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Internet Use and Political Polarization: the Case of Italy

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Internet Use and Political Polarization: the Case of Italy

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Abstract

What is the effect of Internet diffusion on individual political polarization? I exploit the case of Italy to develop a novel indirect measure of voters' political polarization based on the behavior of the parties they vote for. From the analysis of the 2013 and 2018 national elections, I find a reduction in voters' political polarization over time. Furthermore, by applying an Instrumental Variable approach suggested by Campante, Durante, and Sobbrio (2018), I provide causal evidence against the hypothesis that the Internet increases voters' political polarization.

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Contents

1 Introduction

The global political landscape has suffered drastic changes starting in the second decade of this century. We have observed numbers of voters shifting from supporting incumbent parties to voting for populist politicians in European democracies. Academic literature studying these trends has identified several factors explaining this phenomenon. However, many commentators agree that the Internet in general - and social media in particular - has played a crucial role in the last two decades (Zhuravskaya et al., 2020). Of course, the Internet is not a unique thing, but the sum of the whole environment linked to it, from the laptop to the undersea fiber optic cables, from routers to communications machinery. The real focus is whether more Internet use affects political outcomes, such as participation or polarization. Different commentators have provided evidence about possible mechanisms through which the Internet could affect political outcomes, such as echo chambers (Sunstein, 2001; Flaxman et al., 2016) and differences in news consumption (Boxell et al., 2017; Allcott et al., 2020; Melnikov, 2021). During the Cambridge Analytica scandal, we have all witnessed the potential harm to politics of misinformation spreading online.

The scope of this work is to understand the role of Internet diffusion on voters' political polarization among Italian voters during the election years 2013 and 2018 to test the hypothesis that the Internet, in general, is a driver of polarization. By doing so, I obtained an index of Voters' Political Polarization based on the behavior of the parties they vote for, which is a novel contribution to the economic literature, inspired by the works of Poole and Rosenthal (1985) and Gagliarducci and Paserman (2021). To do so, I first estimate how much parties collaborate in producing new bills in the Italian Chamber of Deputies. Then, for each municipality, I aggregate those party-level indexes by weighting with the share of votes obtained by each party. The result is my Index of Voters' Political Polarization. This index allows me to show that political polarization has decreased from 2013 to 2018. Results come from both an Ordinary Least Squares (OLS) model and an Instrumental Variable (IV) model developed by Campante et al. (2018). The logic of the instrument is to exploit the exogenous part of broadband diffusion in Italy by instrumenting for the costs of building new telecommunication infrastructure, as often the literature has done when studying the effect of Internet availability diffusion (see Guriev et al., 2021). In particular, Campante et al. (2018) leverage the Italian historical background to obtain an instrument based on the distance between each municipality and the pre-existing telecommunication backbone. Following this methodology, I can provide causal evidence that the diffusion of broadband Internet connection harmed voters' political polarization.

The work proceeds as follows. Section 2 overlooks the existing literature about possible relations between Internet usage and political outcomes. In Section 3, I describe the data I employ throughout my analysis. In Section 4, I illustrate the methodology used to obtain my Index of Voters' Political Polarization and the model used to obtain results presented in Section 5. Section 6 presents evidence of the robustness of the results. Section 7 concludes.

2 Literature Review

Many commentators suggest that Internet usage plays, primarily through social media, a key role in amplifying economic, political, and cultural grievances across the world (Zhuravskaya et al., 2020).

After the early enthusiasm for the alleged role of the Internet in coordinating protests and giving a voice to the opposition in autocratic regimes (see Wael, 2012; Zhuravskaya et al., 2020), more recently, observers have started to blame social media in democracies for the rise of populism, the spread of xenophobic ideas and the proliferation of fake news (Müller & Schwarz, 2017; Müller & Schwarz, 2020; Mocanu et al., 2015).

There are different mechanisms through which Internet use could affect political outcomes, but the economic literature highlights mainly two of them: *echo chambers* and *differences in news consumption*. Echo chambers are referred to the exposure to like-minded news forced by social media algorithms, which limits the *"unplanned, unanticipated encounters [that are] central to democracy itself"* (Sunstein, 2001). Instead, when it comes to news consumption, the Internet has been shown to affect both the quality and quantity of our political knowledge (Boxell et al., 2017; Allcott et al., 2020). There are differences between more and less active users, as the first group is more likely to be a victim of propaganda and misinformation (Melnikov, 2021), as we know that the Internet is the primary channel through which misinformation spreads. Plus, more Internet is associated with greater consumption of partisan media, and partisanship affects polarization (Boxell et al., 2017).

2.1 Internet usage over political outcomes

Several papers have studied the impact of the Internet on political participation and voting outcomes in both mature and developing democracies. Falck et al. (2014) and Gavazza et al. (2019a) find that the diffusion of broadband Internet in Germany and the United Kingdom negatively affected political participation. Campante et al. (2018) use an instrumental variable approach based on the historical diffusion of broadband Internet in Italy to find the same negative evidence for Italy until 2008. After this year, the effect switches sign and become positive, presumably thanks to the introduction of social media. Indeed, the Internet has fostered new forms of online and offline political activity through social media, including all the anti-establishment movements labeled as populist. Donati (2019) and Miner (2015) consider the cases of South Africa (2006-2016) and Malaysia (2004-2008) to show that Internet diffusion (respectively, 3G diffusion and broadband diffusion) is associated with greater political participation but a decrease in the support for incumbent parties.

The association between the Internet and the rise of populists in Europe has been confirmed by the analysis of Guriev et al. (2021), which uses the Gallup World Poll for 116 countries at the sub-national-region level for the period 2008–2017. They consider the effect of the spread of 3G mobile networks on incumbent government approval. They show that anti-establishment populist opposition parties in Europe gained political benefits from

expanding mobile Internet infrastructure. There is also specific evidence for Italy, Germany (Schaub & Morisi, 2020; Campante et al., 2018) and the United Kingdom (Gavazza et al., 2019b) showing that support for populists in those countries was higher in municipalities with higher diffusion of broadband coverage. Other recent papers have also studied the effect of the Internet on xenophobia (Bursztyn et al., 2019) and hate crimes (Müller & Schwarz, 2017; Müller & Schwarz, 2020).

2.2 Internet usage over political polarization

Even if the Internet and social media increase exposure to like-minded news (i.e., echo chambers) compared to offline interactions (Flaxman et al., 2016), it is unclear whether this exposure has any real-life impact on political polarization. So far, the literature is inconclusive on this issue, providing arguments and evidence supporting both sides of the debate (Zhuravskaya et al., 2020).

On the one hand, Boxell et al. (2017) studied trends in political polarization using survey data on U.S. voters together with respondents' propensity to obtain news and information online. By computing several standard measures of political polarization, they find evidence that growth in polarization is most pronounced for groups that are less likely to use the Internet and social media. Also, Melnikov (2021) uses the same 3G data as Guriev et al. (2021) to show that the increase in polarization observed in the U.S. did not occur among social media users. Indeed, following the arrival of 3G, more active users became more pro-Democratic, and less active users became more pro-Republican.

