L86.

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"The Internet community is wondering what its place in the world of politics is."
H. Dean ("How the Internet Invented Howard Dean", *Wired*, January 2004.)

1. Introduction

The idea that the Internet has profound effects on society and that it brings substantial economic benefits is widespread both among experts and in public opinion.[1] The Internet is also often mentioned as a powerful political tool that can contribute to overcome collective action problems and foster political change.[2] In fact, some have gone as far as stating that the world is experiencing a true "communication revolution" which provides yet unexplored opportunities for democratic development and social reform (McChesney, 2007).[3] Yet, despite this perceived importance of the Internet for politics, business and the public sector, much remains to be learned about its effects.

This paper investigates the impact of access to high-speed Internet on political participation and political outcomes in the context of Italy, a developed country with solid democratic institutions, but where traditional media such as TV and newspapers are largely controlled by the government or by powerful private interests. We exploit differences in the timing of the introduction of broadband (ADSL) technology across Italian municipalities, between 2005 and 2011, to analyze how access to high-speed internet affected individuals' decisions with regard to different types of political involvement, and how that translated into electoral outcomes over time.

To identify the causal impact of the diffusion of broadband access, we exploit the fact that the diffusion of ADSL technology in a given municipality is affected by its relative position in the pre-existing voice telecommunications infrastructure. Specifically, since ADSL-based internet services could only be available in municipalities connected to high-order telecom-

[1] According to a report by the Broadband Working Group at MIT (2006), areas where broadband Internet was available in 1999 had, by 2002, enjoyed a rise in employment between 1% and 1.4% and an increase in business creation between 0.5% and 1.2%. The 2010 UK Conservative manifesto claimed that "establishing a superfast broadband network throughout the UK could generate 600,000 additional jobs and add £18 billion to Britain's GDP."

[2] As an example, according to the popular American on-line magazine *The Huffington Post*: "Were it not for the internet, Barack Obama would not be president" (January 9th 2009). In a different context, speaking of the upheaval of the Arab Spring, Alec Ross, a senior US state department adviser, commented: "Dictatorships are now more vulnerable than ever as disaffected citizens organize influential protest movements on Facebook and Twitter" (*The Guardian*, June 22, 2011). Heavy censorship of the Internet in countries like China suggests that also authoritarian regimes perceive the Internet to have a relevant political impact.

[3] This presumed democratizing role of the Internet has also been used as an argument to relax media ownership rules in the traditional media sector. For instance, in 2002 the Federal Communication Commission Chair Michael Powell suggested that: "Information technology [...] has a democratizing effect [...] With a low cost computer and an Internet connection every one has a chance to 'get the skinny', the 'real deal', to see the wizard behind the curtain." (quoted in Hindman, 2009, p.2).

munication exchanges ("Urban Group Stage", UGS) through optic fiber, we use the distance between a given municipality and the closest UGS - which represents a good proxy for the investment required to connect the municipality - as a source of exogenous variation for the availability of high-speed internet. As the pre-existing infrastructure was not randomly distributed, our identification strategy relies on interacting that distance with the time variation between the period before and after broadband became available, under the assumption that the correlation between distance and unobserved municipal characteristics did not change at that point in time, other than through the introduction of ADSL technology.

Our results point to a complex chain of effects in which the initial impact of broadband internet availability is substantially affected by the reaction of what we may call the political "supply side". We first find that the diffusion of broadband led to a significant decline in electoral turnout in national parliamentary elections between 1996-2001 and 2006-08. This decline, of the order of 2-3 percentage points for going from zero to at least 50% coverage, was especially detrimental to "outsiders", namely parties outside the two main coalitions. This is consistent with the diffusion of broadband having led to a particularly disenchanted part of the electorate dropping out of the mainstream electoral process.

We also find evidence, however, that the political system responded to the existence of this available demobilized contingent, by fostering other forms of political participation. First, we find that turnout in national referenda in 2009-2011, which had a distinct anti-establishment flavor, was actually greater in better connected municipalities. We then collect a unique data set on the territorial expansion of local, grassroots protest groups on the online platform *Meetup.com*, which has been used by political movements in Italy and elsewhere as a tool of political mobilization. We show that the diffusion of broadband was associated with these online protest groups forming and growing. The same pattern holds for the performance of the Five-Star Movement (M5S), a largely web-based political movement that coalesced around those online groups and evolved into a potent electoral force. We show that broadband access was positively associated with the presence of the M5S on local election ballots, starting in 2008, and also with the electoral performance of these M5S lists.

This pattern suggests that political entrepreneurs eventually seized the opportunity of using the Internet to mobilize different forms of political engagement. We then look at how this process reflected back onto mainstream electoral politics, taking advantage of the fact that the M5S was a major presence in the national parliamentary elections of 2013. We show that the negative causal impact of broadband access on voter turnout essentially dissipated over this new electoral cycle, a pattern that is associated with a positive impact of broadband availability on the electoral fortunes of the M5S and other new, "web-friendly" parties.

In sum, our evidence underscores what we may call the "general-equilibrium" repercussions of the change in media technology exemplified by the onset of high-speed Internet. That shock entails a shift on the "demand side" of the political process, as voters react to the new medium; this, however, is merely the first reaction in the more complex chain. Eventually, political entrepreneurs on the supply side take advantage of the opportunity presented by the initial demand-side movement, and also by the possibilities of the new medium itself, to enhance political mobilization in ways that eventually feed back and alter the initial landscape.

We provide an interpretation for this pattern based on the classic Hirschman (1970) framework: the new medium initially constitutes an "exit" option from the mainstream political process, but is eventually harnessed into a new "voice" mechanism within that process. This exit-to-voice transition is quite natural, once we consider that the effect of that mainstream political process on public-good provision ought to induce Hirschmanian "loyalty" - it is essentially impossible to completely exit its reach (at least short of emigration). In addition, while we might expect a similar pattern to hold with different instances of shifts in media technology, that transition seems especially relevant for the case of the Internet. Its interactivity and prevalence of user-generated content translate into relatively low barriers to entry, and make it particularly suited for exploitation by a wide range of political actors, including newcomers. Grasping these general equilibrium effects is thus crucial to understanding the political impact of changes in the media environment, and particularly so for the Internet.

Our paper relates to the vast literature on the role of the media and of information in the political process, and on what it would lead us to expect from the diffusion of the Internet.[4] Both decision- (Matsusaka, 1995) and game-theoretical (Feddersen and Pesendorfer, 1996) models of electoral participation suggest that more informed individuals are more likely to vote. However, the Internet may change the citizens' level of information in several subtle ways, and its overall effect is far from obvious. First, it may increase the level of information by providing more (and more diverse) news sources. At the same time, it is much more than a mere news media platform, offering unprecedented entertainment opportunities, and a platform for different forms of participation beyond elections. It may thus crowd out traditional (and potentially more informative) news media, as has been noted with other episodes of new media technologies such as television (Gentzkow, 2006), or offline modes of participation.[5]

[4] See Prat and Stromberg (2011) for an extensive literature review on the political economy of media.

[5] The Internet may also affect the level of information of citizens who do not use it, by indirectly influencing the news contents provided by traditional news media. Indeed, supply-driven models of media bias (e.g., Besley and Prat 2006; Ellman and Germano 2009; Anderson and McLaren 2012) suggest that the increased competition coming from online sources may lead traditional media to deliver more accurate news reports. Moreover, the Internet may indirectly change the composition (i.e. demographics) of the average consumers of traditional news media, by attracting some segments of their audience. This may induce them to change the type of issues they cover (George, 2008).

Our evidence is consistent with the presence of a crowding-out effect, but it qualifies its nature - in particular, we show that the individuals who seemed to have dropped out initially as a result of broadband expansion were relatively more likely to be politically informed and engaged. This makes it unlikely that the demobilization we identify would have been induced by simple crowding out. In addition, it highlights that the political equilibrium reacts in ways that may eventually compensate for any initial demobilization.

Our work is also closely related to the incipient literature on the specific link between Internet and electoral politics.[6] Existing evidence is based primarily on correlations between broadband penetration and various outcomes, but a few recent contributions have also exploited within-country variation in broadband availability to assess the (causal) impact of the Internet. To the best of our knowledge, the only studies looking at the causal impact of the Internet on political outcomes, and turnout in particular, are Miner (2012), Czernich (2012), Falck, Gold, and Heblich (2012) and Larcinese and Miner (2012). Miner (2012) examines the effect of Internet use on voting behavior in Malaysia, instrumenting Internet penetration with the distance of each electoral district from the backbones of Malaysia's main Internet Service Providers (ISPs). He finds that Internet penetration increased turnout and decreased the electoral returns of the incumbent party. Both Czernich (2012) and Falck, Gold, and Heblich (2012), in turn, look at the effects of Internet on turnout and electoral competition in Germany, finding a negative impact of the internet on participation and a differential effect on electoral support for moderate and extremist parties. Finally, exploiting differences across U.S. states in right-of-way (ROW) laws Larcinese and Miner (2012) find a positive effect on the Democratic party's vote share but no significant effect on turnout.

Our paper differs in terms of empirical strategy, since it is able to use the interaction between the pre-existing infrastructure and time to identify causality. This relies only on the assumption that whatever correlation that may have existed between that infrastructure and unobserved determinants did not change at the time of the introduction of broadband, other than through that introduction. Most importantly, however, it also differs in stressing the general equilibrium effects over time, and across different forms of online and offline participation. While the short-run effects on voter turnout are important, our emphasis provides a unified perspective on the ultimate chain of effects, and shows it can be very different from those partial-equilibrium effects.

The remainder of the paper is organized as follows. Section 2 provides relevant background information, and Section 3 describes the data and empirical strategy. Sections 4 and 5 then

[6] More broadly, our paper relates to the literature on the political economy of the Internet which includes, among others, Gentzkow and Shapiro (2011), Enikolopov, Petrova, and Sonin (2012), Larcinese and Miner (2012), and Jaber (2013).

discuss the early effects of broadband respectively on parliamentary elections, and on other forms of political participation. Section 6 revisits the results on parliamentary elections using the data from the 2013 cycle. Section 7 summarizes our interpretation for the main findings, and Section 8 concludes.

2. Background

2.1. Broadband Internet in Italy

Broadband Internet connection to residential customers in Italy has been traditionally provided through Asymmetric Digital Subscriber Line (ADSL) technology, while the use of alternative technologies, such as cable and satellite, has remained negligible (OECD, 2001; Between, 2008).[7] ADSL technology was introduced by the Italian telecommunications incumbent operator (*Telecom Italia*) in 1999; the broadband infrastructure developed rather slowly at first, but at a faster pace in the following years. If by the end of 2000 only 117 out of 8,100 Italian municipalities had access to ADSL, by the end of 2005 ADSL was available in about half of them, accounting for about 86% of the population. Figure 1 summarizes the evolution in Italy of both the availability of ADSL Internet access (panel A), and Internet penetration in terms of the share of population with an ADSL subscription (panel B), between the end of 2000 and 2011, with election years marked by dashed vertical lines. Because in 2001 the levels of access and penetration were very small, we take this to be the last "pre-broadband" election cycle.

[Figure 1 here]

ADSL technology typically relies on data transmission over the user's copper telephone line, and as a result access to ADSL depends crucially on the user's position in the pre-existing voice telecommunications infrastructure. Two technical parameters are especially important in this regard. The first one is the lenght of the so-called "local loop", i.e. the distance between the end user's premises and the closest telecommunication exchange (or "central office", henceforth CO). If this distance is above a certain threshold (between 4 and 5 km), the ADSL connection cannot be implemented through traditional copper wires, but instead requires the deployment of fiber optic cables between the CO and the user's premises. This procedure involves significant costs since, unlike copper wires, fiber optic cables need to

[7] Definitions of broadband Internet access vary widely (OECD, 2001, p.6). The most common definition of "broadband" adopted by many telecommunications operators as well as by the OECD refers to technologies that allow for data download speed of at least 256 Kbps. At the end of 2007, ADSL technology accounted for more than 97% of broadband access in Italy (Between, 2008).

be laid underground. The second parameter is the distance between the CO and the closest higher-order telecommunication exchange, the Urban Group Stage (UGS), corresponding to the portion of the network referred to as "backhaul". For a given area to have access to ADSL, the respective CO must be connected to the closest UGS through fiber optic cables.[8]

In the context of Italy, the first parameter has not constituted a limiting factor to the development of the broadband infrastructure since, unlike other countries, Italy's voice telecommunications network has traditionally been characterized by a very short average length of the local loop: more than 95% of end users are located at less than 4 km from the closest CO, and about 100% at less than 5 km (OECD, 2001, see Figure B.1 in Appendix).This situation has allowed telecom operators to provide ADSL access in most municipalities through a system, the "Fiber To The Exchange" (FTTE), that requires the deployment of fiber optic cables between UGSs and COs, but not between COs and end users' premises (see Figure 2 for an illustration of the FTTE system).

[Figure 2 here]

Consequently, the distance between a municipality's COs and the closest UGS - which, quite importantly, was completely irrelevant for voice communication purposes - represents the main determinant of the investment needed to provide access to ADSL in that municipality. Indeed, this distance and the necessity to cover it using optical fiber cables has been the main factor behind the delay in ADSL adoption experienced by different municipalities over time (Ciapanna and Sabbatini, 2008). What is important for the purposes of our analysis is that, since the 10,700 COs and the 628 UGSs were inherited from the pre-existing voice telecommunication system, their location was determined several decades before the advent of the Internet (Impiglia et al. 2004, AGCOM, 2011). Hence, all else equal, the closer to an UGS a municipality happened to be when ADSL came into the picture, the more likely that a telecom operator would have provided that municipality with ADSL access earlier on in the diffusion process.[9]

For a given distance between the CO and the closest UGS, of course, the decision of whether to provide ADSL access to a given municipality also depends on a range of socio-demographic

[8] For more details on the technical background regarding ADSL in Italy, see Appendix B.

[9] Notice that the cost of supplying ADSL to a municipality is increasing in the distance to the closest UGS not just because of the cost of fiber optic cables and excavation per se. Telecommunication operators typically need the authorization of the municipalities where these cables have to be deployed (Ciapanna and Sabbatini, 2008). Similarly, private landowners may, in principle, also delay the development of the broadband infrastructure when cable deployment involves their private property. As shown by Larcinese and Miner (2012) for the US, these dimensions are quite relevant in determining the bureaucratic costs that Internet Service Providers (ISPs) have to incur in order to provide broadband internet in a given geographical area. Hence, the farther away the closest UGS is, the higher these bureaucratic costs are likely to be.

factors which can affect the expected commercial return of the investment, i.e. population density, income and education levels, etc. Indeed, ADSL technology was introduced earlier in more densily populated areas, typically urban and suburban. Figure 3 reports the distribution of access to broadband internet across Italian municipalities in 2005, the first year for which data are available, with ADSL availability increasing from dark (no access) to light (complete access).

[Figure 3 here]

2.2. Political and institutional background (1996-2013)

Italy is a parliamentary democracy characterized by a bicameral legislative system consisting of a lower and an upper house (Chamber of Deputies and Senate).[10] Five national legislative elections have been held over the past seventeen years, in 1996, 2001, 2006, 2008, and 2013. This is the period we focus on, as it constitutes the set of elections since the collapse of the Italian post-World War II party system (the "First Republic"), in 1994, in the wake of the widespread corruption that was brought to light in the early 1990s by the set of judicial investigations that became known as *Mani Pulite* ("Clean Hands").

Over most of the period, right up to the 2013 elections, the Italian political landscape was largely dominated by two main coalitions, from the center-right and the center-left, whose we will later describe in greater detail. The center-right coalition, led by Silvio Berlusconi, owner of Italy's largest private media conglomerate, has typically included the heirs to the former fascist party, a northern separatist party (the Northern League), and, until 2006, part of the former Christian-Democrats. The center-left coalition includes part of the former communist party, left-leaning former Christian-Democrats, and a few smaller parties. Both coalitions comprise a bigger and relatively moderate party, which accounts for a very large share of the coalition's votes, alongside smaller and more ideologically extreme ones.

Despite the presence of these two coalitions, the Italian political system has remained relatively fragmented, with more than thirty parties running in each election, and parties outside the mainstream coalitions attracting significant electoral support. This tendency was even more pronounced in 2013, with the presence of a centrist coalition led by former prime minister Mario Monti, and, most importantly, the considerable electoral performance of the Five-Star Movement (henceforth M5S), led by blogger and former comedian Beppe Grillo.

