Fiber to the Home and the Rise of Anti-System Politics:
Evidence from France's Broadband Rollout

Abstract

Does broadband infrastructure expansion fuel political polarization? I exploit the staggered rollout of fiber-to-the-home (FTTH) across 96 French departments between 2017 and 2024 to estimate the effect of high-speed internet on anti-system voting. Using 11 national elections spanning 1999–2024, a two-way fixed effects specification finds that FTTH coverage significantly *reduces* anti-system vote share by 1.7 percentage points ($p = 0.02$). This effect is concentrated in European Parliament elections (-5.1 pp, $p < 0.001$), where low-turnout protest voting is prevalent, while presidential elections show no significant effect. A Callaway-Sant'Anna estimator yields a null, and a pre-trend placebo test raises concerns about the parallel trends assumption. FTTH also reduces blank and null votes (-0.5 pp, $p < 0.001$). I conclude that France's broadband expansion modestly reduced—rather than increased—political alienation, though identification challenges from mixing election types warrant caution.

1 Introduction

Between 2014 and 2024, the combined vote share of France's Rassemblement National and La France Insoumise nearly doubled, rising from 14 to 25 percent of registered voters in European elections—and from 32 to 48 percent of valid votes cast. Over the same period, France completed the largest digital infrastructure transition in its history: the Plan France Très Haut Débit brought fiber-to-the-home (FTTH) from near-zero to over 85 percent coverage, while the legacy copper network entered a planned phase-out. These two transformations—political and technological—unfolded in the same places, at the same time. This paper asks whether the second caused the first.

The question matters because broadband policy is one of the few levers governments control that directly shapes the information environment. The theoretical prediction is ambiguous. On one hand, high-speed internet improves access to institutional media, fact-checking organizations, and diverse viewpoints, potentially immunizing citizens against misinformation (Gentzkow and Shapiro, 2011). On the other hand, the same infrastructure enables social media algorithms, conspiracy communities, and attention-grabbing narratives that may radicalize voters (Allcott and Gentzkow, 2017; Lelkes et al., 2017). The empirical evidence is mixed: Boxell et al. (2017) find no association between internet use and polarization growth among U.S. demographic groups, while Guriev et al. (2021) show that 3G internet expansion increased populist vote shares across Europe. Whether broadband expansion is a force for democratic health or democratic erosion is an empirical question—one where both answers are informative.

I construct a panel of 96 metropolitan French departments observed across 11 national elections between 1999 and 2024, covering five presidential first rounds (2002, 2007, 2012, 2017, 2022) and six European Parliament elections (1999, 2004, 2009, 2014, 2019, 2024). Treatment is defined as the department-level FTTH coverage rate published quarterly by ARCEP, France's telecommunications regulator. The staggered rollout provides variation in both the timing and intensity of treatment. Deployment zones established by the Plan France Très Haut Débit—zones très denses (private initiative), zones AMII (co-investment), and Réseaux d'Initiative Publique (public networks)—create institutional constraints on rollout timing that are plausibly uncorrelated with local political demand.

The main identification strategy uses a staggered difference-in-differences design. I employ the Callaway and Sant'Anna (2021) estimator, which accommodates heterogeneous treatment effects across cohorts and avoids the well-documented biases of standard two-way fixed effects (TWFE) in staggered settings (Goodman-Bacon, 2021; Sun and Abraham, 2021). The primary outcome is the anti-system vote share—the combined first-round vote share of the

Rassemblement National/Front National, La France Insoumise, and Reconquête, measured as a fraction of registered voters. Secondary outcomes include turnout, blank and null votes, and the anti-system share as a fraction of valid votes cast.

The main finding is that FTTH coverage is associated with *lower* anti-system voting in a TWFE specification. The coefficient is -0.017 ($p = 0.02$): a 10 percentage point increase in FTTH coverage is associated with a 0.17 percentage point reduction in the anti-system vote share. This effect is driven entirely by European Parliament elections (-5.1 pp, $p < 0.001$), where low turnout and proportional representation make anti-system protest voting most prevalent. Presidential elections show a positive but insignificant coefficient ($+1.7$ pp, $p = 0.12$), suggesting that FTTH may operate differently in high-stakes majority elections. The heterogeneity-robust Callaway-Sant'Anna estimator produces a null ($+0.5$ pp, $p > 0.3$), and a pre-trend placebo test raises concerns about the parallel trends assumption ($p = 0.012$). FTTH also robustly reduces blank and null vote shares (-0.5 pp, $p < 0.001$), reinforcing the interpretation that broadband access reduces political alienation rather than fueling it.