On the contrary, Lelkes et al. (2017) look at the effect of broadband Internet availability on political hostility using U.S. survey data and observe a positive impact on partisan hostility and segregation in the consumption of partisan media, which are critical potential drivers of political polarization. There is also evidence coming from the randomized experiments of Mosquera et al. (2020) and Allcott et al. (2020) showing that deactivating Facebook for, respectively, one and four weeks reduced factual news knowledge and political polarization.

The scope of this work is to participate in the current debate about the effect of Internet use on the present political framework by assessing its impact on political polarization. I question aggregated Internet use and whether more Internet use — across all people and all uses — has, on the net, resulted in more political polarization.
I focus my analysis on Italy because Italian elections in the last decade have shown a lot of variation among voters' preferences, with those who mistrust the mainstream media being more exposed to misinformation (Mocanu et al., 2015). In particular, the emergence of the populist movement *"Movimento 5 Stelle"* (M5S) and the following shift from moderate incumbent parties towards more extreme ones - as *"Lega Nord"* (LN) or *"Fratelli d'Italia"* (FI) - reflects the increasing polarization of Italian voters. Indeed, as shown by Iannelli et al. (2021), political campaigns and partisan news media systems have deeply divided public opinion about topics such as immigration into *two irreconcilable views* (Iannelli et al., 2021).

3 Data

Electoral data at the municipal level for parliamentary elections are available from the Italian Ministry of Interior[1]. The Italian administrative system includes 7,900 municipalities, and each municipality belongs to one of 110 provinces and each province to one of 20 regions. Therefore, I focus on a balanced sample of 7,633 municipalities for which I have information for the parliamentary elections held in 2013 and 2018. The data include information on eligible voters, turnout, and votes for individual parties. I consider, in particular, elections for the Chambers of Deputies over elections for the Senate because the former is composed of 630 deputies elected by direct universal suffrage of citizens who have reached 18 years of age. At the same time, the latter requires the minimum age of 25 years for voting.

To measure how much Deputies and parties collaborate, I gathered data on Deputies' activity from 2008 to 2018 from the Chamber of Deputies' database[2]. Every unit of this dataset is a couple of Deputy-bill. For each couple, I collected information about: the activity of the Member of the Parliament (MP) (either sponsorship or cosponsorship), the date at which the bill was presented, a brief description of the bill, and the party to which the Deputy belonged when the bill was presented. The final sample presents data on 61106 MP activity over 5258 bills and 664 Deputies for the 16^{th} legislature (2008-2013) and data on 53700 MP activity over 4384 bills and 664 Deputies for the 17^{th} legislature (2013-2018).

During the 16^{th} legislature each party presented (as sponsor) 657 bills on average. However, most of those (69.3%) were presented by the largest parties, i.e., *"Partito Democratico"* (PD) or *"Popolo della Libertà"* (PDL), as both of them were part of at least one government during that legislature. Differently, during the next legislature, each party presented, on average, 441 bills, with only 47% of the total bills coming from the two major parties, *"Partito Democratico"* (PD) and *"Movimento 5 Stelle"* (M5S). Instead, considering the cosponsorship activity, we find a higher concentration among larger parties. In particular, 78% of the total cosponsorship in the first legislature considered, and 63.5% for the second one. For all those reasons, in my analysis, I will ignore the intensive margin of cosponsorship (i.e., the number of cosponsors from the party) in favor of the extensive margin (i.e., if the party was either a cosponsor or not).

Infratel, an in-house society of the Ministry for Economic Development, provided data on the availability of broadband connection in Italy. The data include information about the proportion of real estate with access to Internet speeds of 2 Mbit/second and above in 2013 and the proportion of real estate with access to Internet speeds of 30 Mbit/second and above in 2018[3]. I choose to use data on broadband access rather than penetration because

[1] https://elezioni.interno.gov.it/opendataData on Italian Elections

[2] https://dati.camera.it/it/Data on Deputies' activity

[3] In the Digital Agenda for Europe (DAE), the European Commission modified the definition of broadband connection by raising the minimum Internet speed requirement from 2 Mbit/second to 30 Mbit/Second (TIM, 2019)

the latter is the result of an individual decision that could be related to political outcomes (i.e., endogenous problem).

Figure 1 shows how broadband availability has developed in Italy from 2013 to 2018, particularly in the southern part of the country. On average, 21% of households in our sample have access to Internet speeds over the minimum threshold, with a standard deviation of 32.6%. Expressly, in 2013 the average number of households connected was 15% ,with a standard deviation of 27.4%, while in 2018, the average was 26.8% and the standard deviation 36.2%, showing an increase of 56% in the average but also a more significant dispersion (i.e., larger inequalities).

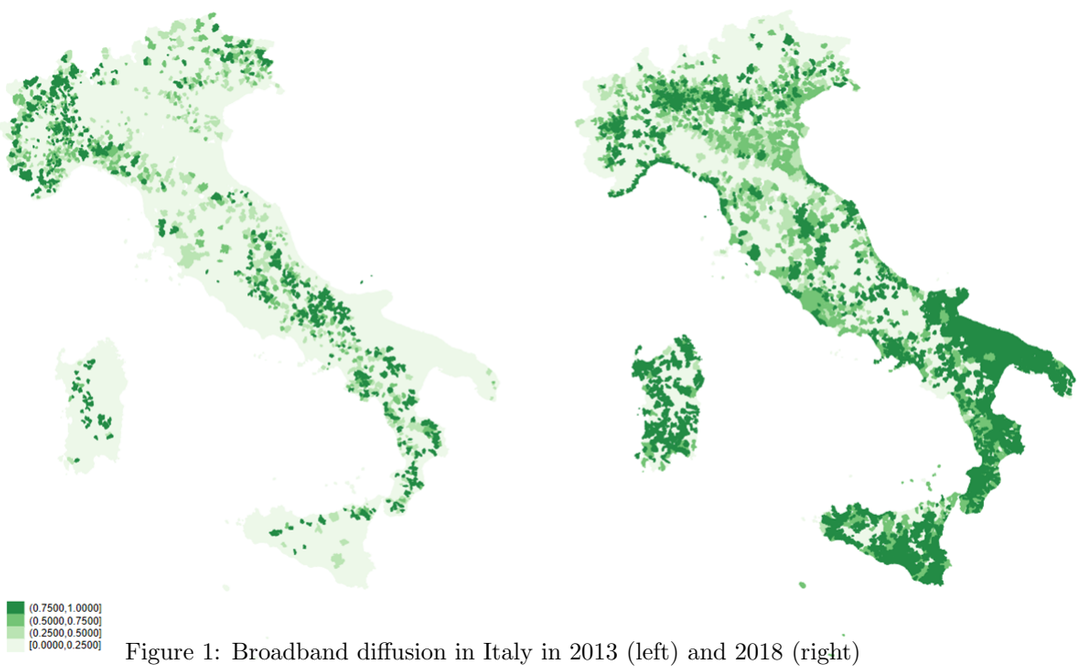

Figure 1: Broadband diffusion in Italy in 2013 (left) and 2018 (right)

Lastly, the Italian national statistical office (ISTAT) provided information on additional socio-demographic and topological characteristics of the Italian municipalities. In particular, I collected information about population, population density, age structure (captured by the share of individuals aged above 65), economic strength (measured with the unemployment level), and the education level (indicated by the share of highly educated individuals), whose importance will be discussed later.