In addition to national parliamentary elections, our analysis will also focus on all municipal elections held between 2001 and 2012. This is especially important for our analysis because

[10] While all Italians aged 18 or more are entitled to vote for the Chamber, only those aged 25 or more can vote for the Senate.

the M5S became politically active at the local level a few years before entering the national stage. Finally, we will also look at participation in national referenda. According to the Italian constitution, referenda can only be used to abrogate existing laws (or part of them) and require a 50% turnout quorum to be valid. Various referenda have been held over the past few years, on a variety of issues ranging from electoral rules to public management of water supply and nuclear energy, among others. These referenda, which are promoted by popular initiative, have been largely ignored, when not overtly boycotted, by mainstream parties (and mainstream media), and hence provide voters with a rather different, and relatively anti-establishment, opportunity for political participation.

2.2.1. Emergence and rise of the Five-Star Movement (M5S)

In the most recent parliamentary elections, held in February 2013, the M5S emerged as the most voted party, obtaining 25.5% of the votes.[11] This represented the best electoral performance for a party running for the first time in national elections in post-war Italy. Since the general perception is that the Internet was central to the emergence and political development of the M5S, it thus provides us with a unique opportunity to understand the impact of Internet on political participation, both online and offline. The M5S started in 2005 as a grassroots protest movement, and then consolidated into an organized political actor running for elections first at the local level, and finally at the national level.

Internet and social media are at the heart of the M5S organization and political activism, especially in light of its rejection of mainstream media, which M5S activists see as captured by powerful economic and political interests. A cornerstone of this organization is the blog that Beppe Grillo, the Movement's charismatic leader, created in January of 2005, from which most of M5S political initiatives have traditionally originated.[12] Another is the online platform *Meetup.com*, which has been used by Beppe Grillo's supporters since 2005 to organize

[11] The M5S refuses to describe itself as a "party", in an effort to differentiate itself from the traditional mainstream parties towards which its criticism is directed. As clearly stated in the M5S' manifesto,"the Five-Star Movement is not a political party, neither is it supposed to become one in the future."

[12] In light of its intensive use of Internet and social media, the M5S has been compared to the "pirate parties" appeared in Scandinavia, Germany and other European countries over the past few years. For the anti-establishment nature of its political platform, M5S may also be associated to other grassroots protest movements that have emerged in many countries, such as the Occupy Wall Street movement in the US, or the Spanish *Indignados*.

in thematic groups and coordinate their activities at the local level.[13] The *Meetup.com* platform has represented the springboard for the later emergence of a decentralized bottom-up political movement that ultimately made the leap to the national stage.

In the first phase of the blog/*Meetup* experience, between 2005 and 2007, the initiatives promoted by Grillo and his supporters were primarily aimed at voicing widespread popular discontent with the lack of transparency and accountability in the Italian political system. Their criticism was directed against corruption, the misuse of public funds by political parties, the inadequacy of the electoral system, and the absence of legislation imposing both term limits on elected officials and the ineligibility of previously convicted politicians.[14] Despite the considerable popular response they generated, these initiatives were largely ignored by mainstream politicians.

Grillo and his supporters then moved towards the creation of an active political movement to run in elections. This new phase begun in 2008, when Grillo announced on his website that he would endorse local groups of citizens willing to run for elections, particularly at the local level, as long as candidates subscribed to the movement's platform on a variety of issues (including free and universal broadband Internet access) and satisfied certain transparency requirements: no affiliation to any party, and no prior penal conviction. The endorsement would take the form of a quality certification "five-star seal".[15]

The first Five-Star-certified lists ran in municipal elections in 2008, in a handful of municipalities, and in Sicily's regional elections in that same year, with rather modest outcomes. Since then, the M5S has taken part in an increasing number of municipal and regional elections with increasing success. It elected its first mayor in 2010, and became the most voted

[13] The *Meetup.com* platform was created in 2001 in the US, to facilitate online networking of people sharing similar interests towards enabling them to meet in person. Howard Dean is understood to be the first prominent politician to use the *Meetup.com* platform on a large scale to coordinate his supporters, during the 2004 Democratic party primaries. As pointed out by Hindman (2009): 'New technology allowed Dean to create local, decentralized social networks from scratch." (Hindman, 2009, p. 32). Interestingly, it seems that most of the Dean campaign volunteers recruited through the *Meetup.com* platform had not been involved in previous electoral campaigns Hindman (2009).

[14] For example, in November 2005, Grillo's blog launched a fund-raising campaign aimed at financing the publishing of a list of previously convicted Italian MPs on the *International Herald Tribune*, in the context of the so-called "Clean Parliament Initiative". On September 8 2007, a campaign was launched in several Italian cities to collect the signatures required to propose three laws of popular initiative to Parliament, dealing with the ineligibility of convicted politicians, the imposition of a two-term limit for both national and local elected officials, and a reform of the electoral system. Overall, more than 300,000 signatures were collected in one day.

[15] The M5S refuses to be framed in the traditional left-right dimension, claiming to be "beyond" it. Indeed, some points of the M5S political platform (e.g., the emphasis on green energy or extended unemployment benefits) have clear roots in the tradition of leftist parties or the *green wave* started in western Europe in the 80s like the German *Grünen* (Pedrazzani and Pinto, 2013). At the same time, other parts of the M5S' program (e.g., the opposition to Roma immigration) seem closer to the positions of right-wing parties.

party in Sicily's 2012 regional elections, before running for national elections in 2013.

Throughout this trajectory, the use of web-based social media and of the original network of local *Meetup* groups has remained absolutely central to the evolution and growing electoral success of M5S. Indeed, the selection of M5S national candidates has been carried out through online primary elections among M5S early activists. Furthermore, evidence on the presence of candidates from different parties on the web suggests that, despite the lack of financial resources on the same scale available to other parties, M5S candidates have been especially successful in communicating with potential voters through web-based platforms such as Youtube and social media such as Facebook, Twitter, Google+ and *Foursquare* (Mosca and Vaccari, 2013).

3. Data and Empirical Strategy

3.1. Data

Electoral data at the municipal level for both local and parliamentary elections as well as for popular referenda are available from the Italian Ministry of Interior. The Italian administrative system includes 8,100 municipalities with a median area of 22 km^2 and median population of 2,468 people; each municipality is located in a province (of which there are 110 as of 2012), and each province in one of 20 regions.[16] We look at a balanced sample of municipalities for which we have information on all of the parliamentary elections we consider, which leaves us with 7,969 municipalities. (Results are essentially unaltered if we consider all municipalities available in any given year.) The availability of data at such a fine level provides us with a considerable level of spatial detail. The data include information on eligible voters, turnout, and votes for individual parties or individual referendum questions. We focus in particular on the past five parliamentary elections, held in 1996, 2001, 2006, 2008 and 2013, on the municipal elections held between 2001 and 2012, and on two series of popular referenda held respectively in 2009 and 2011.[17]

Data on the Beppe Grillo/M5S *Meetup* groups were gathered directly from the *Meetup.com* platform applying a crawling procedure on the webpage of each group related to either Beppe Grillo or the M5S. For each group we collected the following information: date of formation, geographic location, number of members, and the date at which each member joined the group. When multiple groups exist in a given municipality, we consider the date at which

[16] When looking at parliamentary elections we exclude the region of Valle D'Aosta, since it adopted a different electoral system with respect to the one used in the other regions, starting with the 2001 elections.

[17] Three other series of popular referenda were held respectively in 2003, 2005 and 2006. Unfortunately municipal data on turnout in these referenda are not available from any source.

the oldest group was formed.

Data on the availability of ADSL technology in Italian municipalities were provided by the "Osservatorio Banda Larga-Between," a joint-venture between the main Italian telecommunications operators, the Italian Ministry for Telecommunications and other private and public stakeholders. The data include information on the percentage of households with access to ADSL-based services in each Italian municipality between 2005 and 2011 on an asymmetric six-point scale, from zero to 5, corresponding to the following brackets: 0%, 1-50%, 51-75%, 76-85%, 86-95%, and above 95%.[18] No data are available for previous years, and we set the measure to zero for year 2001 and before, as an approximation of the very low levels of broadband penetration indicated in Figure 1.

We choose to use data on broadband access, rather than penetration, first and foremost because the latter is obviously the result of endogenous individual decisions. That said, and very much as expected, the data show a clear positive link between broadband access and penetration at the regional level, which is the lowest level at which penetration data is available for Italy (see Figure B.4 in Appendix B). In fact, a simple regression on the percentage of households covered by ADSL access in a given region and year along with the yearly regional unemployment rate and year fixed effects is able to explain more than 92% of the variation in regional internet penetration (results are available upon request).

Finally, information on additional socio-demographic controls, which we discuss below, is available from the Italian national statistical office (ISTAT).

3.2. Empirical Specification and Identification Strategy

Following our discussion on the characteristics of the Italian broadband infrastructure, our identification strategy will exploit the role played by the distance between the existing Central Office (CO) supplying voice-services to a given municipality and the closest urban group exchanges (UGS). First of all, we rely on the fact that this distance represented the main variable determining the cost of supplying ADSL services in a municipality, given the technical need to deploy underground and optical fiber connection between the CO and the closest UGS. As such, we would expect it to affect the pattern of ADSL rollout across different municipalities.

We have pointed out that the presence and the location of both the COs and UGSs precede the development (and even the existence) of broadband in Italy. That said, that does not

[18] Figure B.3 in Appendix B reports the distribution of ADSL coverage by year with the percentage of household with ADSL access increasing from grey (limited access) to black (full access).

mean that their spatial distribution is random, and in fact the data reveal that UGSs are more likely to be located, for instance, in provincial capitals, and in more densely populated and educated places. These are all characteristics that could be expected to correlate with our outcomes of interest in ways that could confound causal interpretation. We can go some of the way in addressing these confounding factors by exploiting the panel structure of our data and including municipality fixed effects; however, this evidently does not control for those factors that change over time.

In order to deal with that, our key source of variation will be the distance from a municipality to the closest UGS interacted with a dummy for the post-2001 (i.e. post-broadband introduction) period. Our underlying identification assumption is that, whatever correlation existed between the location of UGSs and relevant municipality characteristics, it did not change at the time of introduction of ADSL technology. In other words, we are identifying off of the change in the impact of distance on the outcomes of interest, and the assumption is that any change in that impact occurs solely through that new technology.

This assumption justifies the implementation of the following two-stage specification:

$$Y_{m,t} = \gamma Broadband_{m,t} + \beta X_{m,t} + \alpha_m + \tau_t + \varepsilon_{m,t} \tag{1}$$

$$Broadband_{m,t} = \phi(Distance\_UGS_m \times Post\text{-}2001) + \sigma X_{m,t} + \zeta_m + \theta_t + \eta_{m,t} \tag{2}$$

where subscripts m and t indicate respectively municipality and electoral year, Y represents the outcome of interest (e.g. turnout), α and ζ are sets of municipality fixed effects, and τ and θ are year fixed effects.

We measure *Broadband* using the six-point scale based on the percentage of households in a municipality that are covered by ADSL access. In addition, we also experiment, for robustness, with "Years of Broadband", namely the number of years since at least 50% of households in a municipality are covered by ADSL access.[19] The main advantage of this alternative measure is that it allows for the possibility that the effect of the Internet accumulates over time. An important disadvantage, on the other hand, is that we have to take 2005 as the first year of good broadband coverage for all municipalities that were covered up to that point, because that is the first year for which we have data. This naturally adds considerable noise to this measure in the early years of our sample.

[19] We have also experimented with specifications where the threshold is 1%. We prefer the 50% threshold because it seems unlikely that any tipping point in the effect of broadband diffusion would occur at levels as low as 1%. In any case, the results are very similar, and are available upon request.

Distance_UGS is the (time-invariant) distance from a municipality's centroid to the closest UGS. We interact this variable with a dummy that takes the value of one for electoral years after (and excluding) 2001. This implies that the shift introduced by the availability of ADSL technology stays constant after its introduction, which seems consistent with the data.[20]

X is a vector including several control variables. The only variable available on a yearly basis at the municipality level is population. However, we also consider key observable municipal characteristics that are only observed in Census years (population, education, age structure, number of firms per capita, all as of the 2001 Census), plus the distance to the closest provincial capital (*capoluogo*) as a proxy for the degree of urbanization. In order to flexibly control for the possibility of different time trends in the impact of these variables, we include into X the interactions between the variables and a fourth-order polynomial in time, as suggested by Gentzkow (2006). Appendix Table A.1 shows that broadband internet access (as of 2006) is not correlated with our key dependent variable (turnout) once those demographic variables are accounted for. This suggests that controlling for them helps us focus on the idiosyncratic component of the variation in that access, thus complementing the fixed effects strategy that controls for unobserved time-invariant municipality characteristics.

We also include in X interactions between those key demographic variables and year dummies, to allow for any effect to vary across election years. Last but not least, we control for regional dummies interacted with the election-year dummies, which lets us take into account any effect of unobservable regional factors over time.[21] All of these enable us to take into account the possibility of pre-existing or underlying trends that could confound the causal interpretation of our estimated coefficients.

4. Early Effects of Broadband Access: National Elections

We start off by asking the question: What happens to electoral participation when broadband internet access first diffuses? We look at that in the context of national (lower House) elections, and comparing the first two elections after the diffusion of broadband, in 2006 and 2008, with the status quo ante from the two pre-broadband elections in 1996 and 2001.

[20] We also experiment with letting that impact vary with time, by setting $T = 1$ for 2001, $T = 2$ for 2002, and sucessively. As we will see, the basic results are consistent. However, if we exclude the pre-2001 period and focus on the later years only, the interaction between distance and time loses its power as a predictor of broadband access. This indicates that the shift introduced by ADSL availability was indeed a one-off.

[21] Similar results obtain if we use province dummies instead of region.

4.1. PRELIMINARIES

Our first step is to look at the raw data, to check whether differences in turnout seem to correlate with patterns of internet diffusion, and to help validate the assumption behind our empirical strategy. We start off by showing, in Figure 4, the evolution of the difference in turnout between localities that would eventually be early-adopters of broadband internet and those that would turn out to lag in that respect. We can see rather clearly that in the pre-broadband years of 1996 and 2001 the eventual early adopters display substantially higher levels of turnout, consistent with the fact that these are on average more educated and densely populated localities. This difference is essentially unchanged between the two elections. Quite remarkably, the picture changes after broadband is introduced: the gap in turnout essentially disappears.[22] This is consistent with a substantial *negative* effect of broadband access on turnout.

[Figure 4 here]

How does that pattern relate to our key source of variation? First of all, Figure 5 shows, using the data on ADSL coverage from 2006, that there is a clear negative relationship between broadband coverage and distance to the closest UGS, as we would have expected from our background discussion. Based on this picture, let us consider two sub-samples, that we may think about as roughly representing "treatment" and "control" groups in the natural experiment of broadband access induced by the location on the pre-existing telecommunications network. The "treatment" group includes the municipalities in the bottom group (closer than 5km), which translates roughly into the bottom decile of the overall distribution. We take the "control" group to be those municipalities that are more than 40km away from the closest UGS, which corresponds roughly to the top 1% of the distribution, because that is roughly where the link between distance and ADSL coverage flattens out in Figure 5. This group had evidently very little broadband coverage in the immediate period of diffusion, and pretty much uniformly so.

[Figure 5 here]

These groups are very different in many dimensions, but it is nevertheless instructive to compare the behavior of turnout over time for each of them. For that we run a regression

[22] Appendix Figures A.1 and A.2 provide a similar picture by comparing the average turnout in late broadband-adopters municipalities with the one of municipalities with a UGS and provincial capital municipalities, respectively.

of turnout on election-year fixed effects, and take the average residual for each group as a measure of turnout relative to the national average for a given election year.

The results are plotted in Figure 6. We see a very clear drop in turnout, between the last pre-broadband election in 2001 and the first post-broadband one in 2006, in the group more likely to have early ADSL coverage. No such break is apparent for the "control" group of municipalities. This discontinuity in the turnout trends, and the fact that it is present only for the "treatment" group, are very much in line with what we would expect in order to validate our empirical strategy. Just as interestingly, Figure 7 shows that no breaks are apparent between 2001 and 2006 when it comes to population trends.

[Figures 6 and 7 here]

It is also instructive to consider the coefficients from a reduced-form regression, to see how the change in turnout relates to distance from the closest UGS when we use the data on all municipalities. Figure 8 depicts the estimated coefficients from separately running, for the two pre- and the two post-broadband elections, a regression of turnout on distance interacted with time, with municipality fixed effects and the full set of controls described in our empirical strategy section. What we see is that, prior to the advent of broadband, there is no statistically significant relationship between changes in turnout and distance, whereas a significant positive coefficient emerges afterwards. That the coefficient is positive is, of course, consistent with the negative link between turnout and broadband access that was suggested by Figure 4 above.