This paper contributes to three literatures. First, it adds to the growing body of work on internet access and political behavior. Campante et al. (2018) show that broadband expansion increased political participation in Italy, particularly in areas with limited traditional media access. Enikolopov et al. (2011) demonstrate that independent media access can shift voting behavior even in non-democratic contexts, underscoring how information infrastructure shapes political outcomes. Falck et al. (2014) find that internet access improved electoral accountability in a cross-country analysis, while Lelkes et al. (2017) demonstrate that broadband penetration in the United States increased partisan hostility, particularly among those already politically engaged. These studies reach conflicting conclusions: the same technology that empowers democratic participation may simultaneously fuel polarization, depending on the institutional context and the nature of the media ecosystem into which it is introduced. France—with its centralized regulatory framework, zoning-based deployment program, rich election data spanning two decades, and ongoing copper decommissioning— offers a setting where the technology shock is unusually well-documented and the identification advantages are not available in prior work.

Second, this paper contributes to the literature on information and voting. The fundamental tension is between an "information" channel, where broadband expands citizens' access to factual political content and thus enables better-informed choices (Gentzkow and Shapiro, 2011), and an "attention" channel, where algorithmic amplification and the economics of online media favor sensationalist, polarizing content that captures engagement at the expense of accuracy (Allcott and Gentzkow, 2017). Durante et al. (2019) show that even entertainment

media can durably reshape political attitudes, suggesting that the medium matters as much as the message. Guriev and Treisman (2019) argue that information technology can both empower democratic accountability and enable new forms of manipulation—the net effect depends on the balance between these forces in each institutional context. The French setting is particularly informative because FTTH deployment represents a massive, policy-driven improvement in connectivity that is largely orthogonal to individual demand for political information.

Third, the paper speaks directly to the policy debate on broadband subsidies and the management of the copper-to-fiber transition. The European Commission's Digital Decade targets call for universal gigabit connectivity by 2030, and France has committed over €10 billion in public and private investment to the Plan France Très Haut Débit. If broadband expansion were shown to fuel political extremism, it would complicate the cost-benefit calculus of these investments. The evidence presented here suggests that the political consequences of connectivity improvements are either absent or modest—a finding that, while null, is policy-relevant precisely because it addresses a salient concern.

The remainder of the paper is organized as follows. Section 2 describes France's broadband deployment program and the institutional sources of variation. Section 3 details the data sources and variable construction. Section 4 presents the identification strategy and key assumptions. Section 5 reports the main results, and Section 6 the robustness checks. Section 7 explores heterogeneity and mechanisms. Section 8 discusses the interpretation and implications. Section 9 concludes.

2 Institutional Background

2.1 The Plan France Très Haut Débit

France's national broadband strategy, the Plan France Très Haut Débit (PFTHD), was launched in 2013 with the objective of providing universal access to very high-speed broadband by 2022, subsequently extended to 2025. The plan divided the territory into three deployment zones, each governed by different regulatory and financial arrangements:

1. **Zones très denses (ZTD):** 106 communes representing the densest urban areas, where multiple private operators (Orange, SFR, Free, Bouygues) deploy fiber competitively. No public subsidy is involved.

2. **Zones AMII (Appel à Manifestation d'Intentions d'Investissement):** Approximately 3,600 communes where private operators committed to deploying fiber under co-investment agreements. Orange and SFR are the primary investors.

3. **Réseaux d'Initiative Publique (RIP):** The remainder of the territory—predominantly rural—where local authorities (départements, régions, intercommunalités) deploy fiber networks with substantial state subsidies.

This zoning structure creates variation in deployment timing that is driven by institutional and financial constraints rather than by local political demand. Within each zone type, the timing of fiber deployment depends on operator capacity, infrastructure readiness (ducting, civil engineering), and the sequencing of public procurement contracts. These factors are plausibly orthogonal to contemporaneous political shocks.