4 Empirical Strategy

This research aims to estimate the effect of broadband availability on voters' political polarization. To perform this kind of analysis, I am going to use a new way of measuring political polarization based on the activity of the Italian Chamber of Deputies (Section 4.1) along with an instrumental variable approach obtained following Campante et al. (2018) (Section 4.4) that could solve problems arising from the standard OLS approach (Section 4.2).

4.1 Measuring Polarization

Given the impossibility of directly measuring individual ideological polarization, the economic literature has developed multiple indirect measures based on individuals' actions (Dalton, 2008; Poole & Rosenthal, 1985; Boxell et al., 2017; Gagliarducci & Paserman, 2021). In the spirit of Poole and Rosenthal (1985), who developed the NOMINATE score based on roll-call votes in the U.S. Senate, I look at cooperation among parties over bills production[4] in the Italian Chamber of Deputies to obtain an index of parties' polarization. Then I look at individual votes in the 2013 and 2018 elections as a measure of individuals' preference over parties' polarization.
This chapter starts with a brief presentation of the Italian Chamber of Deputies, then moves to introducing the Polarization Index for parties and voters.

4.1.1 The Italian Chamber of Deputies

The Italian Chamber of Deputies is the lower house of the bicameral Parliament of Italy (the other being the Senate of the Republic). The two houses together form a perfect bicameral system, meaning they perform identical functions, but do so separately. The Chamber of Deputies has 630 members elected by citizens who have reached 18 years of age (the Senate requires 25 years of age). The Chamber of Deputies is re-elected every five years unless Parliament is dissolved early. In our sample, both legislatures lasted almost five years despite early dissolutions.

The Rules of Procedure state that every Deputy must belong to a Parliamentary Group. Within two days of taking their seats, Deputies must tell the Secretary-General of the Chamber of Deputies to which group they belong. The Mixed Group encompasses all Deputies who do not belong to any other Group. A minimum of 20 Deputies is required to form a Group.

When it comes to the law-making process and the introduction of private members' bills, the Italian Parliament presents some limitations that are undoubtedly less severe than other Western European systems (Mattson, 1995). Moreover, there are no time limits for a bill to be approved, meaning that a bill presented at the very beginning of the legislature has up to five years to move forward through the different steps of the legislative process. Every Member of the Parliament can decide at every moment during the legislative mandate to sign a bill alone or with other deputies, irrespective of their party affiliation (Borghetto

[4]See Gagliarducci & Paserman, 2021 for an earlier application of this approach regarding gender cooperativeness in the U.S. House of Representatives

& Pellegata, 2013). It is also possible for a group of at least 50.000 people to present a bill without the support of a Member of the Parliament, but this happens in 0.01% of the bills in my sample.

In the Italian system, every bill presented by a Deputy has a primary sponsor - the legislator who proposes the bill and attaches his name to the final act - and may have multiple cosponsors who add their names as supporters of the primary sponsor's bill. As shown by Borghetto and Pellegata (2013), the partisan affiliation of the legislator and the composition of the supporting coalition are critical determinants of the probability of approving the bill (see also Gagliarducci & Paserman, 2021). Therefore, since the scope of this analysis is to evaluate how much Deputies collaborate with other Deputies belonging to different parties, I will look at all the bills that were proposed, without any regard for the result of the bills' legislative process, in order to avoid possible problems of endogeneity.

I must mention that multiple governments took place during each legislature I consider. Specifically, the 16^{th} legislature started on 29 April 2008 after President Giorgio Napolitano dissolved the Houses at the start of February 2008. On May the 9^{th}, with the support of "*Popolo della Libertà*" (PdL), "*Lega Nord*" (LN) and "*Popolo e Territorio*" (PT), Silvio Berlusconi started his fourth Cabinet, which lasted until November 2011. Indeed, on 16 November 2011 started a new broad-based government by Mario Monti, where only two parties were not in the majority ("*Lega Nord*" (LN) and "*Italia dei Valori*" (IDV)). The legislature was dissolved by President Napolitano on 22 December 2012, a few months before the end of its natural five-year term. The 17^{the} legislature started on 15 March 2013 after the general election of 24-25 February 2013 and lasted the full five-year term. Three different governments took place during this period thanks to the collaboration of left parties (in particular "*Partito Democratico*" - PD), centrist parties ("*Unione di Centro*" - UDC), and some of the right parties (first PdL and then "*Nuovo Centrodestra*" (NCD), born after the break up inside PdL). The Presidents of the Council of Ministers were, in order, Enrico Letta, Matteo Renzi, and Paolo Gentiloni.

4.1.2 Parties' Polarization Index

Using data on Deputies' activity, I distinguish Deputies that were part of the government majority from those that belonged to the minority (i.e., the opposition) at any time of the legislature. By collapsing data at the bill level, I can label each bill as either sponsored by a majority member or sponsored by a minority member. In particular, I label a bill as sponsored by a majority (minority) member if the primary sponsor was a Deputy belonging to one of the parties in the government majority (minority). The same logic holds for labeling cosponsors. In the end, I came up with a dataset of 5097 bills for the period 2008-2013 and another dataset of 3984 bills for the period 2008-2013 with information about which party and side of the government (either majority or minority) the sponsor and the cosponsors belonged to when the bill was presented.

I define the Party Index of Polarization of party p during legislature t (PI_p^t) as the share of bills sponsored by Deputies of party p and cosponsored by Deputies of parties belonging to the same government side out of the total number of bills sponsored by Deputies of party p. In other words, the Parties Index of Polarization for party p represents the probability of having collaborated with a party associated with the opposite side of the government table. Define $F_{p,k}^t$ as the raw count of how many bills party p presented as a sponsor along with party k as a cosponsor during legislation t and the set Majority_τ (Minority_τ) as the set of parties that make up the government majority (minority) at the moment τ of the legislature. Then, the Party Index of Polarization is as follows:

$$PI_p^t = \frac{F_{p,Majority}^t * 1\{p \in Majority_t\} + F_{p,Minority}^t * 1\{p \in Minority_t\}}{F_{p,Majority}^t + F_{p,Minority}^t}$$

The distinction between legislature t and time τ comes from the multiple numbers of government majority that were present during each of the legislature considered (see Section 4.1.1). The complementary of the Parties' Polarization Index (i.e., 1 - PI_p^t) represents an index of collaboration: how much party p collaborates with parties belonging to the opposite side.