[Figure 8 here]

All of this suggests that the distance to the closest UGS is relevant in explaining the diffusion of broadband coverage, that its interaction with the timing of introduction of ADSL technology is a credible source of exogenous variation in that diffusion, and that there exists a connection between the diffusion of broadband and voter turnout, in the immediate aftermath of ADSL.

4.2. RESULTS

We now turn to the estimation of a causal effect, using our two-stage specification in (1) and (2). Our baseline results are presented in Table 1. We start by showing the basic OLS results, in Column (1), controlling for year and municipality fixed effects and for population. We

see a negative, statistically significant coefficient suggesting that the advent of broadband was associated with lower turnout. The effect we estimate implies that extending broadband coverage from zero to at least one-half of all the households in the municipality - which we take to be the minimal definition of good broadband coverage - would be associated with a decline in turnout of about 1.2 p.p., which we can compare to an average turnout above 80% between 1996 and 2001.

[Table 1 here]

We then implement our empirical strategy by instrumenting broadband access using distance to the closest UGS interacted with the post-2001 dummy. First of all, in Column (2), we again see a negative and statistically significant effect. The next three columns ((3)-(5)) then introduce sequentially the controls intended to account for demographic and unobservable trends. We see that controlling for demographics is important, as the coefficient and first-stage F-statistic falls in size by over one-half, but the results are rather stable across the additional specifications.[23]

What are the quantitative implications of our estimates? The same exercise of extending broadband access from zero to good coverage, as above, would correspond here to a decrease in turnout of about 2-3.5 p.p. To get a better sense of what that implies, we can follow DellaVigna and Kaplan (2007) and DellaVigna and Gentzkow (2010) in computing "persuasion rates" - namely, considering the share of people who did change their behavior, out of those who could have changed. In our case, the change in behavior is from voting to not voting, so the set of potentially affected individuals is the set of those who turned out in 2001, corresponding to 79.8% of the total population. Considering that, in 2008, 27% of the Italian population reported having broadband internet (as surveyed by ISTAT), and assuming that voters and non-voters are equally likely to have broadband, we take that out of 100 Italians approximately 22 (100*0.798*0.27) could potentially be affected by the broadband "treatment". Given an estimated coefficient of 0.0171, as in Column (5), and since we take good broadband access to correspond to (at least) 50% coverage, a move from zero to good access (corresponding to two points on our scale) would imply a persuasion rate of approximately 8 (100*2*0.5*0.0171/0.22). In other words, eight percent of the "treated" individuals were actually persuaded to change their behavior. This is very much within the range of persuasion rates (between 4 and 20) reported by DellaVigna and Gentzkow (2010) in their survey of studies of the effect of different kinds of media on voter behavior.

[23] This can also be seen from the first-stage coefficients, reported in Table A.2. The coefficient initially falls as the controls are added, and eventually stabilizes.

Columns (6) and (7) turn attention to a couple of robustness exercises. We first look at the possibility that the change in the effect of distance to the closest UGS brought about by the introduction of broadband could have varied with time. In other words, instead of interacting distance with a post-2001 dummy, we interact it with time. Column (7) then considers, as a measure of broadband internet access, the years of good broadband coverage, confirming the negative effect. In both cases we see our results confirmed.[24]

Another important robustness check is in Column (8), to deal more systematically with the possibility that we could be picking up some underlying trend in turnout that just happened to be correlated with the diffusion of broadband. To do so, we run our IV specifications for the pre-ADSL election years of 1996 and 2001 only, assuming that the patterns of internet access observed in 2006 had been present in 2001. Reassuringly, we see no impact of this fictitious episode of introduction of broadband internet, which reinforces that our results do not seem to be driven by pre-existing trends.[25]

4.3. Interpretation

The negative impact of broadband expansion on turnout in national elections is consistent with previous evidence, related to the introduction of different media technologies. For instance, this effect has been documented by Gentzkow (2006) and Campante and Hojman (2013) in the case of the introduction of TV in the US, or by Czernich (2012) and Falck, Gold, and Heblich (2012) for the introduction of broadband in Germany. This evidence has been interpreted as indicating that the appearance of a new media technology that dilutes the consumption of political information leads to lower levels of political engagement and participation. At least at first sight, it seems that the introduction of broadband internet, with its myriad entertainment options, would certainly fit the bill.

The patterns in our data suggest something rather more complex. For an initial glimpse of that, we can look at whether voting patterns across different political forces were also affected in early national elections. This is interesting in itself, as an across-the-board drop in turnout could have very different political implications from a scenario in which different parties or coalitions are affected differently; this can obviously speak to the question of

[24] Our results are not driven by the relatively small number of localities, typically more urban and densely populated, where a UGS is located: the coefficient is very similar if we exclude those localities (available upon request).

[25] We also check the results against demographic patterns. For instance, it would be surprising, and concerning, if the effects of broadband were coming largely from localities with large senior populations, which would presumably be less exposed to the Internet. Appendix Table A.3 shows that the effect is indeed significantly larger for younger municipalities (in the bottom quartile according to the share of over-65-years-old), and essentially absent for the older ones (top quartile).

whether the internet has operated as a polarizing force or not, on which there has been much debate and relatively conflicting evidence (Sunstein, 2009; Hindman, 2009; Gentzkow and Shapiro, 2011). In addition, to the extent that supporters of different coalitions and parties have different patterns of engagement with politics and consumption of information, differences between them can help us interpret what is driving that drop in turnout.

In Table 2 we distinguish between the mainstream center-right and center-left coalitions, and the "outsider" forces that come into elections with very little chance of affecting political balance. We then compare the results obtained by these different groups of parties between the elections of 2001 and 2008. We choose these years because in 1996 the coalitions were very different, and because in 2006 different rules greatly increased the incentive of minor parties to join the main coalitions; as a result, the definitions of mainstream coalitions are very different in these elections. Table 3 then shows the breakdown of results across the main parties in each coalition, and among outsiders.[26]

[Tables 2 and 3 here]

The first panel in Table 2 shows the coefficients on "Broadband Access" (with the full IV specification), using as dependent variable the vote shares of each of the three different forces. The results suggest that the mainstream center-right and center-left coalitions won at the expense of the outsider forces.

This initial conclusion is very much qualified in the second panel, where the dependent variable is the share of votes relative to the total number of eligible voters, as opposed to the number of voters who actually turned out. This is important, of course, because it lets us control for the negative impact on turnout that we have just documented. Here we see that what looked like gains for the mainstream coalitions was actually simply coming from a greater share of a smaller total number of voters. In terms of performance in attracting voters, the one distinctive impact of the diffusion of broadband was a negative one on outsider parties, and particularly on the extreme left, as shown in Table 3.

This pattern is interesting for two reasons. First, it is well-understood that the mainstream coalitions, and especially Silvio Berlusconi's center-right, had substantial control over "old media" outlets, from newspapers to TV (Durante and Knight, 2012). The fact that Berlusconi's party did not lose from the penetration of broadband internet is consistent with the

[26] For the definitions of coalitions, see Table A.5. The Italian system has a large number of parties, with new ones forming and old ones merging and dissolving very often; by the same token, the main coalitions are led by the same forces over this period, but their membership varies drastically across election cycles. For each election, we take the main center-right and center-left coalitions, and define all parties that do not belong to either as outsiders, with th exceptions of the M5S and Monti coalition in 2013. Table A.6 describes how the different party labels in Table 3 map onto different parties in different elections, because of mergers.

idea that the latter was not a major factor in the diffusion of political information counter to the individuals' prior beliefs: had that been the case, one would have expected a negative impact, relatively speaking, on the coalitions' level of support.

Second, the fact that those who seem to drop out are the supporters of outsider forces - which include those more at the extremes of the ideological spectrum, such as the unreformed Communists - suggests that the fall in turnout is due to more subtle reasons than a straightforward reduction in the consumption of political information. To further explore this aspect, we use data from the Italian National Election Study (ITANES), a series of electoral surveys conducted on a representative sample of the Italian population in coincidence with national parliamentary elections. We focus in particular on the 2001 wave, which interviewed 3,209 individuals and included various questions on self-reported voting choice, political participation, and media consumption. Based on this information we construct measures of "Interest in Politics", "Political Activism", and "Political Information", and look at differences along these dimensions between voters of different parties and coalitions.[27]

Figure 9 presents the results, comparing the averages for voters who reported to have voted for either of the mainstream coalitions, and for outsider parties (variables are standardized, so that magnitudes correspond to standard deviations of each of the variables). The comparison suggests that voters of outsider parties are among the most interested in and informed about politics, and certainly the most politically active.[28] This evidence seems hard to reconcile with the view that the effect of broadband would be working through demobilization induced by reduced information since those voters are unlikely to be the ones disproportionately switching into online entertainment.

[Figure 9 here]

All in all, this suggests that the depressing effect of broadband internet on turnout in national elections was driven by the disengagement of individuals who were already disappointed with mainstream politics. If that is the case, the initial impact of broadband constituted an opportunity for political entrepreneurs who could target that disenchanted audience.

5. Subsequent Effects of Broadband Access: Referenda, Online Platforms, and the Rise of the Five-Star Movement (M5S)

The existence of this political opportunity, and the emergence of entrepreneurs who take advantage of it, can be seen rather clearly when we consider patterns of political participation

[27] More information on how these variables were constructed is reported in the notes to Figure 9.

[28] The party breakdown (available upon request) shows that the unreformed Communists, which represent the bulk of outsider voters in 2001, score particularly high in all three dimensions.

beyond mainstream national elections. Fortunately, the Italian political system, and its evolution in recent years, offers a number of windows into those different patterns, both offline and online.

We start by looking at the effects of broadband access on electoral participation in referenda. Since our data comes from 2009 and 2011, we cannot use the time variation induced by the pre-2001 and post-2001 breakdown.[29] We thus present the results looking separately at the 2009 and 2011 referenda. (Results are similar if we pool the sample and include year fixed effects.) We focus on the variation across municipalities, by excluding the municipality fixed effects α and ζ, and instrumenting $Broadband_{m,t}$ using $Distance\_UGS_m$.

The identification here is not as clean as when we can actually use the time variation within municipalities. To improve on that, we include fixed effects at the level of provinces, and of *sistemi locali del lavoro* (SLL). These correspond to commuting areas, designated by the Italian statistical office as groups of municipalities that are contiguous, and geographically and statistically comparable.[30] By including these sets of fixed effects, we are identifying effects from the comparison between municipalities belonging to the same commuting area, while controlling for their population and a number of geographical and demographic characteristics from the Census.[31] Our identification assumption would now have to be more stringent than before, requiring that the distribution of UGS within provinces and SLLs is as good as random, at least once we control for these characteristics. As a result, we will refrain from pushing a causal interpretation of our estimated coefficients.

Table 4 displays the results, for the full specifications in OLS and IV, with standard errors clustered at the province level. What we see is a strikingly different pattern relative to the national elections: a statistically significant *positive* association between broadband diffusion and turnout.

[Table 4 here]

We cannot directly compare magnitudes with the coefficients in Table 1, not the least since we cannot replicate our identification strategy, but also because turnout in referenda is of

[29] In particular, we cannot use the post-2001 time variation either: the first stage in which we regress *Broadband* on *Distance_UGS* interacted with time is not valid, as the latter is not a predictor of broadband access. This clearly indicates that the effect of *Distance_UGS* is not varying after ADSL technology first becomes available.

[30] There are just under 700 SLL in Italy, for an average of just over ten municipalities for each SLL.

[31] The demographic characteristics are education (% population with *diploma laurea*), age structure (% population under 25 and % population over 65), and number of firms per capita. The geographic controls are distance from closest provincial capital, altimetric zone, dummy for mountainous area, dummy for coast, distance to coast, land area, and ruggedness of terrain.

course of a peculiar nature: minimum turnout requirements for enactment naturally imply that abstention essentially counts as a "No" vote. However, as we noted, this means that the mainstream parties, and the center-right in particular, were in many cases actively trying to keep turnout low. The positive association with turnout thus suggests that the internet had a rather damaging effect on the support for the mainstream parties (and especially the center-right) when it comes to the referenda - in a very different direction from the results we found for the national elections.

The referendum results are an indication that the diffusion of broadband internet did not have a simple negative effect on political participation. In fact, the idea that it actually had a positive impact on other forms of engagement beyond mainstream elections is further bolstered by looking at a notable measure of online political activity: the evolution of the local grassroots protest groups inspired by Beppe Grillo, on the online media platform *Meetup.com*. As we have discussed in Section 2.2.1, these groups constituted an important springboard in the expansion of the M5S, and in the eventual creation of M5S-affiliated electoral lists at the local level. It is not unreasonable to expect that the presence of these online protest groups would be enhanced by the diffusion of broadband internet - although one may wonder whether the disengagement opportunities offered by the internet, in the form of entertainment and different kinds of information, could negate that impulse.

In order to check for that hypothesis, we collected a unique data set, at the local level, on the formation and membership of *Meetup.com* groups associated with the Beppe Grillo-led protest movement that eventually coalesced into the M5S. Specifically, for each municipality, we know whether by 2012 there exists such a group, and if so, the date on which it was formed. We also know the number of members as of 2005-2012 across the entire sample of Italian municipalities (we normalize membership in each municipality by 1,000 inhabitants).[32]

Table 5 shows the results, using IV specifications. The first column uses as dependent variable the time since the formation of the local group, as of 2012, to see if broadband access is associated with earlier formation. In this case we are naturally without the benefit of time variation, so we include the province and SLL fixed effects and cluster the standard errors at the province level, as was the case for the referendum regressions in Table 4. We see that municipalities that had earlier access to broadband internet indeed tended to form groups

[32] We should stress that it is possible for an individual to be a member of multiple local groups, including in localities other than the one where she lives. To the extent that there exists an effect of broadband access on the existence of local groups, this possibility of multiple membership would magnify the difference between localities with extensive and limited access; we would argue that this magnified effect corresponds to the true impact of broadband access. In any event, the data on the date of formation of the groups should not be affected by multiple membership.

earlier. Column (2) then looks at the panel variation in membership between 2005 and 2012, setting the number at zero for the pre-broadband period of 2001. We also see that these groups tended to have more members as well in places where broadband arrived earlier. In particular, going from zero to full ADSL coverage corresponds to an increase of just under two standard deviation in the sample of membership.

[Table 5 here]

We should emphasize that while this pattern is not exactly surprising, it is not as obvious as it might appear. Indeed, there is no deterministic relationship between broadband access and an increase in online participation in *political activities*. That is, the idea that broadband access leads individuals to participate online even in this specific type of activity is a hypothesis rather than a fact. Our results provide support to this hypothesis by showing that the use of online platforms for political mobilization is indeed related to the diffusion of broadband internet access.

Most importantly, in light of the connection between these online groups and the creation and expansion of the M5S movement, the results in Table 5 immediately beg the question of whether the diffusion of broadband access impacted the performance of that movement, once it started taking part in the electoral process. This would provide direct evidence that the kind of political entrepreneurship exemplified by the M5S indeed eventually developed the ability to translate the new mobilization tools into electoral participation and results.

The first piece of evidence in that regard comes from data on local elections. Municipal elections in Italy take place typically every five years, in staggered fashion so that every year has some elections taking place; we consider elections between 2001 and 2012, leaving aside the elections between 2002 and 2004, because the data on ADSL penetration is unavailable for those years.

Table 6 displays the results. First of all, Column (1) reproduces the full IV specification, along the lines of Column (4) in Table 1. We see a negative effect, as was the case for national elections, suggesting that again the diffusion of broadband led to lower levels of electoral participation. Note, however, that the identification is now coming from a small number of municipalities, since most localities did not have more than one election in the years of our sample (2001 and 2005-2011). This means that our coefficient is rather imprecisely estimated, and the first-stage relationsip is much weaker than was the case in Table 1.

[Table 6 here]

Column (2) then shows that, if we limit the analysis to the period after 2008, which is the year in which the M5S starts appearing on the ballot in some local elections, we see a rather different pattern, with no distinct effect. It is hard to interpret the direct comparison between the two coefficients: they are estimated using different sources of variation, because we cannot use the time variation within municipalities in the post-2008 period. That said, there is at least the suggestion that the initial negative effect may have been reversed.

We can also show some direct evidence that the impact of the diffusion of broadband internet was actually positive when it comes to the performance of the M5S candidates. Column (3) shows that municipalities with better access to broadband were more likely to have the M5S on the ballot, consistent with the idea that the creation of local *Meetup.com* groups could have translated into an M5S electoral presence at the local level. Note that, as we focus on more recent years, the fact that our ADSL coverage data goes only up until 2011 leads us to drop a lot of useful information from 2012. In light of that, we also show a specification with years of good broadband coverage as our key independent variable, which lets us include those 2012 elections.[33] Column (4) confirms the results under that specification. Finally, columns (5) and (6) then show that, also consistent with that same logic, those M5S candidates seemed to have obtained more votes in places with stronger and earlier broadband diffusion.