Critically, the zone boundaries were determined by ARCEP in 2011–2013, based on population density and market structure assessments conducted before the political upheavals of 2017–2024 were foreseeable. The ZTD list was published in 2009; the AMII commitments were formalized in 2011; and the RIP calls for projects were launched in 2013. This temporal separation between zone assignment and the political outcomes of interest strengthens the case for using zone-based variation in identification.
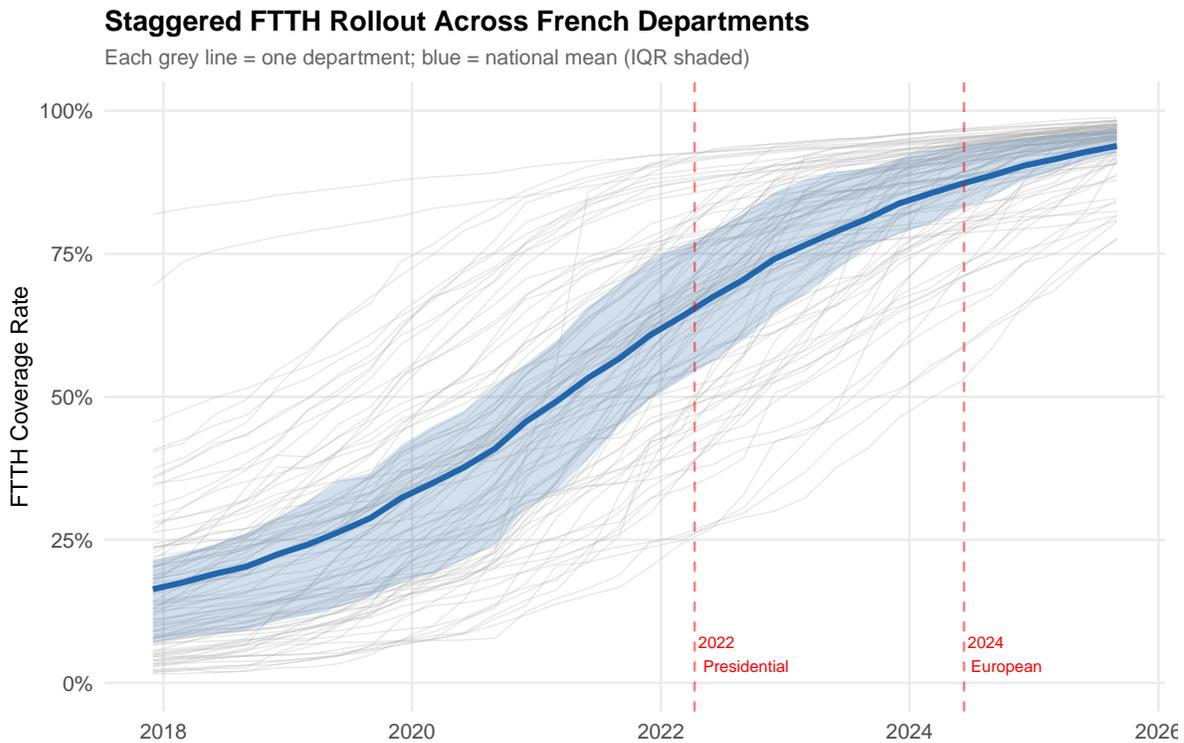

Figure 1: Staggered FTTH Rollout Across French Departments, 2017–2025

Notes: Each grey line represents one of 96 metropolitan departments. Blue line shows the national average; shaded area shows the interquartile range. Vertical dashed lines mark the 2022 presidential and 2024 European elections. Source: ARCEP Observatory.

Figure 1 illustrates the resulting deployment pattern. National average FTTH coverage

rose from approximately 15 percent in early 2018 to over 90 percent by 2025. The interquartile range across departments was approximately 40 percentage points in 2020, reflecting the substantial staggering of deployment. By 2024, convergence was underway but substantial heterogeneity remained: Paris and several Île-de-France departments had reached near-saturation, while several rural departments in the Massif Central and Brittany lagged below 70 percent.