I obtain that the big parties present in both the legislature (namely, PD, PDL and LN) suffered minimal changes in their estimated polarization, moving from the first legislature to the second. Instead, parties that only entered the Parliament during the 17^{th} legislature result in being, on average, more polarized than parties who were only present in the 17^{th} one. The scores obtained for each party are shown in Table 6 in the Appendix.

There are some concerns regarding the previous measures. In particular, it might sound unreasonable to count as polarization when two parties on the opposite side of the ideological spectrum work together, but this might be the case during broad-based governments[5]. In order to verify that this concern does not affect our results, I developed two other indexes as a robustness check of the Parties' Polarization Index based on majority and minority. In particular, I apply the same logic as the former index, and I just change the partitions of the set of parties. For the first measure, I divide parties according to the coalition they belonged to at the first elections after the legislature, such that Coalitions = {"Left"; "Right"; "Others"}[6] and the Index becomes:

$$PI_{p,c}^t = \frac{F_{p,c}^t}{\sum_{c \in Coalitions} F_{p,c}^t} \tag{1}$$

This index tells the share of bills that each party presents only with parties belonging to the same coalition out of the total number of bills presented. Once again, the complementary of this Coalition Polarization Index (i.e., 1-$\text{PI}_{p,c}^t$) tells us how much party p collaborates with

[5] As the Mario Monti's government

[6] See Section 7 in the Appendix for the complete list of parties in each coalition and the estimated scores.

parties that are members of different coalitions.

The second measure counts each party as per se, such that a bill increases the polarization of the party only if no cosponsors are coming from a party different from the sponsor's. Therefore, in this case, the induced partition is the set of parties.

$$PI^t_{p,c} = \frac{F^t_{p,p}}{\sum_k F^t_{p,k}} \tag{2}$$

This last measure ignores the existence of neither coalitions nor governments, but this allows us to understand where the differences - if there are - between the two previous estimators come from.

I will continue the rest of the analysis using the Parties' Polarization Index based on the membership to the government majority/minority because it looks more reasonable to me, particularly for the Italian political landscape and the period considered.

4.1.3 Voters' Political Polarization

In order to measure the level of Political Polarization among voters, I consider the vote itself as a revealing political polarization preference of the voter (i.e., the voter prefers the party who reflects the most his level of political polarization). This assumption makes particular sense for the considered sample because of the presence of M5S in the 2013 elections, whose electoral success has often been attributed to its ability to occupy the space of radical protest against the forces of the "old politics" identified primarily with the existing parties and their leaders (Corbetta & Gualmini, 2013; Passarelli & Tuorto, 2016). That being the case, I also made a further assumption about the Parties' Polarization Index of those parties who were not in the Parliament during the legislature. Indeed, since I cannot to observe their behavior as Deputies, I cannot estimate my index for them. Therefore, to overcome this problem, I assume the maximum level of polarization for all those parties (i.e., PI^{t-1}_p=1). Indeed, this assumption is only relevant for the M5S in 2013 [7], which we have already established as a benchmark for the political polarization between parties as they presented themselves in opposition to the old politics.

That said, I estimate the Index of Voters' Political Polarization for municipality m and legislation t ($\text{PI}_{m,t}$) as the weighted average of Parties' Polarization Index at time *t-1* (PI^{t-1}_p), where the weights $w^t_{p,m}$ are the share of votes obtained by party p at the elections for the legislature t in municipality m.

$$PI_{m,t} = \sum_p w^t_{p,m} PI^{t-1}_p \tag{3}$$

Figure 2 shows how Voters' Political Polarization has reduced from 2013 to 2018. Specifically 94.55% of the Italian Municipalities reduced their Voters' Political Polarization level.

[7] Results would not change if I modified the value for all the other excluded parties because of the small share of votes obtained at the elections by them.

Given that most of this difference is driven by massive number of votes that the populist parties (e.g., M5S) received at the 2013 national election, we might expect different patterns according to the country's. Rodríguez-Pose (2018) documents that people who live in "places that don't matter" are those who voted for populist parties to revolt against the status quo. He refers mainly to those countries and cities that have suffered most from globalization (see also Piketty, 2018). Therefore I control for possible heterogeneity in the pattern of Voters' Political Polarization by looking at differences between urban and rural areas and between the North, the Center, and the South of Italy. As Figure 3 and 4 (in the Appendix) show, we observe no particular independent pattern across any of those dimensions that are worth investigating.

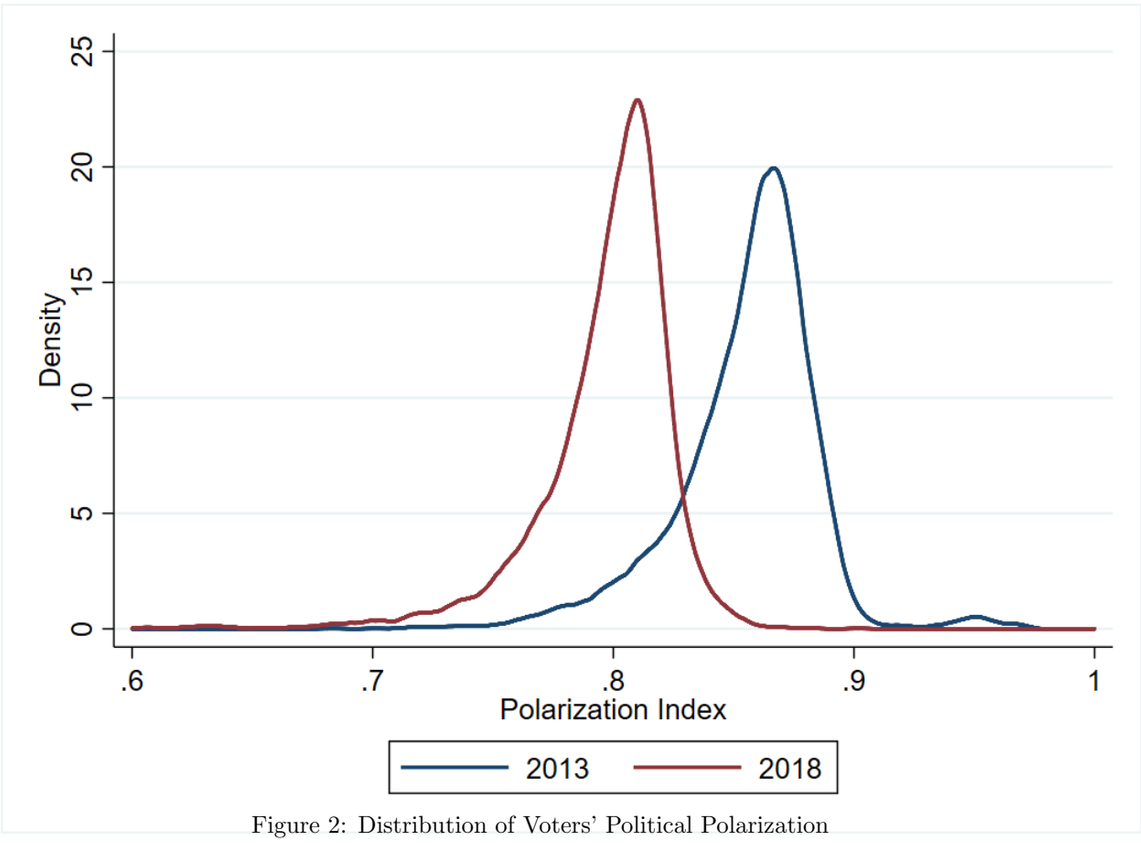

Figure 2: Distribution of Voters' Political Polarization

4.2 OLS Model

To estimate the effect of broadband Internet diffusion on voters' political polarization, I perform the following identification strategy. First, I consider