The evidence seems suggestive that the emergence of new political forces - likely in tandem with the evolution of the Internet itself, with the rise of social media and user-generated content - may have substantially changed the effect of broadband access on political engagement. Still, the empirical variation that underlies these results is unavoidably narrow, coming from a small and select group of places: the number of municipalities with the M5S on the ballot is rather small, and they tend to be relatively large in terms of population. As such, the variation is coming from a small and select group of places, and again we cannot control for unobservable characteristics at the municipal level. In the next section, we turn our attention back to the national elections, to check our results against a broader source of data.

6. Full Circle: Revisiting the National Elections

We thus have evidence that the initial negative effect of the expansion of internet access on political participation in mainstream national elections stands in contrast with a positive

[33] The number of municipalities with M5S presence is 17 (2008), 51 (2009), 11 (2010), 78 (2011), and 103 (2012); the number of elections in each of these years was 610, 4284, 1072, 1338, and 1006, respectively. The measure of years of good broadband coverage includes some inevitable additional measurement error for 2012, but this should be relatively minor. In any case, the difference in result seems to be driven by the power added by the 2012 information: the result is insignificant when we run the specification with the alternative measure on the sample up to 2011.

impact on a number of other forms of engagement, particularly ones that appealed to individuals that were in fact disenchanted with the mainstream political forces. Fortunately, from our perspective, these different forces came full circle in the 2013 national elections, in which the M5S made its definitive entrance into the realm of mainstream politics.

From an empirical perspective, considering national elections has a major advantage in terms of data availability: every election year gives us information from all the roughly 8000 municipalities. This greatly increases the effective sample size, and lets us take full advantage of the contrast between the pre- and post-broadband eras before and after 2001, while controlling for unobserved municipality characteristics. We can thus revisit the effect of the Internet on political participation in national elections, now taking 2013 into consideration, to obtain estimates of the causal effect of the diffusion of broadband on electoral participation across different time horizons. Note that, since our data on broadband access stops in 2011, we attribute the 2011 data to election year 2013.[34]

We have thus updated the data used in Section 4 with the outcomes from the 2013 national lower House elections. The results are shown in Table 7, and in column (1) we reproduce our preferred specification from Table 1, for the 1996-2008 period, in order to facilitate the comparison. Column (2) then shows that the negative effect is cut substantially when 2013 is incorporated into the analysis. In fact, if we simply look at the effect between the pre-broadband (pre-2001) and the 2013 elections, leaving aside the more immediate impact from 2006 and 2008, as shown in Column (3), we see that the negative effect completely vanishes. The first stage is considerably weaker, and the estimates rather imprecise, which is not surprising when we consider that there is substantially less variation in broadband access, by 2011, between locations with relatively large or small distances from the closest UGS. That said, this striking reversal suggests that the initial depression of electoral participation as a result of the expansion of broadband access was to a large extent erased by 2013.[35]

[Table 7 here]

The other columns in Table 7 then break down the results obtained by different political forces. We focus attention on the variation between the pre-broadband era and 2013, in

[34] This naturally introduces some additional measurement error. This particular source of error should be less important when we consider years since good broadband coverage; by the same token, the source of error that contaminates this latter measure, namely the fact that we have no data prior to 2005, should become less important as the years go by. Our results are reassuringly similar if we reproduce Table 7 using this alternative measure.

[35] In principle, a possible concern for our identification strategy as we reach 2013 may be represented by the presence of mobile broadband in areas where ADSL is not available. However, as explained in Appendix B, the characteristics of the mobile broadband infrastructure, its coverage and the use of mobile broadband in Italy all point to the conclusion that this is not an issue for our analysis.

terms of votes per eligible voters, attributing zeroes to the parties or movements that were not on the ballot in 2001, such as the M5S. This lets us estimate the causal effect of the diffusion of broadband access on the electoral growth of these forces as well. We immediately notice a contrast between the M5S (Column (4)) and mainstream coalitions (Column (5)). Confirming the notion that the M5S was indeed an internet-savvy movement, we detect a strong positive effect of longer exposure to broadband: an increase from zero to good coverage (at least 50% of households) would be associated with an M5S gain of just under 4 p.p.. This compares to an average share of M5S votes per eligible voters of 17% in our sample.[36] If we compute the persuasion rate along the lines of what we did for Table 1, we find a number around 4.5 percent - again far from trivial and very much within the typical range in the literature.

In contrast, the old-fashioned mainstream coalitions faced essentially no impact. This negative effect in fact masks some important heterogeneity across the different mainstream forces, as shown in Table A.4: we find that the center-left PD seems to have been able to make use of the new medium, whereas the center-right was left behind. This is consistent with the idea that the center-right, with its influence over the "old" media, may have had its previous advantage eventually dissipate with the diffusion of the new media environment. Column (6) in turn shows that the old-fashioned outsiders' loss is now statistically insignificant - though Table A.4 shows again the extreme left losing out.

Quite interestingly, however, Columns (7) and (8) show that the M5S were not unique in realizing the internet's mobilization potential. First, another "web-friendly" political movement, "*Fare per Fermare il Declino*" (henceforth *Fare*), also seemed to be able to leverage the effect of the internet, though to a much more limited extent than the M5S phenomenon.[37] We interpret this as additional evidence that the supply-side of the political system did react to the initial shock represented by the emergence of high-speed internet. Column (8) in turn shows a relatively mild positive effect in favor of the centrist party led by former prime minister Mario Monti.[38][39]

[36] The M5S national average was just over 19%, again in terms of votes per eligible voters - corresponding to 25.5% out of a 75.2% turnout.

[37] This movement was co-founded by a group of US-based academic economists. Most importantly, similarly to the M5S, it also exploited a blog as its springboard (namely, *noiseFromAmerika.org*, founded in 2006). However, the party suffered with a political scandal regarding the qualification of its political leader just before the elections, which naturally detracted from its performance. Its average share of votes was a mere 0.7%, though it did get a significant share (up to 29%) in a few localities.

[38] The Monti-led party could also be considered, to a lesser extent, an Internet-savvy movement. Indeed, Monti announced his intention to actively enter into the political arena on Twitter on December 26, 2012, and made extensive use of this platform, reaching in a couple of months more than 240,000 followers.

[39] The persuasion rates for *Fare* and the party lead by Monti are 0.6 and 1.4, respectively - consistent with the fact that both had a less substantial impact in the 2013 election cycle than M5S.

These three parties were indeed the only ones whose candidates were by-and-large picked among people without previous experience running for office. This suggests that the internet may have played a broader role leveling the playing field in favor of relative newcomers, without established party structures. Indeed, the use of online platforms and the network of local groups may help explain how the M5S could run a successful national campaign on a very limited budget, reportedly around 350,000 euros. This compares, for the sake of illustration, with the over-10-million-euro budget of the main center-left party, which in the end got a few thousand fewer votes in total than the M5S, in the national House elections.[40]

In sum, the evidence suggests quite clearly that the initial negative effect of broadband internet on political participation in national elections was overturned, and that this is closely related to the emergence of political entrepreneurs that were able to use the internet to increase mobilization, and to a reduction in barriers to the entry of new forces beyond traditionally established parties.

7. Interpretation: Exit, Voice, and the Demand and Supply of Politics 2.0

The main takeaway from the results presented above is that the impact of broadband Internet was rather nuanced. In particular, it seems to have varied across different types of political participation and, quite crucially, also over time, as the demand and supply sides of politics reacted endogenously to the increasing challenges and opportunities posed by the diffusion of the new medium.

We have documented that, at first, the introduction of broadband Internet across Italian municipalities was associated with a decline in political participation in the form of electoral turnout, in both parliamentary and local elections. Our results suggest, however, that this should be best interpreted as merely the immediate, partial-equilibrium effect of the change in media technology. Indeed, the initial drop in electoral participation was counteracted by rather distinct effects on other forms of political engagement, both online and offline. First, we provide evidence that early access to the Internet facilitated the emergence and expansion of local grassroots online protest groups. Second, it was also positively associated with higher turnout in popular referenda, which are largely boycotted by mainstream parties and tend to have a very distinct, more anti-establishment flavor than parliamentary elections. This pattern suggests that, while the Internet may have operated as a "demobilizing" force with regard to participation in mainstream elections, the same was not necessarily the case for political engagement more broadly.

[40] Sources: www.beppegrillo.it/movimento/donazioni, "Il PD: Ecco le nostre spese per le elezioni", *La Repubblica*, January 10, 2013.

What is more, our findings document how these new forms of mobilization seem to have eventually fed back into the mainstream electoral process. This process is exemplified most clearly by the emergence of the M5S, which to a large extent grew out of those local online groups, and in due course turned into a potent electoral force. Our results show that, once it started competing in elections, the M5S was able to leverage the expansion of broadband access into better outcomes - as was the case, to a lesser extent, with other web-friendly newcomers such as *Fare*. Their success strongly suggests that the initial demobilization, coupled with the possibilities offered by the new media platform, presented an opportunity that new, Internet-savvy political entrepreneurs were able to exploit to enhance mobilization. Once this supply-side reaction had taken place, the initial negative effect on parliamentary election turnout was largely reversed.

How can we rationalize such a multifaceted pattern, and how can it inform our general understanding of the political impact of the Internet? The evidence seems to indicate a subtle interplay between what we may call "voice" and "exit" strategies (to use the language of Hirschman, 1970), put in motion when the brodband-induced change in media landscape hit a political system widely perceived as dysfunctional, such as that of Italy in the 2000s. Our evidence is consistent with a story in which what we may call "disenchanted" citizens, namely those particularly dissatisfied with the state of mainstream Italian politics, might have opted at first for voicing their displeasure by casting "communicative" or "protest" votes (Piketty, 2000; Castanheira, 2003; Razin, 2003; Myatt, 2012) for "outsider" parties with no actual chance of becoming part of a governing coalition. The advent of broadband Internet may then have offered an exit option whereby they could find ways of expressing their political views beyond the mainstream political process.[41]

This interpretation is underscored by the fact that it was the outsider parties that essentially lost voters in the immediate aftermath of the introduction of broadband. Not surprisingly, the resulting electorate was tilted towards those citizens with greater "loyalty" to the existing system, namely those who were supporting the mainstream coalitions. Indeed, as a result of the diffusion of broadband, those coalitions increased their share of votes without increasing their absolute numbers of voters.[42]

[41] This phenomenon does not seem to be specific to Italy but rather consistent with the pattern of political participation observed in other countries. In particular, over recent decades voter turnout has decreased in many advanced democracies (Franklin, 2004) - a process that, many have argued, has been accompanied by an increase in the extent of public dissatisfaction with the performance and institutions of representative democracy (Pharr, Putnam, and Dalton, 2000; Dalton, 2004).

[42] In addition, Bailard (2012) shows that, in a weakly-institutionalized environment, the Internet may also foster disenchantment, by increasing the citizens' level of information about an electoral system perceived as disreputable. By the same token, Chong, De la O, Karlan, and Wantchekon (2012) point out that an exogenous increase in the level of information about incumbent politicians' misbehavior may translate into lower levels of electoral participation.

The M5S, and to a lesser extent other similar forces, in turn encapsulate the Internet's potential to transition from exit device to a novel source of voice within mainstream politics. These were typically movements that initially emerged outside and in explicit repudiation of mainstream politics, and that eventually gravitated toward taking part in it. In that sense, this constitutes another mechanism for what Hirschman called the "influence and power that come from 'having nowhere to go" (1970, p.73): disenchanted voters opting for exit from mainstream politics became the driving force of a political movement that eventually punished the political forces that had disaffected them, through that movement's strong impact on mainstream politics.

In fact, it is rather clear from the survey evidence that the M5S has fished into the pool of demobilized voters. People who did not vote in the 2008 national elections are largely overrepresented among M5S voters compared to other parties: one out of seven people who voted for the M5S in 2012 local elections reported to have abstained in the 2008 parliamentary elections; the overall figure is only one out of fifteen (Pedrazzani and Pinto, 2013).

There could also be alternative interpretations for these demand-side movements, beyond the role of disenchantment. The initial drop in turnout, for instance, is evidently consistent with the existing literature on the effects of new media technologies, which has underlined how they may have negative effects on political participation. The usual explanation is related to the potential crowding-out of the consumption of existing media sources that placed a greater weight on relevant political information. The pool of demobilized voters surely contained many purely apathetic citizens, but there is strong evidence that the initial demobilization was indeed associated with disenchantment. First, as discussed in Section 4.3, we document that the drop in turnout was mostly linked to supporters of outsider parties, and unreformed Communists in particular, and these tend to report relatively high levels of interest in politics and news consumption. Second, a pure apathy story would not lead us to expect that other forms of political participation would be enhanced by the Internet, as we find in the data.

Additional evidence in that regard comes from looking at the socio-demographic characteristics of M5S voters. They typically have a medium-to-high level of instruction, and are generally well-informed about politics (Pedrazzani and Pinto, 2013). Rather unsurprisingly, M5S voters were also heavy Internet users: 80% of M5S voters access the Internet and 42% use it as their main source of news (compared with a population average of 61% and 26%, respectively). They are also more likely to express political opinions on websites or social media, and to visit websites of party or candidates (Mosca and Vaccari, 2013). In sum, these are to a large extent "people who have resources to be active and the willingness to do it but that find high barriers to entry into the traditional channels of political participation" (Passarelli, Tronconi, and Tuorto, 2013, p.130); people whose electoral abstention seems to be

driven by protest rather than apathy (Tuorto, 2006).

Their anti-establishment profile is also apparent from direct survey evidence that M5S voters are more prone to opining that voting is useless, and that political parties are not necessary in a democracy, and further validated, for instance, by an overrepresentation of individuals who are not religious, or who are religious but non-practicing. It is also supported by the evidence we find of a positive impact of broadband internet on political participation in the context of direct democracy: since the national referenda analyzed have been largely ignored or boycotted by mainstream political parties, that positive impact is likely to have involved voters dissatisfied with mainstream politics.

In any event, our evidence very clearly underscores the importance of the general equilibrium effects in any episode of diffusion of high-speed Internet - and more broadly, for any change in media environment. Quite simply, we should expect that its effects will shift over time - from exit back to voice - once the supply side of politics has endogenously responded to the initial shock, precisely by targeting the inflated contingent of demobilized voters.

We should expect this transition from exit to voice, and relatively quickly, for at least a couple of reasons. The first one is eminently Hirschmanian: while it is a basic tenet that exit tends to drive out voice, it remains true that the mainstream political process is a crucial driver of policy choices and public good (or bad) provision; as such, it inevitably affects even those who have opted for exit. This exemplifies a situation such that "full exit is impossible; in some sense, one remains (...) a member of the organization in spite of formal exit" (Hirschman, 1970, p.100), and these are the precisely the situations in which loyalist behavior with respect to the organization is most likely. In other words, there is bound to be sufficient underlying loyalty so as to provide an opportunity for those who could devise, from the new medium, new voice options that could be brought to the mainstream.

The second reason lies in the specific characteristics of the Internet as a medium, and particularly its evolution towards the so-called "Web 2.0", with the rise of user-generated content and of social media platforms such as Facebook and Twitter. This created new opportunities for political engagement, with barriers to entry that are much lower than for pre-existing media - as underscored by the fact that newcomer parties feature heavily among the beneficiaries of broadband. In essence, the characteristics of the Internet imply that its use as a political platform is within the reach of a much broader set of people than was the case for TV or radio or the press. This, in turn, means that the pool of political entrepreneurs that can potentially make use of it in order to offer a voice option is considerably larger and broader than in these previous episodes of shifts in the media landscape. This ought to increase the likelihood and swiftness of that transition from exit to voice mechanism. Since the advent

of "Web 2.0" largely coincides with the latter part of our period of analysis, this probably facilitated the transition we document in the data.[43]

8. Conclusions

Our evidence from Italy has unearthed important political implications of the diffusion of broadband Internet access, as one would have expected from the widespread perception of the advent of the Internet as a watershed event. Most interestingly, it has also stressed that those implications were multifaceted and evolving, over time and across different forms of political participation.

These results highlight the importance of looking beyond the initial, partial-equilibrium response of the political system to the shock of the introduction of the Internet. It becomes apparent that political entrepreneurs seize the opportunity to put in motion a supply-side reaction that fundamentally alters that initial response, by turning the initial exit option into a new source of voice in the mainstream political process - a process that is facilitated by the low barriers to entry that characterize the Internet.