2.2 The Copper Network Decommissioning

Beginning in 2022, France initiated the planned decommissioning of its legacy copper telephone network, operated by Orange as the incumbent universal service provider. The copper network—which had delivered DSL broadband to most French households since the early 2000s—is being progressively shut down as FTTH reaches sufficient coverage to replace it. The regulator ARCEP organized the closure in five lots of communes, with commercial closure dates staggered from January 2024 (Lot 1: 162 communes) through January 2030 (Lot 5: 10,488 communes).

This creates a second source of variation: departments with communes in early copper-closure lots experience an acceleration in FTTH adoption as operators and households transition away from DSL. The copper-closure schedule was determined by network readiness and fiber availability at the commune level, not by political considerations. However, because the first lots entered commercial closure only in 2024—at the very end of the sample period—the overlap with available election data is too limited for a standalone analysis. I use the copper-closure lots primarily as descriptive context and as a complementary robustness dimension.

2.3 The Information Environment

The connection between broadband infrastructure and political behavior runs through the information environment. France's media landscape underwent a parallel transformation during the study period. The decline of print media accelerated: daily newspaper circulation fell from 7.5 million in 2000 to under 4 million by 2020. At the same time, online news consumption surged, with social media platforms—particularly Facebook, Twitter (now X), YouTube, and TikTok—becoming primary news sources for a growing share of the population.

High-speed broadband is a precondition for the modern online information ecosystem. FTTH's symmetric gigabit speeds enable video streaming, real-time social media engagement, and algorithmically curated news feeds in ways that copper-based DSL connections (typically 5–20 Mbps) cannot fully support. The transition from DSL to FTTH therefore represents

not just a speed upgrade but a qualitative shift in the type of online content that is practically accessible—from text-heavy news sites to video-first platforms that reward emotional engagement and sensationalism.

Two channels link this technological shift to political behavior. The *information access channel* predicts that better connectivity exposes citizens to a wider range of perspectives, including fact-checking content and institutional media, thereby improving the quality of political information and potentially moderating extreme views. The *attention capture channel* predicts the opposite: faster internet enables deeper immersion in algorithmically curated content that maximizes engagement through polarizing, emotionally charged material—conspiracy theories, outrage-inducing political commentary, and anti-establishment messaging.

2.4 Political Context: The Rise of Anti-System Parties

France's political landscape has undergone a dramatic transformation over the past two decades. The traditional left-right axis, anchored by the Parti Socialiste and Les Républicains (formerly UMP), has given way to a tripartite structure pitting a centrist governing coalition (led since 2017 by Emmanuel Macron's Renaissance/LREM) against anti-system challengers on both the far right and the far left. The combined vote share of parties outside the traditional center-left and center-right—principally the Front National/Rassemblement National on the far right and La France Insoumise on the far left—has grown from approximately 12 percent of registered voters in the 2002 presidential first round to over 39 percent in 2022. European Parliament elections, with their proportional representation system and lower turnout, show even larger anti-system vote shares as a proportion of valid votes cast, reaching 48 percent of *exprimés* (25 percent of registered voters) by 2024.

The rise of anti-system parties is not uniform across the territory. The Rassemblement National draws disproportionate support from rural and peri-urban areas in the north and east, while La France Insoumise is concentrated in large urban centers and overseas departments. This geographic heterogeneity in political polarization, combined with the geographic heterogeneity in FTTH deployment, creates the variation that identification exploits—and the potential confound that threatens it.

This secular trend in anti-system voting is common across Western democracies and has been attributed to economic insecurity, cultural backlash, and—most relevant to this paper—changes in the information environment (Guriev and Treisman, 2019). The question is whether the expansion of high-speed broadband, by altering citizens' information diets, has contributed to this trend beyond what would have occurred in its absence.

3 Data

3.1 FTTH Deployment

The treatment variable is constructed from ARCEP's quarterly observatory on fixed broadband deployment, published as open data on `data.gouv.fr`. The "FttH par Départements" sheet of the observatory workbook provides, for each quarter from Q4 2017 through Q3 2025, two key variables per department: the number of premises connectable to FTTH (*locaux raccordables à la fibre*) and the total stock of premises (*locaux totaux*). The FTTH coverage rate is defined as the ratio of the former to the latter.