$$PI_{m,t} = \alpha_t + \eta_r + \beta Broadband_{m,t} + \gamma X_{m,t_0} + \epsilon_{m,t} \tag{4}$$

where m and t indicate, respectively, municipality and electoral year. $PI_{m,t}$ is our outcome variable of interest, the Voters' Index of Polarization, α and η are sets of time and region fixed effects, and X includes a set of control variables that I discuss below. *Broadband* is the share of real estate in municipality m that at time t have access to Internet connection which speed is above a time varying-cutoff, as explained in Section 3. The implicit assumption behind the model, i.e., $E[\epsilon|Broadband, X] = 0$, may fail if the Internet availability is not random but an outcome of strategic choices.

4.3 Strategic Concerns

Strategic concerns did play a role in determining where the Internet service providers would roll out broadband connectivity first, as those entities are profit maximizing-agents. Therefore it is crucial to understand the determinants of revenues and costs.

I look up to Schaub and Morisi (2020). They report how the degree of urbanization (or, equivalently, the population density) represented a key determinant of the expected future returns for Internet service providers. On the other hand, meaning the costs, they underline how important is the steepness of the terrain of a municipality for building new infrastructures by mentioning how rugged areas tend to be more poorly provided with all forms of telecommunication technology. There is also evidence that municipalities with relatively high education levels, a youthful population, and a strong economy were given preference during the roll-out (Schaub & Morisi, 2020). My empirical model considers this process of assignment of broadband coverage by including demographic and topological characteristics at the municipality level. Once those characteristics are considered, the population in more poorly covered areas should be comparable to those in better-covered areas.

Even considering all the characteristics I have just introduced, the Italian historical background offers a peculiar pattern for the development of broadband availability in the country. Indeed, as explained by Campante et al. (2018), 2001 represents the starting year for the rapid diffusion of broadband in Italy, provided through Asymmetric Digital Subscriber Line (ADSL) technology. They also explain how this diffusion meant the expansion of the preexisting telecommunication infrastructures. In particular, the cost of connecting a new municipality to the existing backbone is a function of the distance between the municipality's telecommunication exchange (or "central office") and the preexisting closest Urban Group Stage (UGS), a higher-order telecommunication exchange. Since this connection had to be made through fiber optic cables and since those cables require to be laid underground (unlike copper wires) it involves higher costs. Hence, all else equal, the closer to a UGS a municipality happened to be when ADSL came into the picture, the more likely that an Internet service provider would have supplied that municipality with ADSL access earlier. It is essential to underline that the distribution of UGS in Italy was not random but followed the population density. However, we have already decided to take this characteristic into account. Therefore we should not worry about possible endogenous effects.

4.4 Instrumental Variable Model

Considering the strategic concerns presented above, I obtain my final model following Campante et al. (2018) and implementing an Instrumental Variable Model to find the causal impact of broadband diffusion on Voters' Political Polarization. The Two Stages Model presents as follows:

$$PI_{m,t} = \alpha_t + \eta_r + \beta Broadband_{m,t} + \gamma X_{m,t_0} + \epsilon_{m,t} \tag{5}$$

$$Broadband_{m,t} = \phi Distance_m + \gamma_t + \theta_r + \sigma X_{m,t_0} + \iota_{m,t}$$

where α and γ are sets of time fixed effects, η and θ are sets of region fixed effects, and X encompasses the municipality characteristics we have discussed above. In particular, I have used population density, the share of individuals aged above 65, the employment level, and the share of highly educated individuals, all measured in 2001 - before the start of the diffusion of broadband Internet in Italy. Broadband is the same variable presented in Section 4.2. Note that the set of controls and fixed effects included, plus a dummy for being in an Urban or Rural area, help us control in multiple ways for the possibility that small, isolated towns that are more likely to be far from a UGS may have differential trends in our variables of interest, as compared with larger urban centers.

5 Results

My central question is: what is the effect of broadband Internet access on Voters' Political Polarization? I will consider the Voters' Index of Polarization obtained from the national election of 2013 and 2018 and the Parliamentary activity during the 16^{th} and 17^{th} legislatures. From an empirical perspective, the municipality level is the higher level of granularity that my data could offer, with a sample of almost 8000 municipalities.

5.1 Main Results

The main results arising from this analysis are presented in Table 1. It is possible to notice how already the OLS Model provides negative evidence even when controlling for region and time fixed effects (Column 1 and 2). But once I introduced our Instrumental Variable Model, the magnitude of the estimates almost increased tenfold from -0.015 to -0.139 in Column (3). The economic significance of this result is that a one Standard Deviation (SD) increase in Broadband availability implies a 5.5% reduction in Voters' Polarization Index for the average Voters' Polarization Index. In other words, the higher the access to the Internet, the lower the Voters' Political Polarization - on average.

	Voters' Polarization Index		
	OLS		*IV*
	(1)	(2)	(3)
Broadband	-0.015^{***}	-0.015^{***}	-0.139^{**}
	(0.002)	(0.002)	(0.058)
Observations	15,422	15,422	15,422
Demographic	Y	Y	Y
Topological	Y	Y	Y
Year FE		Y	Y
Region FE		Y	Y
F-Test			20.78^{***}
Mean of Outcome	0.83		
Mean (SD) of Treatment	0.21 (0.33)		

Note: *p<0.1; **p<0.05; ***p<0.01

Table 1: Results from OLS and IV models

Moreover, I find that the instrument used has an F Statistic of 20.78, which fulfills the requirements of the standard F-Test (i.e., F> 10), but we are still managing a Weak Instrument. Therefore, implementing specific techniques that could mitigate the issues could be of interest for further analysis. Nonetheless, it is still worth mentioning how an instrument based on Internet diffusion that mainly happened at the very start of the 2000s is still valuable for Internet diffusion between 2013 and 2018.

5.2 Compliers

The effect found is a Local Average Treatment Effect (LATE) rather than a pure Treatment Effect (TE). Therefore it is worth investigating who the compliers are to understand whether the results might or might not have a global effect. Unfortunately, since our treatment is a continuous variable, I cannot perfectly distinguish compliers from always/never takers. Therefore, I perform my analysis by labeling as Compliers those municipalities m that experienced a change in broadband availability from 2013 to 2018 (also refer to Figure 1) and by testing, if the characteristics of this subsample are different from those of the full panel.