We believe that this lesson should apply more broadly, along at least two dimensions. First, we should expect it to hold for other episodes of changes in media technology. The expansion of the Internet poses a crucial advantage in that its very rapid nature enables us to identify the full reaction chain over the relatively short period of time of just over a decade. Still, it could very well be that other shifts - say, from radio and broadcast TV to talk radio or cable - could very well have entailed a similarly multifaceted set of effects, and so will those that are still to come.

Second, we can speculate over whether similar chains of effects were put in motion by the advent of high-speed Internet in other countries. The rise of upstart, web-savvy movements has also occurred elsewhere: from the so-called "pirate parties" in Scandinavia or Germany to, one could certainly argue, the surprising victory of the relatively unknown Sen. Barack Obama in the US Democratic Party primaries, against a very well-established frontrunner. To one degree or another, these fit the pattern of new forms of political mobilization with significantly lower barriers to entry, and it is natural to think that they may have been catalyzed by the Internet.[44] It would be interesting to explore whether these episodes have followed

[43] One might even argue that any initial use of the Internet for non-political purposes, fostered by the unprecedented entertainment offerings made available by broadband, may have had a positive spillover effect on those new opportunities for engagement, by increasing the skills and involvement in online activities (Anduiza, Cantijoch, and Gallego, 2009).

[44] For some evidence in that regard, in the case of the US, see Larcinese and Miner (2012), Miner (2012) and Jaber (2013).

the exit-to-voice pattern we highlight here, with voter engagement initially being depressed (consistent with the observed decline in turnout in the US in the late 1990s-early 2000s, for instance) and eventually picking up as those new forms of mobilization feed back into the mainstream electoral process.

Last but not least, there is more to be learned about the political impact of high-speed Internet and the mechanism we identify here. For instance, it would be interesting to assess potential implications for political polarization and, by extension, policy outcomes, which would presumably be felt over a longer time horizon. By the same token, one could ask whether the supply-side reaction is reflected in different kinds of politicians emerging, in terms of individual and ideological characteristics. We cannot address this question in our context because, from 2006 on, the Italian electoral law for parliamentary elections does not allow voters to choose the single candidates within a party (i.e., citizens can only vote for the party). Generally speaking, however, this could have important consequences for the supply of different ideological positions in the political system, and for the quality of politicians and, again by extension, policy outcomes. These are open questions for future research.

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APPENDIX A

This appendix describes the relationship between broadband and turnout demographic characteristics (Table 1); it provides the results for the first-stage regression relative to broadband access and turnout in the 1996-2008 parliamentary elections (Table A.2); we also report here the results relative to the effect of broadband access on turnout in the municipalities below the 25th and above the 75th percentile of over-65 population (Table A.3); the results on the performance of parties within the main coalitions and within the outsiders comparing 2001 and 2013 are provided in Table A.4. Moreover, Table A.5 and Table A.6 report the classification of parties and coalitions and the party aggregation throughout our sample period. Finally, Figure A.1 and Figure A.2 describe the differences in turnout by timing of ADSL introduction when comparing municipalities with an own UGS or provincial capitals, respectively, with late ADSL adopters.

APPENDIX B: TECHNICAL BACKGROUND INFORMATION ON ITALY'S BROADBAND INFRASTRUCTURE

The average length of the Italian primary distribution network, running from the "Main Distribution Frames" (MDFs) in the local telecommunication exchange (i.e., the "Central Office", CO) to the street cabinets (SDFs) is 1.3 km. The average length of the secondary distribution network, running from the street cabinets (SDFs) to the buildings, is 0.47 km.[45] Indeed, the length of "local loops" does not seem to be a crucial parameter determining the absence of ADSL access by Italian municipalities even in 2011. Specifically, our data shows that 3/4 of municipalities that did not yet have access to ADSL in 2011 are less than 4 kilometers away from the closest CO.

In order to provide a comprehensive picture of the Italian broadband network, it is also important to point out that in addition to deploying optical fiber cables between the CO serving the municipality and the closest UGS, telecommunication operators had to meet another technical requirement. Specifically, in order to be able to offer ADSL services to the municipality: it also needs to install a DSLAM (Digital Subscriber Line Multiplexer) within the Central Office. However, the installation cost of the DSLAM is remarkably lower with respect to the cost of connecting the CO to

[45] According to other estimates by Telecom Italia the actual average distances are even lower, 1.1 km and 0.4 km for the primary and secondary distribution network, respectively. In Metropolitan areas the average length of the primary distribution network is 0.9 km. Moreover during the 1988-1992 the telecommunication incumbent operator, Telecom Italia, invested significant resources in renovating and improving its copper distribution network (Impiglia, Laurenti, Magnone, and Persico, 2004).

the UGS using optical fiber (Between, 2006; AGCOM, 2008-2012).[46] Indeed, (AGCOM, 2011) distinguish between areas of "medium-run" and " short-run" digital divide. Municipalities served by a CO whose connection to the UGS is still implemented via copper wires (i.e., not connected with optical fiber) belong to the first category. Municipalities served by a central office connected with optical fiber to the UGS but still lacking a DSLAM, belong to the second category.

For what concerns mobile broadband, the data available at the regional and provincial level show that the pattern of its coverage resembles the one of fixed broadband. That is, the regions/provinces characterized by a lower degree of ADSL availability are also the ones with the lower coverage of mobile broadband (Between 2008). Similarly, in terms of connection speed, the digital divide on the mobile connection side follows the very same pattern as the one concerning fixed broadband. For example, the download speed in smaller municipalities (i.e., below 2000 inhabitants) is around half with respect to that of metropolitan areas (Between, 2010). Moreover, a large share of mobile connections are based on "pay-as-you-go" type of contracts (around 76%) which usually have a cap in terms of either the maximum amount of downloadable data or in terms of time that could be spent surfing the web (AGCOM, 2012). Indeed, while the bandwidth available to the end user in the case of fixed broadband corresponds to her "dedicated" one through her own copper wire, in the case of mobile connection the bandwidth of the end user has to be shared with everyone else using the same mobile cell. Thus, while the users of fixed line broadband experience a good average bandwidth speed, this is not the case for the ones using mobile connections. Hence, the differences between the type of contracts typically observed in the fixed and mobile broadband markets, "flat" and "pay-as-you-go", respectively, reflect these differences in the bandwidth availability (Between, 2008). Finally and most importantly, most of the active mobile connections are used by customers who already have a broadband service on the fixed line, e.g., when traveling (Between, 2008). In sum, in the Italian context, mobile broadband internet connections do not seem to constitute and/or used as a valid substitute for the unavailability of ADSL in a municipality. Indeed the Italian government has recently planned to invest 900 million euros in (mainly fixed-line) infrastructures to close this digital divide (Agenda Digitale Italiana, 2013).

[46] In 2008, the cost of installing optical fiber cables was estimated to be around 4,000 Euros per kilometer in small cities and 1,0000 Euros per kilometer in larger ones (i.e., requiring larger cables) in Italy. In addition to the fiber cable costs *per se*, the cost of digging the trenches and the costs of municipal licenses represent other relevant costs necessary to install optical fiber cables (Ciapanna and Sabbatini (2008)). The cost of installing a DSLAM in a central office varies according to the number of lines served. However, the overall cost of installing a DSLAM in an CO is in the range of few thousands euros (AGCOM 2011).

Table 1: Broadband and Turnout in National Lower House Elections: Baseline Results (1996-2008)

Dep. Variable: Turnout	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	IV	IV	IV	IV	IV	IV (Pre-ADSL)
Broadband Access	-0.0058***	-0.0303***	-0.0136***	-0.0101***	-0.0171***	-0.0182***		0.0023
	[0.0003]	[0.0013]	[0.0016]	[0.0029]	[0.0038]	[0.0043]		[0.0035]
Years of Broadband							-0.0536***	
							[0.0124]	
Demographics X Time Polynomial			Yes	Yes	Yes	Yes	Yes	Yes
Demographics X Year FEs				Yes	Yes	Yes	Yes	Yes
Region-Year FEs					Yes	Yes	Yes	Yes
First-Stage F-statistic		1296.0	573.1	196.0	113.2	89.1	67.9	52.1
Observations	31876	31876	31876	31876	31876	31876	31876	15938
Number of Municipalities	7969	7969	7969	7969	7969	7969	7969	7969
R-squared	0.136							

Years: 1996, 2001, 2006, 2008. All regressions include year and municipality fixed effects, and control for contemporaneous population. Instrumental Variable: Distance from Closest UGS X Post-2001 dummy, except for Columns (6) and (8) (Distance from Closest UGS X time). Demographic Controls (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. Pre-ADSL: 1996, 2001. *p<0.1, **p<0.05, ***p<0.01.

Table 2: Broadband and Coalition Performance: 2001 and 2008 (IV Results)

	(1)	(2)	(3)
Dependent Variable:	Center-Right	Center-Left	Outsiders
Vote Share	0.0134***	0.0161***	-0.0306***
	[0.0053]	[0.0053]	[0.0072]
(Mean Vote Share 2001)	0.516	0.320	0.150
Votes per eligible voters	-0.0006	0.0026	-0.0238***
	[0.0046]	[0.0039]	[0.0054]
(Mean Votes per eligible voter 2001)	0.375	0.232	0.107
Demographics X Time Polynomial	Yes	Yes	Yes
Demographics X Year FEs	Yes	Yes	Yes
Region-Year FEs	Yes	Yes	Yes
Observations	15938	15938	15938
Number of Municipalities	7969	7969	7969

Years: 2001 and 2008. Reported coefficients are for Broadband Access. All regressions include year and municipality fixed effects. Instrumental Variable: Distance from Closest UGS X Post-2001. Demographic controls: Population. Demographics (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. *p<0.1, **p<0.05, ***p<0.01.

Table 3: Broadband and Party Performance: 2001 and 2008 (IV Results)

	(1)	(2)	(3)	(4)	(5)	(6)
	Center-Right		Center-Left		Outsiders	
Dep. Variable: Votes per eligible voters	PdL	Lega	PD	IDV	Extreme-Right	Extreme-Left
Broadband Access	0.0008	-0.0108***	0.0063*	-0.0029*	0.0003	-0.0054***
	[0.0043]	[0.0032]	[0.0038]	[0.0016]	[0.0013]	[0.0017]
Mean (2001)	0.290	0.048	0.204	0.029	0.004	0.034
Demographics X Time Polynomial	Yes	Yes	Yes	Yes	Yes	Yes
Demographics X Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15938	15938	15938	15938	15938	15938
Number of Municipalities	7969	7969	7969	7969	7969	7969

Years: 2001 and 2008. Reported coefficients are for Years of Broadband. All regressions include year and municipality fixed effects. PdL: Popolo della Libertá (People of Freedom, main center-right); Lega: Lega Nord (Northern League, junior center-right); PD: Partito Democratico (Democratic Party, main center-left); IDV: Italia dei Valori (Italy of Values, junior center-left); Extreme-Right.: unreformed fascists and other rightist extremists; Extreme-Left.: unreformed communists and other leftist extremists. Instrumental Variable: Distance from Closest UGS X Post-2001. Demographics (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. *p<0.1, **p<0.05, ***p<0.01.

Table 4: Broadband and Turnout in National Referenda (2009, 2011)

Dependent Variable: Turnout	(1)	(2)	(3)	(4)
	2011		2009	
	OLS	IV	OLS	IV
Broadband Access	0.0018***	0.0235***	0.0007	0.0219*
	[0.0005]	[0.0104]	[0.0005]	[0.0119]
First-Stage F-statistic		39.6		23.0
Observations	8075	8075	8075	8075
R-squared	0.568		0.825	

Years: 2009 and 2011. All regressions include province and SLL fixed effects, standard errors clustered at province level. Turnout = average turnout across four referendum questions. Instrumental Variable: Distance from Closest UGS. Demographic controls (2001): Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita. Geographic controls: Distance from Closest Provincial Capital, Altimetric Zone, Mountain Dummy, Coast Dummy, Distance to Coast, Area, Ruggedness. *p<0.1, **p<0.05, ***p<0.01.

Table 5: Broadband and Formation of Beppe Grillo/M5S *Meetup.com* Groups (IV Results)

	(1)	(2)
Dependent Variable:	Log Days since Formation	Members per 1000
Broadband Access	1.0626***	0.1253***
	[0.3120]	[0.0445]
Years	2012	2001, 2005-2011
Demographic Controls (2001)	Yes	
Geographic Controls	Yes	
Province and SLL FEs	Yes	
Demographics X Time Polynomial		Yes
Demographics X Year FEs		Yes
Municipality and Region-Year FEs		Yes
First-Stage F-statistic	20.5	78.7
Observations	8056	64680
Number of Municipalities		8085

Log Days since Formation: Log (1 + Days since Formation of First Group). Members per 1000: Number of Affiliates per 1000 Inhabitants. Instrumental Variable: Distance from Closest UGS (Column (1)), Distance from Closest UGS X Post-2001 (Column (2)). Demographic controls (2001): % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Geographic controls: Altimetric Zone, Mountain Dummy, Coast Dummy, Distance to Coast, Area, Ruggedness. All regressions include contemporaneous population.. Standard errors in Column (1) are clustered at the province level. *p<0.1, **p<0.05, ***p<0.01.

Table 6: Broadband, Turnout, and M5S Results in Municipal Elections

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Turnout	Turnout (post-2008)	M5S on Ballot	M5S on Ballot	M5S Votes per eligible voters	M5S Votes per eligible voters
Broadband Access	-0.0374**	0.0029	0.0503***		0.0005	
	[0.0170]	[0.0122]	[0.0185]		[0.0006]	
Years of Broadband				0.1179***		0.0029**
				[0.0041]		[0.0012]
Province and SLL FE		Yes	Yes	Yes	Yes	Yes
Municipality FE	Yes					
Demographics X Time Polynomial	Yes					
Demographics X Year FEs	Yes					
Region-Year FEs	Yes					
First-Stage F-statistic	8.7	34.7	34.7	23.3	34.7	23.3
Observations	11863	5952	5952	7288	5952	7288
Number of Municipalities	8043					

Years: 2001, 2005-2011 (Column (1)), 2008-2011 (Columns (2), (3), (5)), 2008-2012 (Columns (4), (6)). IV Regressions. All regressions include year fixed effects. Instrumental Variable: Distance from Closest UGS X Post-2001 dummy (Column (1)), Distance from Closest UGS (Columns (2)-(4)). Demographic controls (Column (1)): Population; Demographics (2001) (Column (1)): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita. Time Polynomial: 4th order polynomial in time. Demographic controls (2008) (Columns (2)-(4)): Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita. Geographic controls (Columns (2)-(4): Distance from Closest Provincial Capital, Altimetric Zone, Mountain Dummy, Coast Dummy, Distance to Coast, Area, Ruggedness.Columns (2)-(4) sample excludes municipalities with more than one election between 2008 and 2012. *p<0.1, **p<0.05, ***p<0.01.