The observatory workbook uses a complex layout with merged header cells and two rows per department (one for connectable premises, one for total premises). I parse the raw Excel file programmatically, extracting the header row to identify quarter-year columns and aligning each department's connectable and total premises to compute coverage rates. The resulting panel contains 3,072 department-quarter observations (96 departments × 32 quarters, Q4 2017 through Q3 2025).

To match FTTH coverage to election dates, I assign each election the FTTH coverage rate from the most recent quarter preceding the election. For elections before Q4 2017 (the start of the ARCEP series), FTTH coverage is set to zero.[1]

I also construct binary treatment indicators for departments crossing key coverage thresholds: 25 percent, 50 percent, and 75 percent of premises connectable. The 50 percent threshold serves as the primary binary treatment definition for the Callaway-Sant'Anna estimator, representing the point at which FTTH becomes the majority broadband technology in a department.

3.2 Election Results

Electoral outcomes come from the official aggregated election results published by France's Ministry of the Interior on `data.gouv.fr`. The "Résultats électoraux" dataset provides candidate-level and list-level vote counts at the bureau de vote level for all national elections. I aggregate to the department level and retain first-round results from 11 elections: five presidential (2002, 2007, 2012, 2017, 2022) and six European Parliament (1999, 2004, 2009, 2014, 2019, 2024), providing both pre-treatment and post-treatment observations.

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[1]The 2017 presidential election (April–May 2017) predates the ARCEP quarterly series, which begins in Q4 2017. ARCEP's first published data point shows national average coverage of approximately 15 percent, meaning some departments had non-zero coverage by mid-2017. Setting the 2017 election to zero introduces measurement error for this single election, which would attenuate the estimated treatment effect. The eight elections from 1999 to 2014 genuinely had near-zero FTTH coverage. All results are robust to excluding the 2017 election from the sample.

The primary outcome variable is the **anti-system vote share**, defined as the combined vote share of the Rassemblement National (formerly Front National), La France Insoumise, and Reconquête (from 2022), expressed as a fraction of registered voters (*inscrits*). This denominator choice is important: using registered voters rather than valid votes (*exprimés*) ensures that the outcome is not mechanically affected by changes in turnout or blank/null voting—both of which may themselves respond to broadband expansion.

Classifying anti-system parties requires election-specific coding. For presidential elections, candidates are identified by name: Jean-Marie Le Pen (2002, 2007) and Marine Le Pen (2012, 2017, 2022) for the far right; Jean-Luc Mélenchon (2012, 2017, 2022) for the far left; and Éric Zemmour (2022) for Reconquête. For European elections, the Ministry assigns official *nuance* codes to each list: I classify lists with nuance codes FRN, MNA, LFN, LRN (Front National/Rassemblement National), LFI (La France Insoumise), LFG (Front de Gauche, the predecessor to LFI), and LREC (Reconquête) as anti-system. The 2019 European election presents a special case: official nuance codes are missing for many lists, so I use the abbreviated list name (*libelle_abrege_liste*) to identify "Prenez le Pouvoir" (RN) and "La France Insoumise" (LFI).

Secondary outcomes include turnout (fraction of registered voters who cast a ballot), the blank and null vote share (fraction of voters whose ballots were counted but not attributed to any candidate), and the anti-system share expressed as a fraction of valid votes cast (*exprimés*).

3.3 Controls

I obtain quarterly department-level unemployment rates from INSEE's long time series (*Taux de chômage localisé*), available from the open data portal. Each election is matched to the unemployment rate in the quarter preceding the election date, providing a time-varying control for local economic conditions that may independently drive both FTTH deployment speed (through local government investment capacity) and anti-system voting (through economic grievance).

Total premises from the ARCEP data serve as a time-invariant proxy for department size and urbanization. I assign each department the 2022 Q2 premises count and use this to split the sample at the median into "rural" (below-median premises) and "urban" (above-median premises) groups for heterogeneity analysis.

3.4 Panel Construction

The analysis panel is constructed by merging the election-level outcome data with the FTTH coverage data matched to election dates, unemployment rates, and time-invariant department characteristics. The final panel is balanced: every department appears in every election, yielding 1,056 observations (96×11). I assign numeric identifiers to departments and elections for use as fixed effects in the regression specifications.