Table 2 presents the average for the main characteristics of our municipalities, plus the p-value from the T-test performed between the two populations over each characteristic. It is possible to observe how compliers are more populated municipalities with a higher population density but a higher level of unemployment. There is also evidence at the 10% level that those municipalities are more populated by older people and more educated ones. This could suggest that we are treating more municipalities belonging to an urban area, but this does not appear to be the case. Instead, there is a difference in the geographical distribution of the

compliers as we have a higher representative belonging to the southern part of the country at the expense of the northern part. This was already anticipated in Figure 1, where it is possible to notice the incredible development of broadband connection in the South. Last but not least, our compliers display a lower steepness of the terrain, meaning they faced a lower cost of connecting to the preexisting backbone, as suggested by our instrumental variable approach (Section 4.4), which could partially explain why they changed their level of connectivity.

	Full Sample	Compliers	Difference	T-test *(p-value)*
No. of Observations	7,711	5,902	1,809	
Population	7,293	8,922	-1.629	0.0305**
Population Density	286.3	317,8	-31.5	0.0066***
% Over 65 yrs old	33.55	34.03	-0.48	0.0523*
% Highly Educated	35.99	36.26	-0.27	0.0665*
Unemployment	10.33	10.65	-0.32	0.0367**
Steepness of the terrain	9.98	9.72	0.26	0.047**
% Northern Italy	54.69	52.54	2.15	0.0128**
% Center Italy	12.29	12.70	-0.41	0.4703
% Southern Italy	33.02	34.75	-1.73	0.0344**
% Urban Area	47.76	48.78	-1.02	0.2453

Note: *p<0.1; **p<0.05; ***p<0.01

Table 2: Average characteristics of the Compliers

Nonetheless, the differences are minimal in magnitude - even if often statistically significant at the 5% - and we can represent almost the entire sample (5,902 out of 7,711), meaning that I would expect to see no significant differences between the Average Treatment Effect and my Local Average Treatment Effect.

6 Robustness

As introduced in Section 4.1.2, multiple indexes of polarization for parties were obtained by changing the partition of the set of parties. Specifically, I have obtained one measure according to the national elections' coalitions and one measure by considering each party as a standalone. By repeating the analysis we have done using the partition induced by the distinction between Majority and Minority, I obtain results that are consistent and coherent for both indexes. Results coming from the Instrumental Variable model (column 4 and 6 of Table 3) are even more prominent in magnitude, i.e., -0.184 and -0.237, which indicate that a 1 SD increase in broadband availability implies - respectively - a 6.9% and 13% reduction in Voters' Political Polarization. On the contrary, results coming from OLS are either not significant or positive, which suggests how we should stick our interpretation to the Instrumental Variable approach.

	Deputies partitioning method:					
	Majority/Minority		Coalitions		Single Parties	
	OLS	*IV*	*OLS*	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)	(5)	(6)
Broadband	-0.015^{**}	-0.139^{**}	0.002	-0.184^{***}	0.008^{***}	-0.237^{***}
	(0.002)	(0.058)	(0.002)	(0.066)	(0.002)	(0.079)
Observations	15,422	15,422	15,422	15,422	15,422	15,422
Demographic	Y	Y	Y	Y	Y	Y
Topological	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Regional FE	Y	Y	Y	Y	Y	Y
F-Test		20.78^{***}		20.78^{***}		20.78^{***}
Mean of Outcome	0.83		0.88		0.60	
Mean (SD) of Treatment	0.21 (0.33)					

Note: *p<0.1; **p<0.05; ***p<0.01

Table 3: Results using different estimators

More tests for the robustness of the results were computed by considering results from the analysis of cosponsors' activity rather than the sponsors' one. In other words, instead of caring about who was the sponsor when party p was the sponsor of the bill, I consider who were the sponsor when party p was cosponsoring a bill. The main difference between those two approaches is that for a sponsor, is it possible to present a bill completely alone, i.e., without any cosponsors at all. Instead, the cosponsor activity must be linked to someone else first moving. Table 4 presents results obtained by using the coalition partition as described in 4.1.2.

	Voters' Polarization Index		
	OLS		*IV*
	(1)	(2)	(3)
Broadband	-0.062^{***}	-0.065^{***}	-0.024
	(0.003)	(0.003)	(0.041)
Observations	15,422	15,422	15,422
Demographic	Y	Y	Y
Topological	Y	Y	Y
Year FE		Y	Y
Region FE		Y	Y
F-Test			20.78^{***}
Mean of Outcome	0.52		
Mean (SD) of Treatment	0.21 (0.33)		

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: Results using Cosponsors' Activity

Moreover, I investigated the possibility that the information about Internet availability at time t could explain only the polarization arising from Deputies' activity in the same year t. In other words, it could be the case that the level of Internet access in 2018 was mainly explaining what the Parliament has done in 2017 or 2018 since the elections were held at the start of the year, and the level of broadband connection does not vary so much year by year. In order to control for this possibility, I re-estimate five different Parties' Indexes of Polarization, one per year of the legislature. Table 5 presents the results obtained according to this procedure. All five measures are negative and statistically significant for broadband availability measured in the election year, with similar magnitude. This result provides evidence against the hypothesis that the effect of Internet availability in the year t only explains Parliamentary activity in the same year.

	Year of the legislature used:									
	5^{th}		4^{th}		3^{rd}		2^{nd}		1^{st}	
	OLS	*IV*	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Broadband	-0.013^{***}	-0.114^{***}	-0.011^{***}	-0.122^{***}	-0.012^{***}	-0.118^{***}	-0.012^{***}	-0.116^{***}	-0.012^{***}	-0.125^{***}
	(0.002)	(0.042)	(0.002)	(0.042)	(0.002)	(0.042)	(0.002)	(0.042)	(0.002)	(0.042)
Observations	15,422	15,422	15,422	15,422	15,422	15,422	15,422	15,422	15,422	15,422
Demographic	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Topological	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Region FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mean of Outcome	0.87		0.87		0.87		0.86		0.89	
Mean of Treatment	0.21 (0.33)									

Note: Table 5: Results using years-of-the-legislature estimators *p<0.1; **p<0.05; ***p<0.01

7 Conclusions

In this paper, I tried to understand if the diffusion of broadband connection in Italy had an effect on voters' political polarization in the period 2013-2018 and which is the direction of this effect. In order to perform this analysis, I have developed an index of voters' political polarization that is entirely based on parliamentary activity, which is a novel contribution to the economic literature. First, inspired by the works of Poole and Rosenthal (1985) and Gagliarducci and Paserman (2021), I have evaluated the level of polarization of Italian parties by looking at their activity in the Chamber of Deputies. I have an understanding how much they avoid collaborating with parties belonging to the opposite side by looking at the share of bills presented without those parties. Next, I have weighted the estimated Parties' Index of Polarization with the share of votes received, at the municipality level, during each national election, in order to obtain my Voters' Index of Polarization and provide evidence that a reduction has occurred from 2013 to 2018 in voters' polarization.