Table 7: Broadband, Turnout, and Coalition Performance in National Lower House Elections: 1996-2013 (IV Results)

Dep. Variable:	(1) Turnout	(2) Turnout	(3) Turnout	(4) M5S	(5) Mainstream	(6) Outsiders	(7) Fare	(8) Monti
Broadband Access	-0.0171***	-0.0108***	0.0105	0.0187***	-0.0066	-0.0091	0.0029***	0.0065**
	[0.0038]	[0.0037]	[0.0078]	[0.0060]	[0.0088]	[0.0062]	[0.0010]	[0.0033]
Mean (2013)	0.749	0.749	0.749	0.170	0.430	0.035	0.007	0.060
Sample	Pre-2013	All Years	Pre-ADSL, 2013	2001, 2013	Pre-ADSL, 2013	Pre-ADSL, 2013	2001, 2013	2001, 2013
Demographics X Time Polynomial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographics X Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-Stage F-statistic	113.2	111.3	63.0	31.7	63.0	63.0	31.7	31.7
Observations	31876	39845	23907	15938	23907	23907	15938	15938
Municipalities	7969	7969	7969	7969	7969	7969	7969	7969

All regressions include municipality fixed effects, and contemporaneous population. Coalition Performance (Columns (4)-(8)): Votes per Eligible Voters. Instrumental Variable: Distance from Closest UGS X Post-2001 dummy. Demographic controls: Population. Demographics (2001): Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. Pre-ADSL: 1996, 2001. *p<0.1, **p<0.05, ***p<0.01

Table A.1: Broadband, Turnout, and Demographic Characteristics: OLS Regressions

Dep. Variable: Broadband Access	(1)	(2)
Turnout	7.9820***	-0.3249
	[0.645]	[0.689]
Population (1000's)		0.0017*
		[0.001]
% Population with Diploma Laurea		8.1902***
		[0.490]
% Population under 25		-3.5483**
		[1.507]
% Population over 65		-10.7070***
		[1.039]
Firms per capita		-0.0001*
		[0.000]
Distance Provincial Capital		-0.0072***
		[0.002]
Observations	7969	7969
R-squared	0.161	0.268

The table reports the raw correlation between broadband internet access and electoral turnout (column 1) and the correlation when controlling for key socio-demographic characteristics (column 2). Data for broadband access and turnout refer to electoral year 2006; all other variables refer to census year 2001. All regressions include province fixed effects. *p<0.1, **p<0.05, ***p<0.01

Table A.2: Broadband and Turnout in National Lower House Elections: First Stage (1996-2008)

Dep. Variable:	(1) Access	(2) Access	(3) Access	(4) Access	(5) Access	(6) Years Since	(7) Access (Pre-ADSL)
Distance to Closest UGS X Post-2001	-0.0579***	-0.0445***	-0.0259***	-0.0205***		-0.0065***	
	[0.0016]	[0.0019]	[0.0018]	[0.0019]		[0.0008]	
Distance from Closest UGS X Time					-0.0020***		-0.0045***
					[0.0002]		[0.0006]
Demographics X Time Polynomial		Yes	Yes	Yes	Yes	Yes	Yes
Demographics X Year FEs			Yes	Yes	Yes	Yes	Yes
Region-Year FEs				Yes	Yes	Yes	Yes
Observations	31876	31876	31876	31876	31876	31876	15938
Number of Municipalities	7969	7969	7969	7969	7969	7969	7969
R-squared	0.727	0.736	0.760	0.770	0.770	0.794	0.714

Years: 1996, 2001, 2006, 2008. All regressions include year and municipality fixed effects, and control for contemporaneous population. Demographic Controls (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. Pre-ADSL: 1996, 2001. *p<0.1, **p<0.05, ***p<0.01.

Table A.3: Broadband and Turnout in National Lower House Elections (1996-2008): Age Profile (Over 65)

Dependent Variable: Turnout	(1)	(2)
	Below 25th	Above 75th
Broadband Access	-0.0495***	-0.0018
	[0.0150]	[0.0056]
Demographics X Time Polynomial	Yes	Yes
Demographics X Year FEs	Yes	Yes
Region-Year FEs	Yes	Yes
Observations	7972	7968
Number of Municipalities	1993	1992

Years: 2001, 2006, 2008. All regressions include year and municipality fixed effects, and contemporaneous population. Instrumental Variable: Distance from Closest UGS X Post-2001. Demographics (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita, Distance from Closest Provincial Capital. Time Polynomial: 4th order polynomial in time. 25th percentile of over-65 population:0.1671; 75th percentile of over-65 population: 0.2471. *p<0.1, **p<0.05, ***p<0.01

Table A.4: Broadband and Party Performance: 2001 and 2013 (IV Results)

	(1)	(2)	(3)	(4)	(5)	(6)
	Center-Right		Center-Left		Outsiders	
Dep. Variable: Votes per eligible voters	PdL	Lega	PD	SEL	Extreme-right	Extreme-left
Broadband Access	0.0009	-0.0059*	0.0148**	-0.0112***	0.0026	-0.0065**
	[0.0070]	[0.0030]	[0.0064]	[0.0041]	[0.0024]	[0.0025]
Mean (2001)	0.290	0.048	0.204	0.062	0.004	0.034
Demographic Control	Yes	Yes	Yes	Yes	Yes	Yes
Demographics (2001) X Time Polynomial	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15938	15938	15938	15938	15938	15938
Number of Municipalities	7969	7969	7969	7969	7969	7969

Years: 2001 and 2008. All regressions include year and municipality fixed effects. PdL: Popolo della Libertá (People of Freedom, main center-right as of 2013); Lega: Lega Nord (Northern League, main junior center-right as of 2013); PD: Partito Democratico (Democratic Party, main center-left as of 2013); SEL: Sinistra, Ecologia e Libertá (Left, Ecology and Liberty, main junior center-left as of 2013); Extreme-right: unreformed fascists and other rightist extremists; Extreme-left: unreformed communists and other leftist extremists. Instrumental Variable: Distance from Closest UGS X Post-2001. Demographic controls: Population. Demographics (2001): Log Population, % Population with Diploma Laurea, % Population under 25, % Population over 65, Firms per capita. Time Polynomial: 4th order polynomial in time. *p<0.1, **p<0.05, ***p<0.01.

Table A.5: Party and Coalition Classification (1996, 2001, 2006, 2008, 2013)

Coalition	1996	2001	2006	2008	2013
Center-right	Forza Italia Alleanza Nazionale CCD-CDU	Forza Italia Alleanza Nazionale CCD-CDU Lega Nord Nuovo PSI Others*	Forza Italia Alleanza Nazionale UDC Lega Nord DC-Nuovo PSI Alternativa Sociale Others*	Popolo delle Libertà Lega Nord MPA- Alleanza per il sud	Popolo delle Libertà Lega Nord Fratelli D'Italia La Destra Others*
Center-left	PDS Rinnovamento Italiano Federazione dei Verdi Partito Popolare Italiano	DS La Margherita Il Girasole PDCI Others*	L'Ulivo PDCI Italia dei Valori Federazione dei Verdi Rifondazione Comunista La Rosa nel Pugno Popolari U.D.EUR Partito Pensionati Others*	Partito Democractico Italia dei Valori	Partito Democractico Sinistra-Ecologia-Libertà Centro Democratico
Outsiders	Lega Nord Rifondazione Comunista Movimento Sociale Tricolore Lista Pannella-Sgarbi Others*	Rifondazione Comunista IDV Lista Pannella-Bonino Others*	Minor parties*	La Sinistra Arcobaleno UDC La Destra-Fiamma Tricolore Others*	Rivoluzione Civile Fare per Fermare il Declino Others*

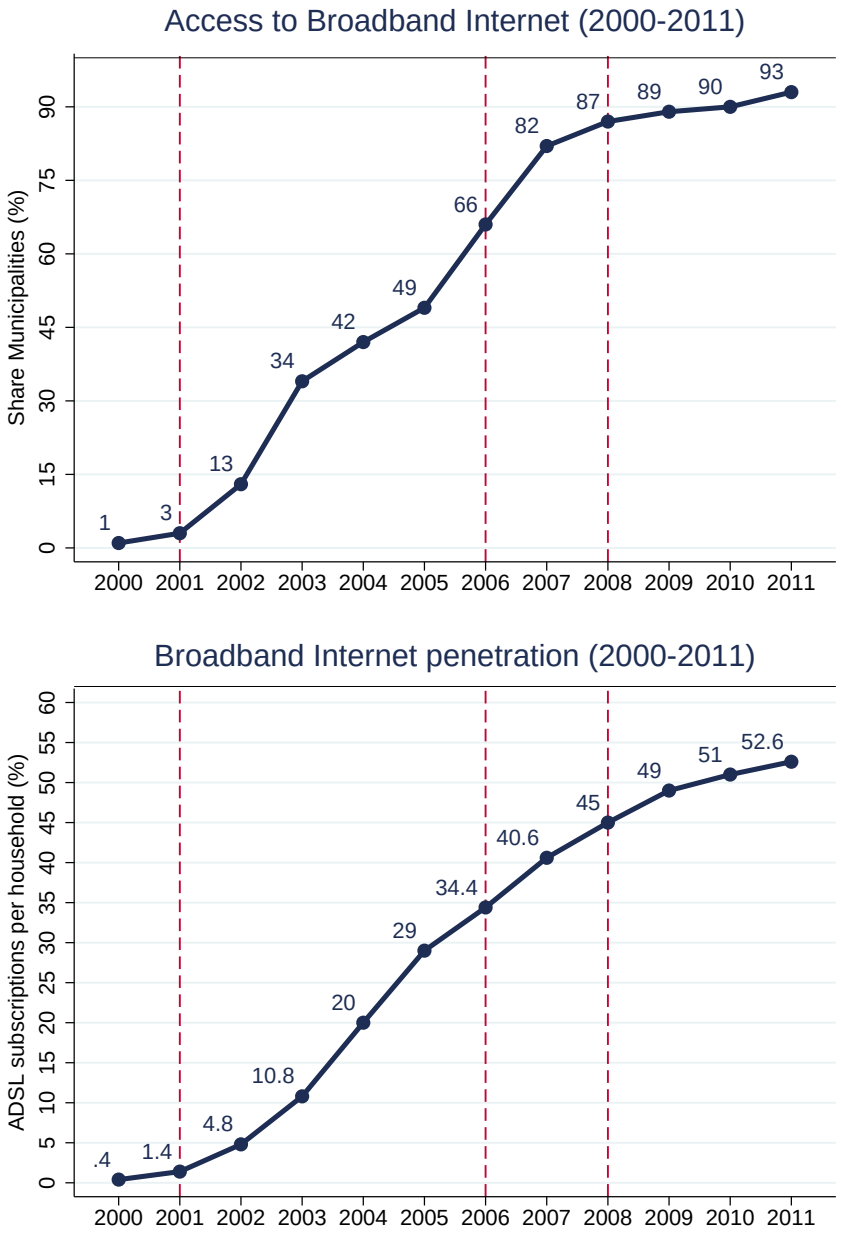
The table reports the parties included in the macro-categories Center-Left, Center-Right and Outsider for each electoral year.
*Parties with vote share below 0.5%.

Table A.6: Party Aggregation (2001, 2008, 2013)

Party	PD	SEL	PdL	Extreme-left	Extreme-right
2001	Democratici di Sinistra + La Margherita	Rifondazione Comunista+ Il Girasole+ Comunisti Italiani	Forza Italia + Alleanza Nazionale	Rifondazione Comunista Comunismo Fronte Nazionale	Fiamma Tricolore Forza Nuova
2008	Partito Democratico	Sinistra Arcolbaleno	Popolo delle Libertà	Sinistra Arcolbaleno Partito Comunista dei Lavoratori Partito Alternativa Comunista Sinistra Critica	Azione Sociale Mussolini Forza Nuova La Destra-Fiamma Tricolore Die Freiheitlichen
2013	Partito Democratico	Sinistra, Ecologia e Libertà	Popolo delle Libertà	Rivoluzione Civile Partito Comunista dei Lavoratori Partito Alternativa Comunista	Forza Nuova Casa Pound Italia Die Freiheitlichen Fiamma Tricolore Progetto Nazionale Rifondazione Missina Italia

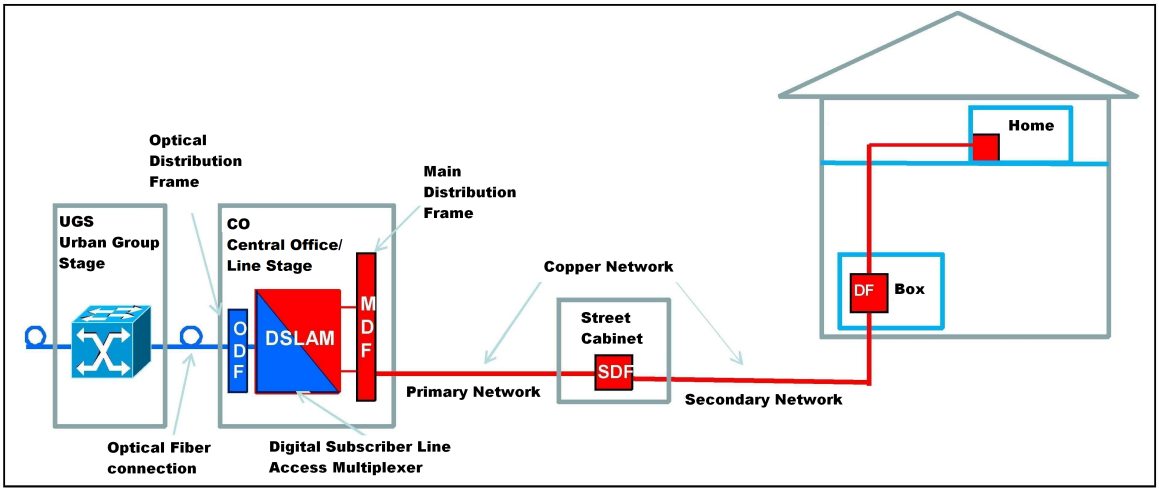
The table reports the parties included in each of the categories in the top row for each election year 2001, 2008, and 2013. The Democratic Party (PD), founded in 2007, resulted from the merger of left-wing *Democratici di Sinistra* and the centrist *La Margherita*; the People of Freedom party (PDL), also founded in 2008, resulted from the merger of Berlusconi's party, *Forza Italia*, and the post-fascist *Alleanza Nazionale*. Parties in the category Extreme-Left (Extreme-Right) were not allied to the Center-Left (Center-Right) coalition.

Figure 1: Evolution of Broadband Access and Penetration in Italian Municipalities



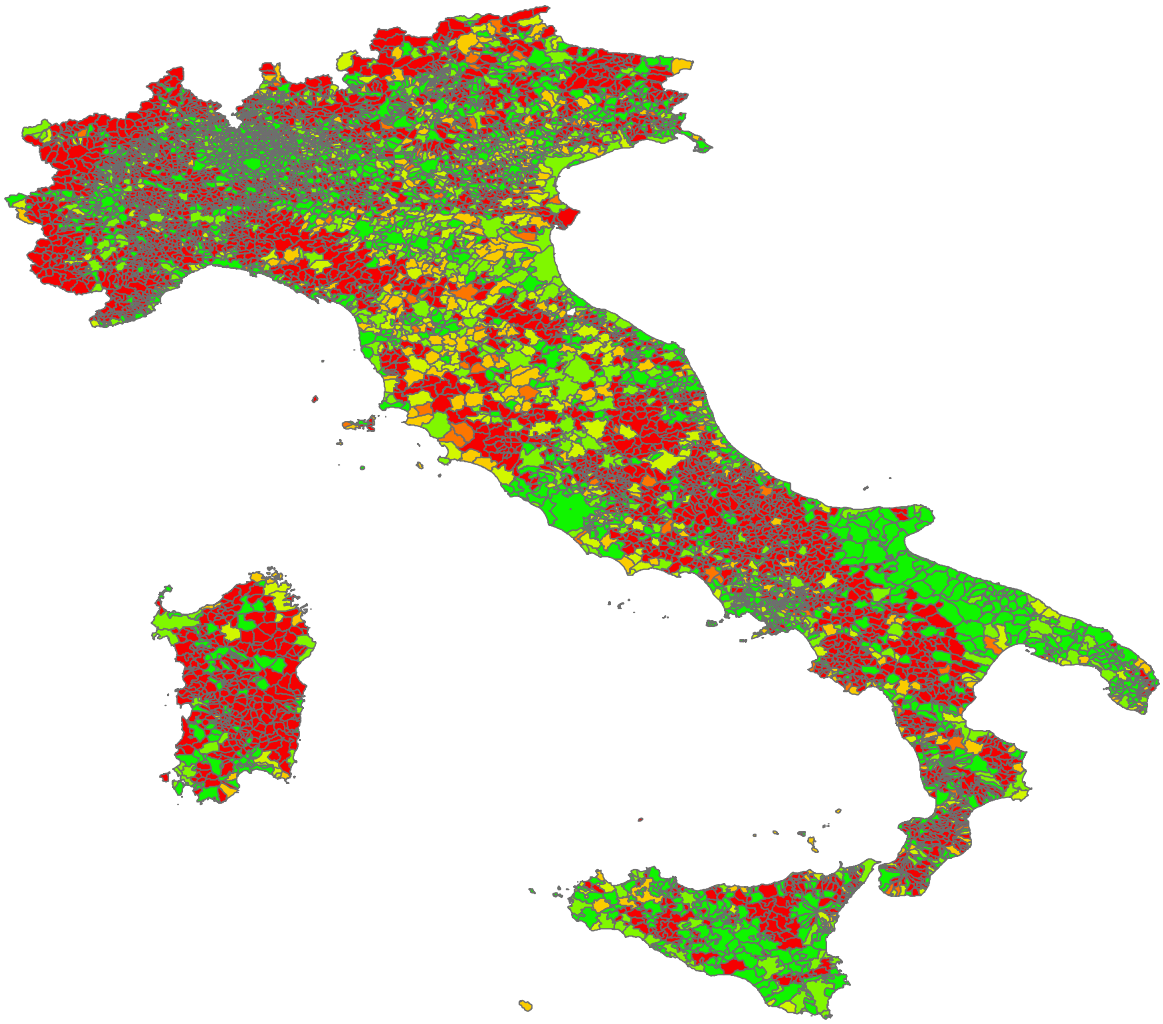
The figure reports the evolution of ADSL availability (top panel) and Internet penetration (share of households with an ADSL subscription, bottom panel), between 2000 and 2011; the dashed vertical lines indicate national elections years (2001, 2006, and 2008). Source: Between (2006, 2008) for ADSL access, and Between (2006, 2008) and AGCOM (2008-2012) for Internet penetration.