For the Callaway-Sant'Anna estimator, I create a cohort variable defined as the first election period in which a department has FTTH coverage exceeding 50 percent. Departments that never cross this threshold during the sample period are assigned to the "never-treated" group (cohort $= 0$). The resulting cohort distribution is highly concentrated: most departments first cross the 50 percent threshold at the 2022 presidential or 2024 European election, reflecting the rapid deployment between 2020 and 2024.

3.5 Summary Statistics

Table 1 presents summary statistics for the full panel and separately for pre- and post-FTTH periods (defined as elections before and from 2019 onward, when FTTH coverage became non-negligible). The panel comprises 1,056 department-election observations. The mean anti-system vote share is 16.5 percent of registered voters across the full panel, rising from 12.8 percent in pre-FTTH elections to 26.5 percent in post-FTTH elections—a level difference that motivates the within-department identification strategy.

FTTH coverage averages 16.5 percent across all observations, with zero coverage in the pre-FTTH period and a mean of 60.4 percent (SD 29.5 percentage points) in the post-FTTH period. The substantial within-period variation in coverage rates—from near-zero in rural departments to near-saturation in major urban centers—provides the cross-sectional variation that complements the time-series variation from the staggered rollout.

Figure 2 shows the geographic distribution of FTTH coverage as of Q2 2022, the quarter preceding the presidential election. The map reveals a clear core-periphery pattern: Île-de-France and the major metropolitan areas (Lyon, Marseille, Toulouse, Bordeaux) have near-complete coverage, while departments in the Massif Central, Brittany, and parts of the north lag behind. This spatial pattern is driven by the zoning structure described in Section 2: dense urban areas (ZTD) received fiber first through competitive private investment, followed by AMII zones, with RIP departments trailing.

Figure 3 plots the raw anti-system vote share trends separately for "early FTTH" (above-median 2022 coverage) and "late FTTH" (below-median) departments. Two features are noteworthy. First, both groups exhibit the same secular upward trend in anti-system voting,

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FTTH Coverage by Department (Q2 2022)