Following, by performing an Instrumental Variable Model inspired by Campante et al. (2018), I can provide causal evidence against the hypothesis that the Internet, in general, is a driver of polarization. Indeed, my results go in the same direction as Boxell et al. (2017), even though I cannot perform their distinction between more and less active users. This level of analysis would be of enormous interest. This work provides enough evidence to continue investigating the Political Polarization in Italy by performing more heterogeneous analysis at the individuals level. Moreover, it leaves space for the improvement of the Voters' Index of Polarization - for example by implementing a text analysis that could skim among all the bills to consider only those concerning polarizing topics.

Appendices

Table 6: Parties Scores on Parties Polarization Index

Party		Legislature	
		16^{th}	17^{th}
Partito Democratico	PD	0.820	0.866
Italia dei Valori	IDV	0.645	
Scelta Civica	SC		0.867
Nuovo Centro Destra	NCD		0.895
Centro Democratico	CD		0.857
Liberi e Uguali	LeU		0.907
Futuro e Libertà	FeL	0.804	
Lega Nord	LN	0.902	0.859
Popolo della Libertà	PDL	0.853	0.897
Fratelli d'Italia	FI		0.356
Unione di Centro	UDC	0.608	
Movimento 5 Stelle	M5S		0.871
Gruppo Misto		0.792	0.805

Table 7: Coalitions scores on Coalitions Polarization Index

Coalition	16^{th} Legislature		17^{th} Legislature	
	Score	Parties in the Coalition	Score	Parties in the Coalition
Left	0.813	PD, IDV	0.901	PD, SC, NCD, CD, LeU
Right	0.877	FeL, LN, PdL	0.965	LN,PdL,FI
Other	0.852	UDC	0.973	M5S