Figure 2: Italy's Broadband Infrastructure



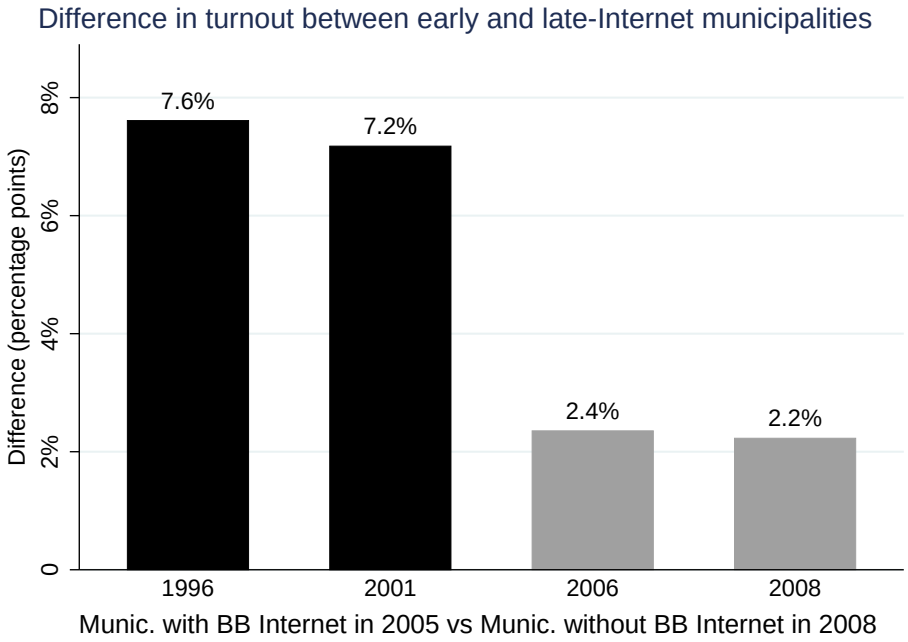
The figure illustrates the main elements of the "Fiber To The Exchange"system characterizing the Italian ADSL infrastructure. The system involves a copper-wire connection between the end user premises and the closest Central Office, and a fiber optic connection between the Central Office and the closest Urban Group Stage. Source: (AGCOM, 2011).

Figure 3: Geographical Distribution of ADSL Access in 2005



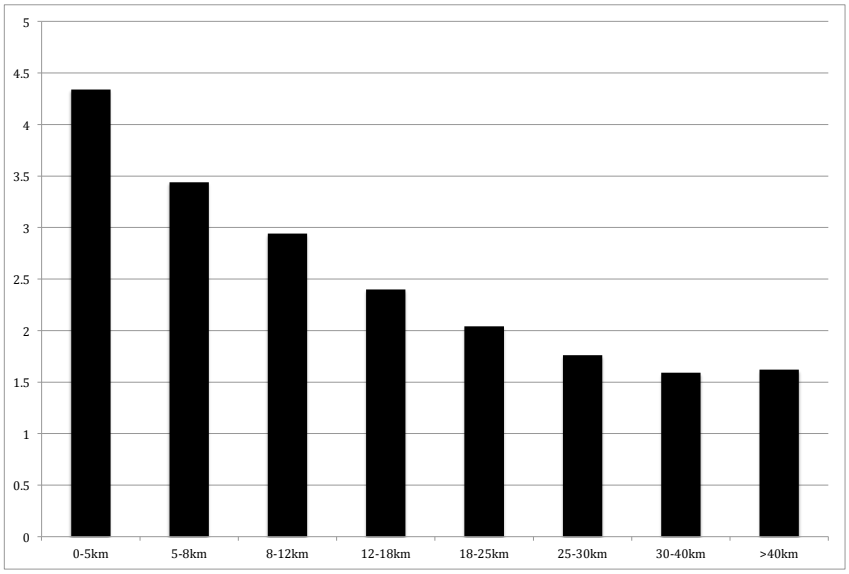
The figure illustrates the distribution of ADSL access across Italian municipalities at the end of 2005 on the 6-point scale used in our data, with darker colora indicating no or low access and lighter colors indicating high or full access. Source: Between.

Figure 4: Difference in Turnout by Timing of Access to ADSL



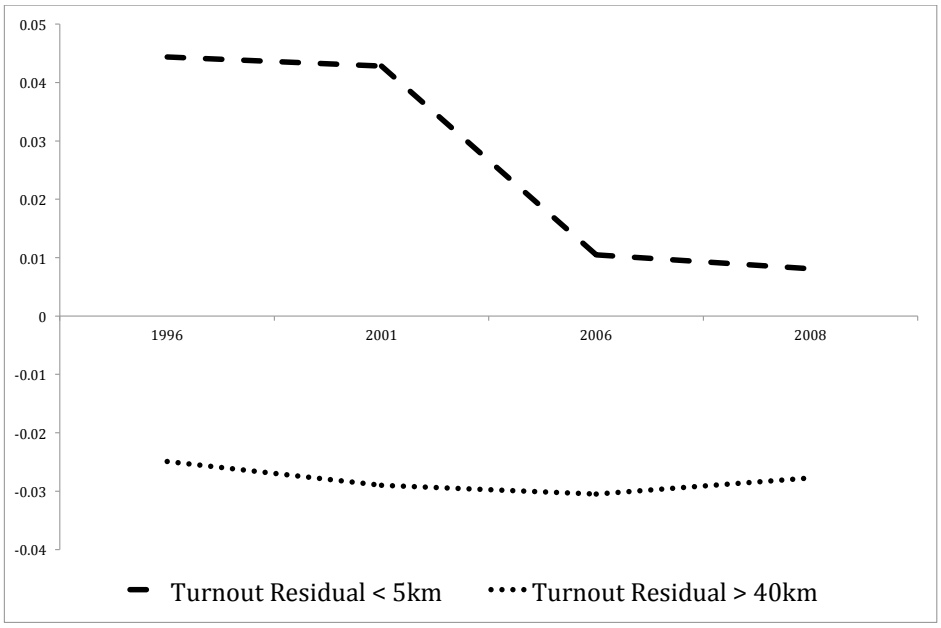
The figure reports the difference in average turnout in the national elections hold in 1996, 2001, 2006 and 2008 (two before and two after the diffusion of ADSL) between municipalities that had access to ADSL in 2005 (the first year for which data are available) and municipalities that still did not have access to ADSL in 2008.

Figure 5: ADSL Coverage (2006) by Distance to Closest UGS



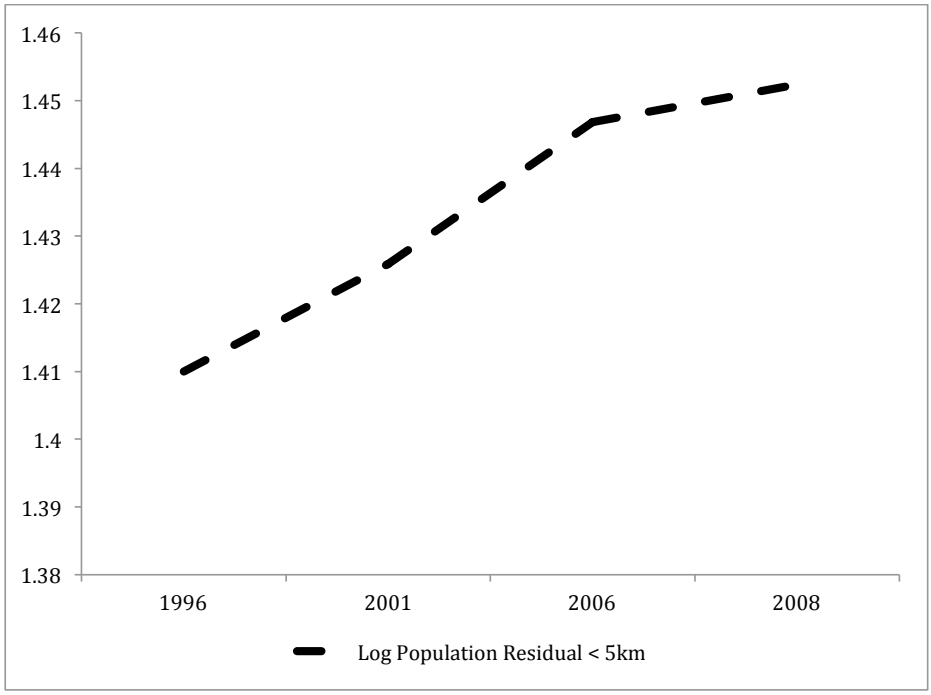
The figure reports the average ADSL access score (from 0 to 5) in 2006 for municipalities located at various distances from the closest UGS (from 0-5 km to 40 km or more). Source: Between.

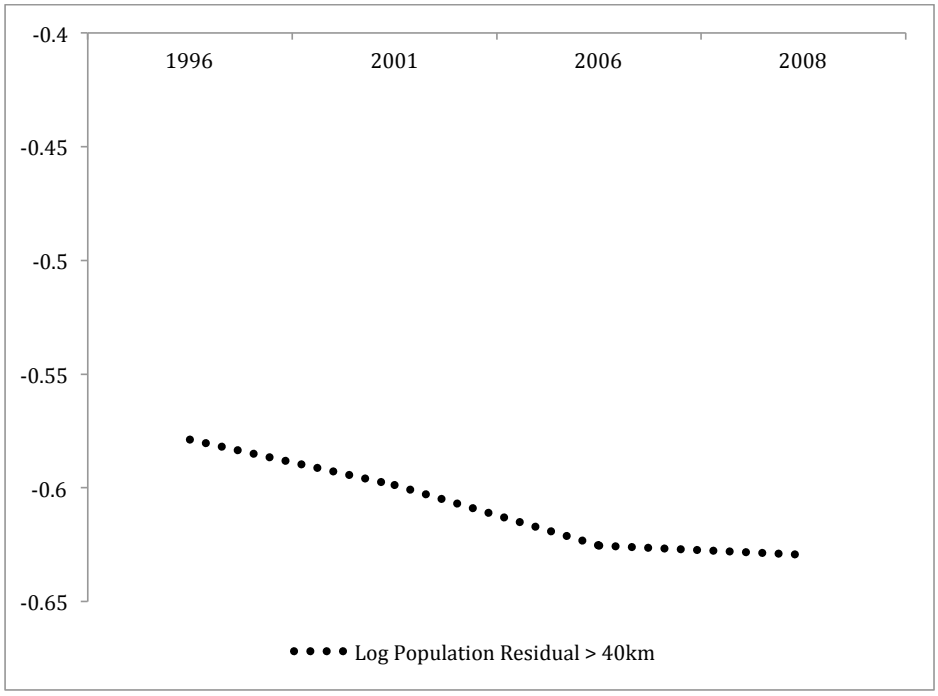
Figure 6: Turnout by Election Year



The figure reports the residual of a regression of electoral turnout in the four national elections between 1996 and 2008 on year fixed effects separately for municipalities located 5km or less (top panel) and 40km or more (bottom) from the closest UGS.

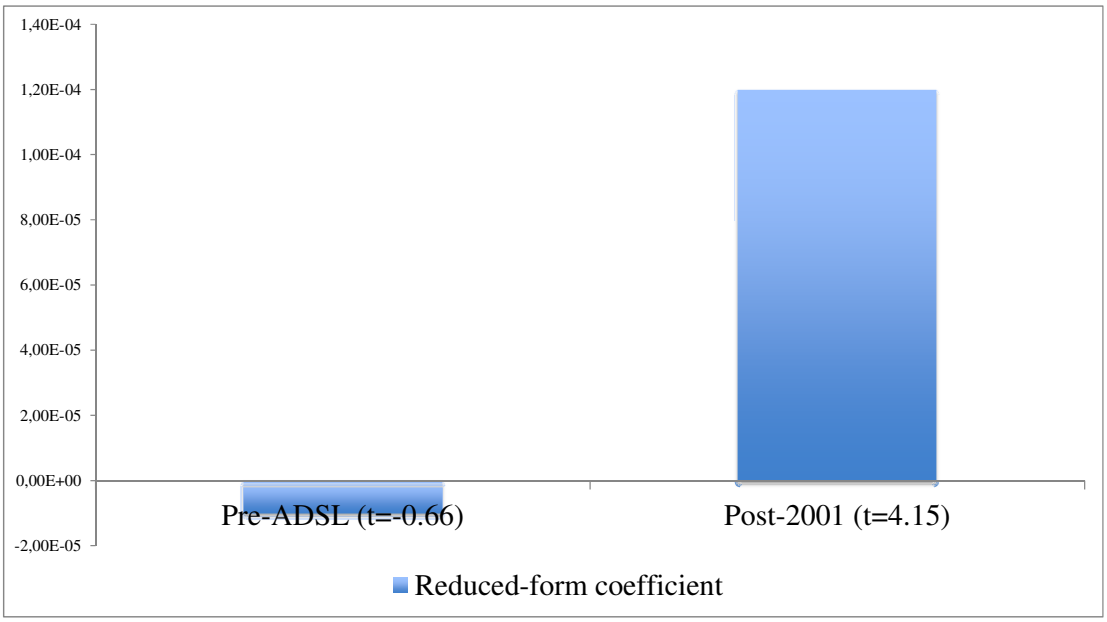
Figure 7: Log Population by Election Year





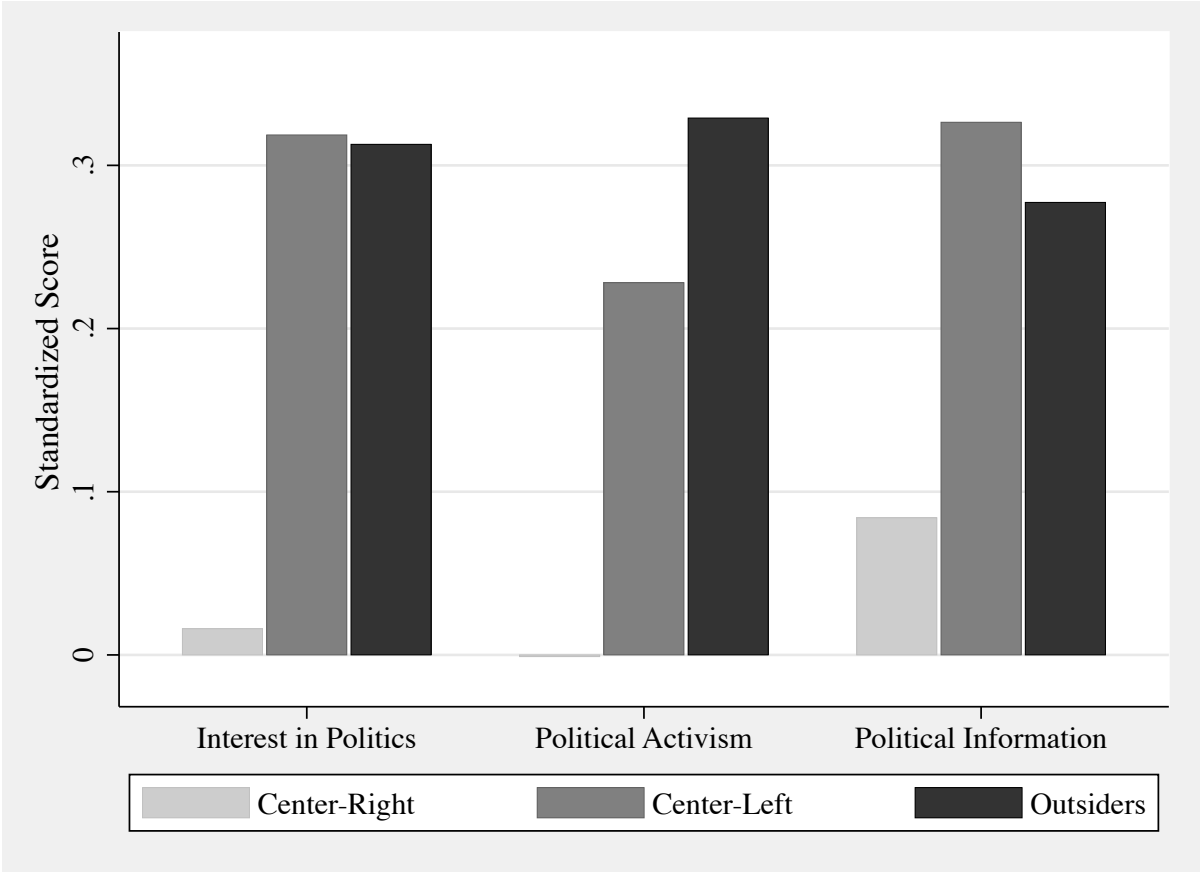
The figure reports the residual of a regression of population between 1996 and 2008 on year fixed effects separately for municipalities located 5km or less (top panel) and 40km or more (bottom) from the closest UGS.