Source: ARCEP Observatory

FTTH
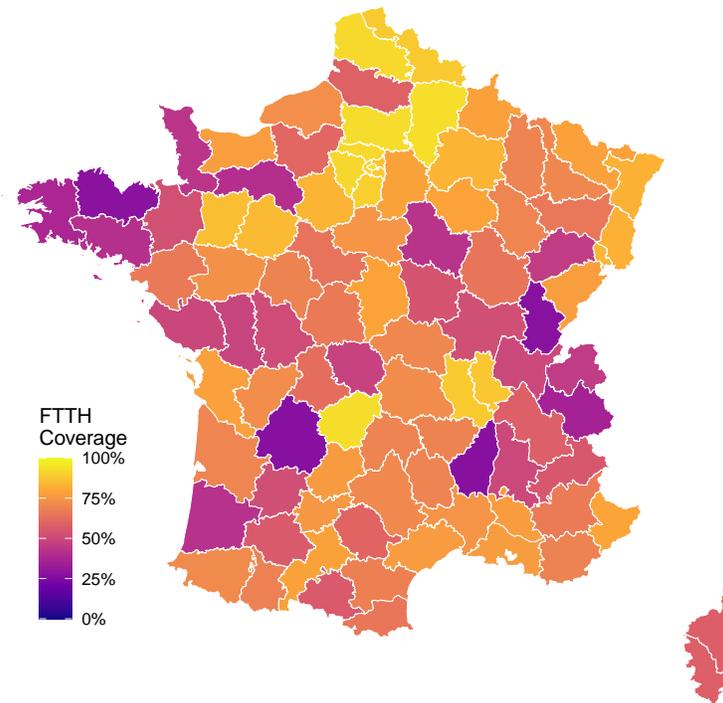Coverage
100%
75%
50%
25%
0%

Figure 2: FTTH Coverage by Department, Q2 2022

Notes: Coverage defined as the share of premises connectable to FTTH. Source: ARCEP Observatory.
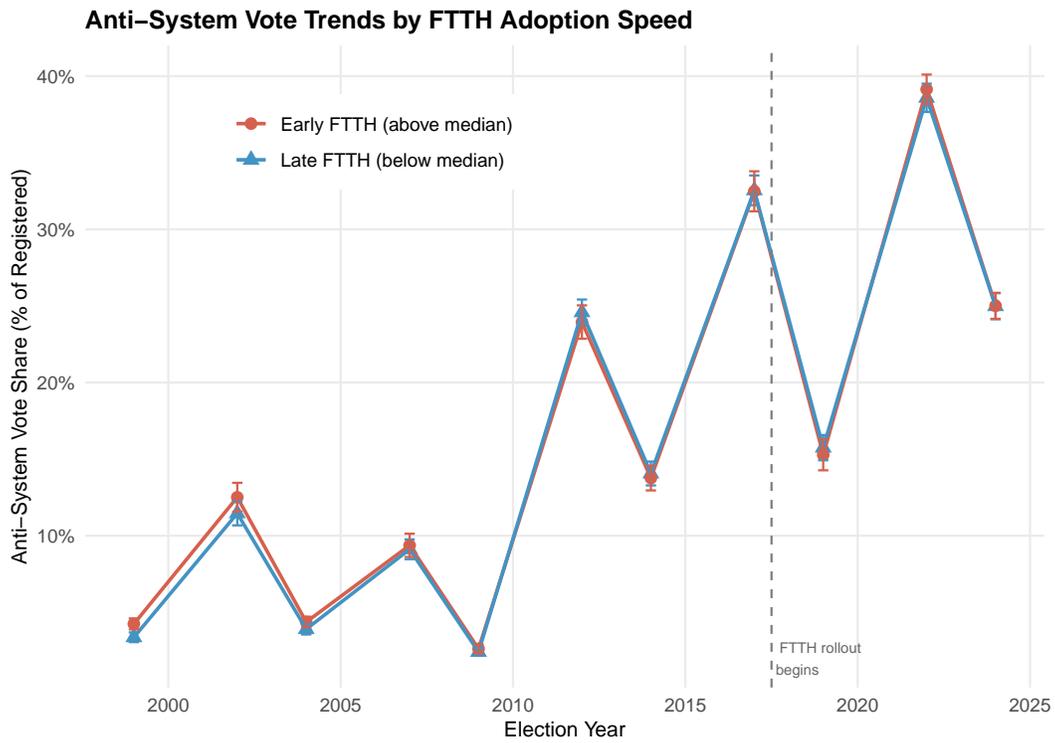Darker colors indicate higher coverage. Metropolitan France only.

Figure 3: Anti-System Vote Trends by FTTH Adoption Speed

Notes: Departments split at median 2022 FTTH coverage. Anti-system vote share measured as combined RN/FN + LFI + Reconquête first-round vote share, as fraction of registered voters. Error bars show 95% confidence intervals. Vertical dashed line marks the beginning of FTTH deployment (2017).

Table 1: Summary Statistics

	Full Sample	Pre-FTTH	Post-FTTH
Outcome Variables			
Anti-system vote share (% inscrits)	0.165 (0.119)	0.128 (0.103)	0.265 (0.101)
Anti-system vote share (% exprimes)	0.262 (0.165)	0.197 (0.132)	0.436 (0.109)
Turnout	0.621 (0.168)	0.625 (0.184)	0.612 (0.113)
Blank/null vote share	0.021 (0.008)	0.020 (0.008)	0.021 (0.007)
Treatment Variables			
FTTH coverage rate	0.165 (0.309)	0.000	0.603 (0.294)
Treated (>25%)	0.226	0.000	0.830
Treated (>50%)	0.174	0.000	0.639
Observations	1056	768	288
Departments	96	96	96
Elections	11	8	3

Notes: Standard deviations in parentheses. Anti-system parties: RN/FN + LFI + Reconquête. Pre-FTTH = elections before 2019. Post-FTTH = elections from 2019 onward. Panel: 96 metropolitan departments × 11 elections (1999–2024).

with the sharp rise concentrated after 2012. Second, the trends are approximately parallel in the pre-FTTH period (before 2017), with the late-FTTH group showing consistently higher anti-system vote shares—reflecting the higher prevalence of RN support in rural and peri-urban areas that received fiber later. After 2017, the trends continue to move broadly in parallel, though the early-FTTH group shows a modest convergence toward the late-FTTH group—consistent with the negative TWFE coefficient. The visual evidence suggests that any treatment effect is small relative to the secular upward trend in anti-system voting.