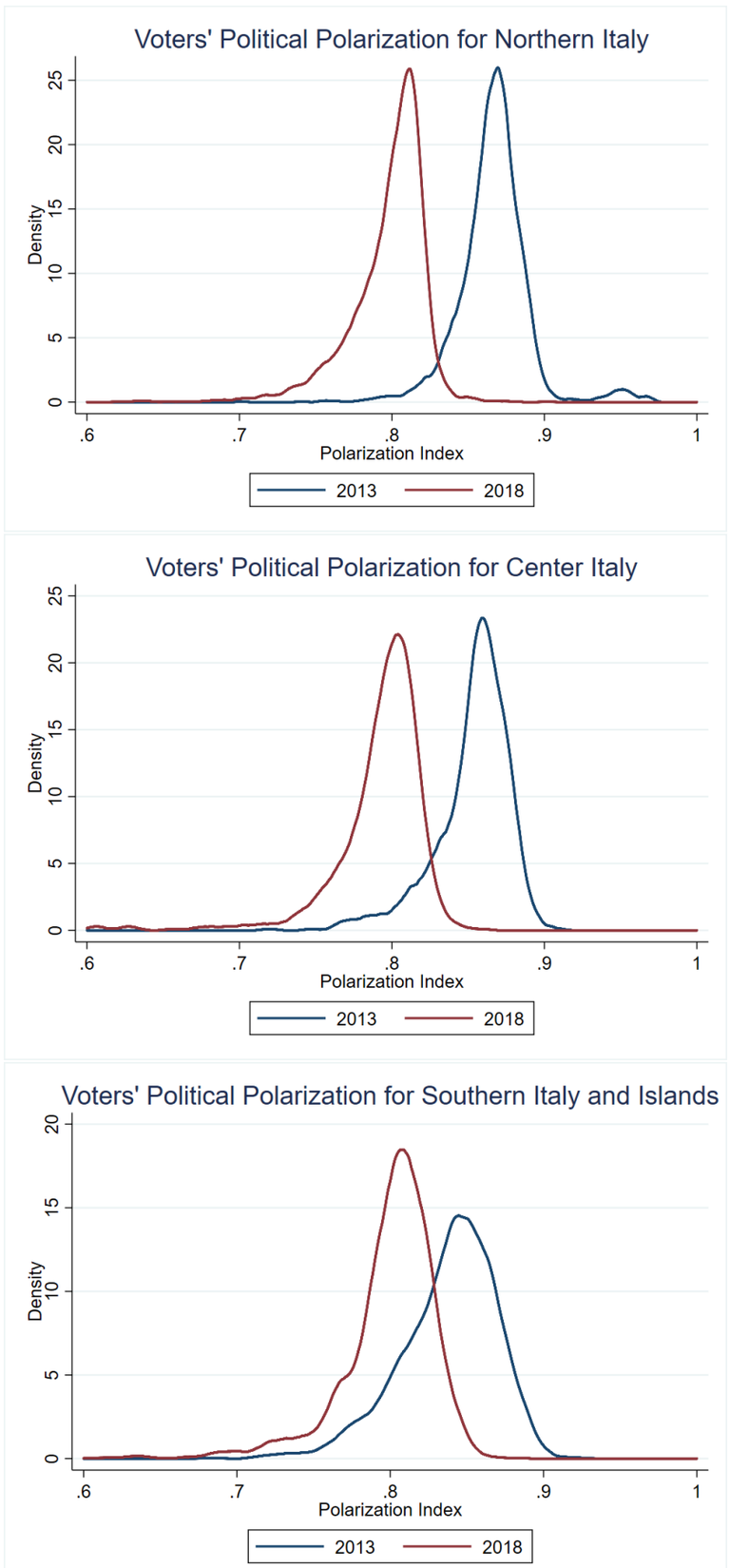

Figure 3: Voters' Political Polarization by Geographical Breakdown

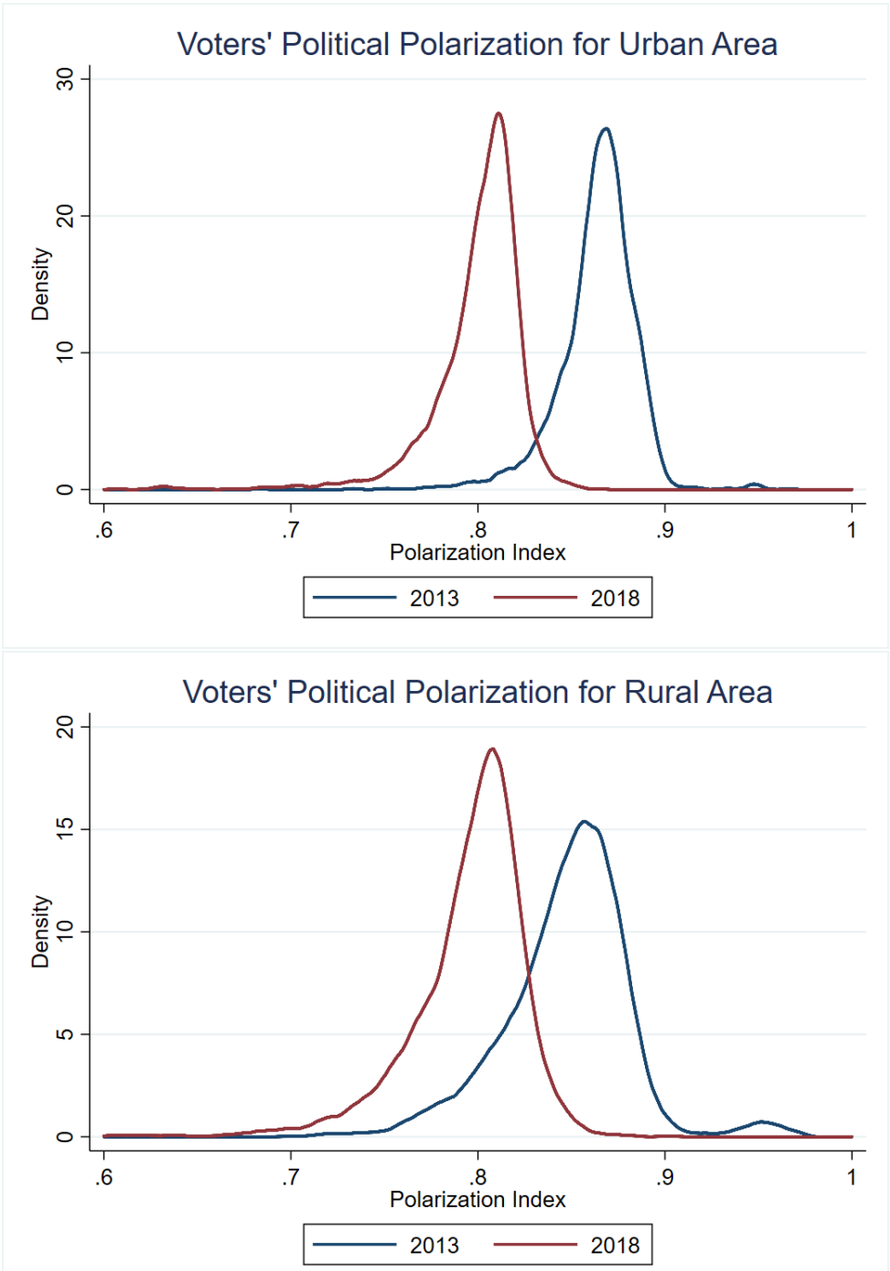

Figure 4: Voters' Political Polarization for rural and urban areas

List of Figures

List of Tables

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Executive Summary

The global political landscape has suffered drastic changes starting in the second decade of this century. We have observed numbers of voters shifting from supporting incumbent parties to voting for populist politicians in European democracies. Academic literature studying these trends has identified several factors explaining this phenomenon. However, many commentators agree that the Internet in general - and social media in particular - has played a crucial role in the last two decades (Zhuravskaya et al., 2020). Of course, the Internet is not a unique thing, but the sum of the whole environment linked to it, from the laptop to the undersea fiber optic cables, from routers to communications machinery. The real focus is whether more Internet use affects political outcomes, such as participation or polarization.

Different commentators have discussed about possible mechanisms through which the Internet could affect political outcomes, such as echo chambers (Sunstein, 2001; Flaxman et al., 2016) and differences in news consumption (Boxell et al., 2017; Allcott et al., 2020; Melnikov, 2021). Echo chambers are referred to the exposure to like-minded news forced by social media algorithms, which limits the *"unplanned, unanticipated encounters [that are] central to democracy itself"* (Sunstein, 2001). Instead, when it comes to news consumption, the Internet has been shown to affect both the quality and quantity of our political knowledge (Boxell et al., 2017; Allcott et al., 2020). There are differences between more and less active users, as the first group is more likely to be a victim of propaganda and misinformation (Melnikov, 2021), as we know that the Internet is the primary channel through which misinformation spreads. During the Cambridge Analytica scandal, we have all witnessed the potential harm to politics of misinformation spreading online. Plus, more Internet is associated with greater consumption of partisan media, and partisanship affects polarization (Boxell et al., 2017).

The economic literature has provided much evidence about possible Internet use's effects on political outcomes. Guriev consider the effect of the spread of 3G mobile networks on incumbent government approval. They show that anti-establishment populist opposition parties in Europe gained political benefits from expanding mobile Internet infrastructure. Campante et al. (2018) uses an Instrumental Variable approach to study the effect of broadband diffusion over turnout in Italy. They find mixed results: there is evidence of a negative impact of broadband diffusion over turnout up to 2008, after which the effect becomes positive – possible because of the development of social media. Focussing on political polarization, so far, the literature has provided opposite evidence. On the one hand, Boxell et al. (2017) develop a series of multiple indexes of political polarization to find a negative effect of internet usage on polarization among US adults. On the contrary, ? (?) performs a randomized experiment showing that deactivating Facebook reduces factual news knowledge and political polarization.

The scope of this work is to participate in the current debate about the effect of Internet use on the present political framework by assessing its impact on political polarization.

I question aggregated Internet use and whether more Internet use — across all people and all uses — has, on the net, resulted in more political polarization. To test this hypothesis, I consider the case of Italy and study Italian voters' political polarization during the election years 2013 and 2018. By doing so, I obtained an index of Voters' Political Polarization based on the behavior of the parties they vote for, which is a novel contribution to the economic literature, inspired by the works of Poole and Rosenthal (1985) and Gagliarducci and Paserman (2021).

The logic behind this index is to observe how much parties cooperate in producing new bills. Therefore, I consider all the Parliamentary activity that happened in the 16^{th} legislature (2008-2013) and 17^{th} legislature (2013-2018), and for each legislature t and party p. I estimate the share of bills sponsored by party p and cosponsored by parties belonging to the same side of the government table. For example, suppose party p belongs to the government majority during the 17^{th} legislature. In that case, its polarization index is the share of bills presented only with cosponsors from the majority.

Then, the Index of Voters' Political Polarization is obtained by aggregating Parties' scores at the municipality level, where the weights are the share of votes obtained by each party. In this way, I can show that political polarization decreased from 2013 to 2018 among Italian voters.

In the last part of the analysis, I study the relationship between Political Polarization and broadband Internet diffusion by implementing an Ordinary Least Square (OLS) model and an Instrumental Variable model (IV) developed by Campante et al. (2018). The logic of the instrument is to exploit the exogenous part of broadband diffusion in Italy by instrumenting for the costs of building new telecommunication infrastructure, as often the literature has done when studying the effect of Internet availability diffusion (see Guriev et al., 2021). In particular, Campante et al. (2018) leverage the Italian historical background to obtain an instrument based on the distance between each municipality and the pre-existing telecommunication backbone. Following this methodology, I can provide causal evidence that the diffusion of broadband Internet connection harmed voters' political polarization.

The robustness of the results is proven by repeating the analysis with two different indexes for parties' political polarization obtained partitioning the set of parties into the set of coalitions, and considering each party as per se. The obtained results provide the same evidence as my main index.