Figure 8: Coefficient from Reduced-Form Regression (ΔTurnout on Distance from Closest UGS)



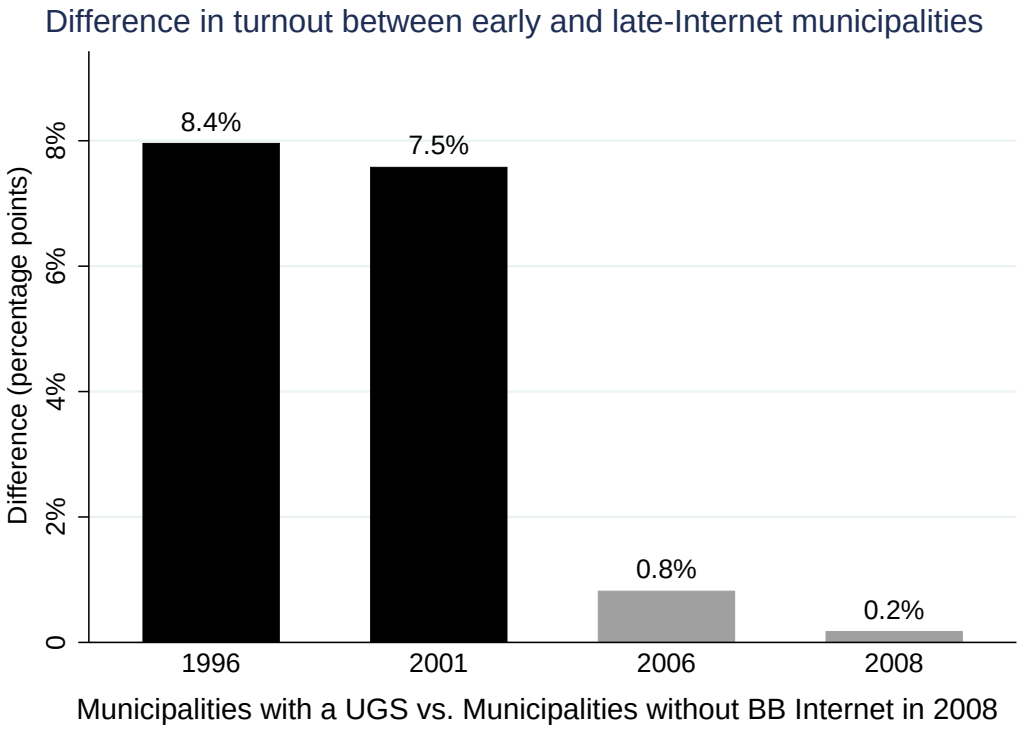
The figure reports the estimated coefficient from a regression of electoral turnout on distance from the closest UGS interacted with time separately for the two pre-broadband elections (1996, 2001) and for the two post-broadband elections (2006, 2008). All regressions include municipality fixed effects and the entire set of controls described in our empirical section.

Figure 9: Interest in Politics, Political Activism and Political Information by Voting Choice (2001)



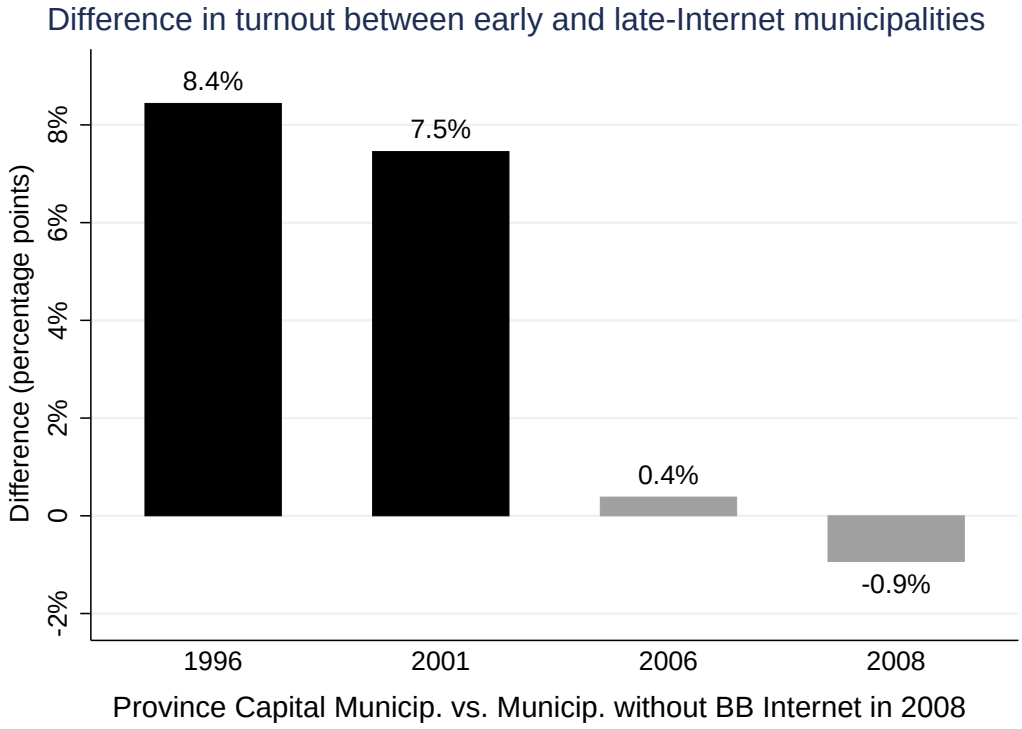
The figure reports the average standardized score in the measures "Interest in Politics", "Political Activism" and "Political Information" separately for voters of the two mainstream coalitions (Center-Right and Center-Left), and of outsider parties. The measures are based on responses to questions included in the 2001 wave of the Italian National Election Study. The variable "Interest in Politics" is based on responses to the question "Generally speaking, are you very interested, fairly interested, a little interested or not at all interested in politics?", with the score recoded as increasing from 0 ("Not at all") to 4 ("Very much"). The variable "Political Activism" is derived from the responses to the following set of questions, by computing the first principal component: "I shall now read a list of things people sometimes do to participate in political life. Please, tell me whether you happened to make any of these things in the last 4-5 years (Yes or No): 1. Signing for law proposals or referenda; 2. Signing in favour of a candidate's or a list's presence in the ballot; 3. Sending letters or complains to public authority; 4. Writing a letter to a newspaper; 5. Participating in a political debate; 6. Participating in a demonstration; 7. Donating money to a candidate, a party or a party's paper; 8. Spending time or work for a party; 9. Attempting to persuade somebody (including family members) to vote for a party or a candidate". Finally, the variable "Political Information" is derived from the responses to the following set of questions, again by computing the first principal component: "Now, I shall read a list of things people did during the last election campaign. For each of them, please tell me if you happened to do it or not. And if you did it, did you do it with interest or without it? 1. Listening radio programs about the elections; 2. Watching television programs about the elections; 3. Reading articles in newspapers or magazines on the elections; 4. Participating in public speeches and meetings about the elections; 5. Reading Internet websites about the elections; 6. Looking at posters about the elections; 7.Watching TV parties' advertisements; 8. Reading flyers or propaganda letters found in my mailbox".

Figure A.1: Difference in Turnout by Timing of Access to ADSL (2)



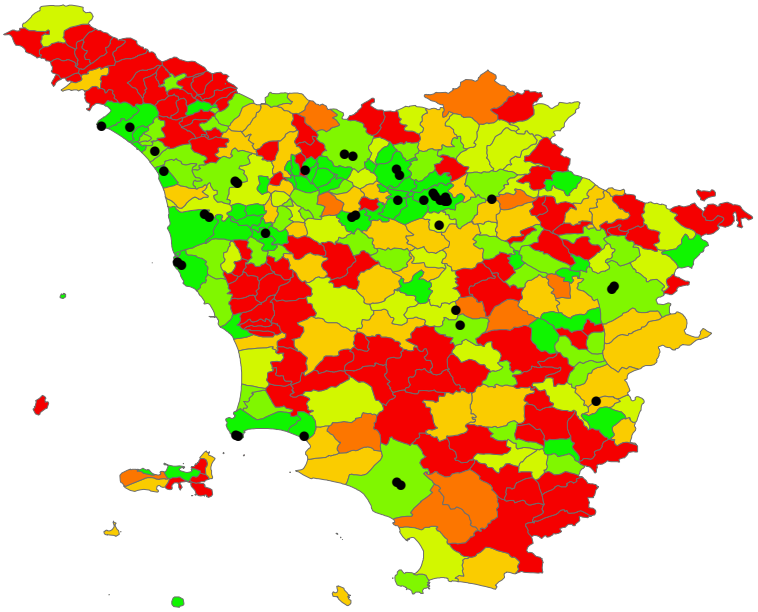
The figure reports the difference in average turnout in the national elections hold in 1996, 2001, 2006 and 2008 (two before and two after the diffusion of ADSL) between municipalities with a UGS (hence, likely to be among the first ones to have access to ADSL) and municipalities that, still in 2008, did not have access to ADSL.

Figure A.2: Difference in Turnout by Timing of Access to ADSL (3)



The figure reports the difference in average turnout in the national elections hold in 1996, 2001, 2006 and 2008 (two before and two after the diffusion of ADSL) between province capitals (the most urban municipalities, hence likely to be among the first ones to have access to ADSL) and municipalities that, still in 2008, did not have access to ADSL.

Figure B.1: Distribution of ADSL Coverage and Location of UGS in Tuscany

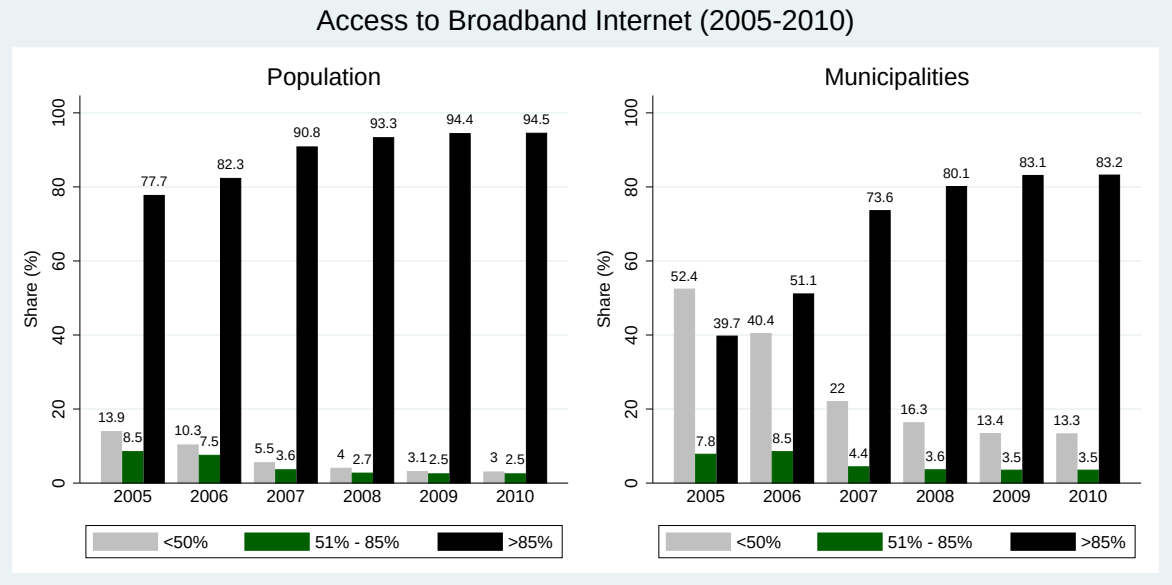


The figure reports the distribution of access to ADSL Internet services across municipalities as of 2005 and the location of UGSs for the region of Tuscany, with ADSL access increasing from darker (limited access) to lighter colors (full access).

Figure B.2: Topographic Map of Tuscany

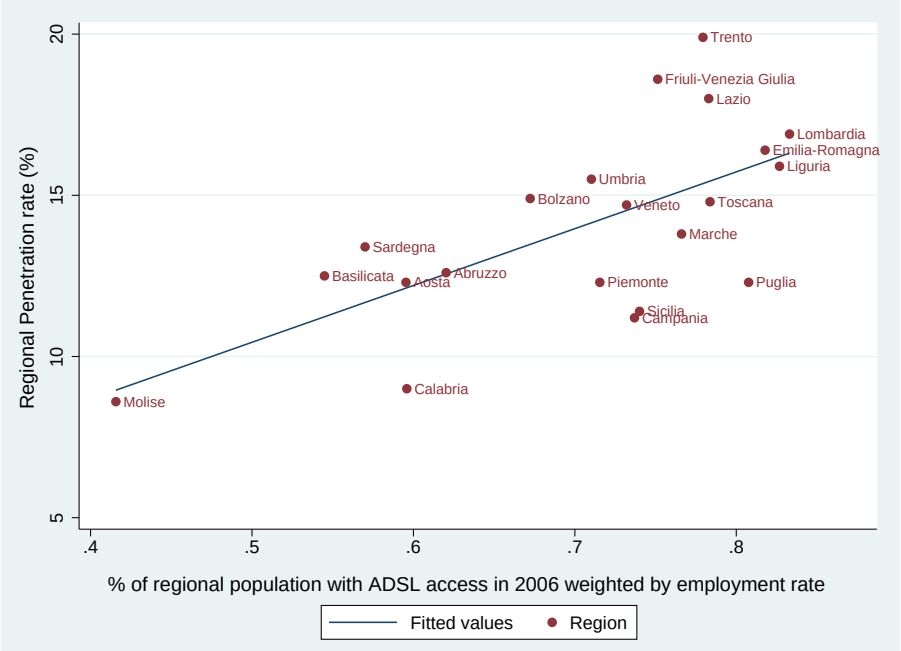
The figure reports the topographic map of Tuscany. The comparison between this map and the one reported in figure B.1 illustrates the relationship between terrain characteristics and access to ADSL technology.

Figure B.3: Evolution of ADSL Coverage (2005-2010)



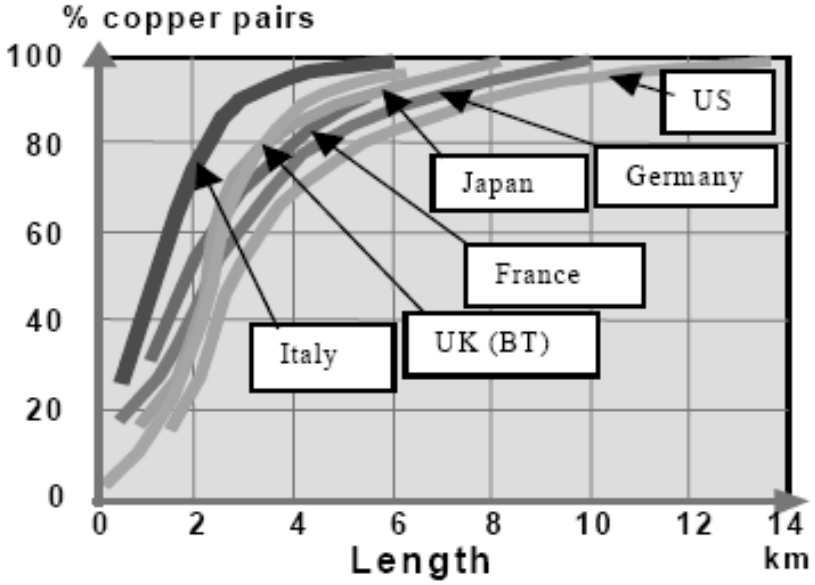
The figure reports the distribution of ADSL coverage by year with the percentage of household with ADSL access increasing from grey (limited access) to black (full access). Source: Between.

Figure B.4: Broadband Penetration and Broadband Access, regional level (2006)



The figure reports the scatterplot of regional broadband penetration against our measure of broadband access for 2006. Source (ISTAT 2013; Between)

Figure B.5: Length of Local Loops in Select Countries



The figure illustrates the distribution of the length of "local loops" in various countries (source: OECD, 2001).