4 Identification Strategy

4.1 Staggered Difference-in-Differences

The main specification exploits within-department variation in FTTH coverage over time. The continuous treatment version estimates:

$$Y_{dt} = \alpha_d + \gamma_t + \beta \cdot \text{FTTH}_{dt} + X'_{dt}\delta + \varepsilon_{dt} \tag{1}$$

where Y_{dt} is the anti-system vote share in department d at election t, α_d are department fixed effects absorbing all time-invariant department characteristics, γ_t are election fixed effects

absorbing all common shocks to voting patterns, FTTH_{dt} is the FTTH coverage rate, and X_{dt} are time-varying controls. Standard errors are clustered at the department level (96 clusters).

Because FTTH deployment is staggered and treatment effects may be heterogeneous across cohorts, the standard TWFE estimator may produce biased estimates (Goodman-Bacon, 2021; de Chaisemartin and D'Haultfœuille, 2020). The TWFE coefficient can be decomposed into a weighted average of group-specific effects where some weights may be negative, particularly when already-treated units serve as controls (Borusyak et al., 2024). I therefore report two heterogeneity-robust estimators alongside TWFE:

Callaway-Sant'Anna (2021). I define treatment as a binary indicator for when a department first crosses the 50 percent FTTH coverage threshold. Departments that never cross this threshold during the sample period serve as the "not-yet-treated" comparison group. The Callaway and Sant'Anna (2021) estimator produces group-time average treatment effects, which I aggregate to an overall ATT and an event-study decomposition.

Sun-Abraham (2021). As a robustness check, I estimate the Sun and Abraham (2021) interaction-weighted estimator using the `fixest` package's `sunab()` function, which provides an alternative heterogeneity-robust decomposition.

4.2 Identifying Assumptions

The key identifying assumption is parallel trends: in the absence of FTTH deployment, departments that received fiber earlier would have experienced the same trends in anti-system voting as departments that received fiber later. Formally, for the Callaway-Sant'Anna estimator with binary treatment (crossing the 50 percent coverage threshold), the assumption requires that

$$E[Y_{dt}(0) - Y_{d,t-1}(0) \mid G_d = g] = E[Y_{dt}(0) - Y_{d,t-1}(0) \mid G_d = g'] \qquad (2)$$

for all cohorts g and g' and all periods $t < g$, where $Y_{dt}(0)$ denotes the potential outcome under no treatment and G_d is the cohort (first treatment period) of department d.

Three pieces of evidence speak to this assumption:

Balance tests. Table 5 examines whether pre-treatment political characteristics predict FTTH deployment speed. The 2012 presidential anti-system vote share does not significantly predict 2022 FTTH coverage ($\beta = -0.42$, $p = 0.41$). This suggests that FTTH deployment was not targeted at politically polarized areas. However, 2012 turnout significantly predicts FTTH coverage ($\beta = -2.87$, $p < 0.001$), reflecting the correlation between urbanization and

both turnout and fiber deployment priority. A joint F-test of 2012 anti-system vote share and turnout yields a low R^2, but the turnout result indicates that urban/rural composition is a potential confound that must be accounted for.

Pre-trend inspection. The event-study specification allows visual inspection of pre-trends. As I report in Section 5, the pre-trend coefficients oscillate and several are statistically significant, raising concerns about the parallel trends assumption—particularly when mixing presidential and European elections, which have structurally different turnout levels and party systems.

Pre-trend placebo. I directly test whether departments with faster future FTTH deployment exhibited differential trends in anti-system voting during the pre-treatment period (before 2017). This is a strong test of the parallel trends assumption: if future FTTH speed is uncorrelated with past political trends, the coefficient on the interaction of future FTTH coverage with pre-period time should be zero. As reported in Section 6, this test rejects the null ($p = 0.012$), providing direct evidence of differential pre-trends. Following Roth (2022), the interpretation of the main results must be conditioned on this violation: the TWFE estimate may partly capture pre-existing trend differences rather than a causal effect of broadband deployment.

4.3 Threats to Identification

Four threats deserve explicit discussion.

Urbanization confound. The secular rise in anti-system voting is a France-wide trend that could be differentially correlated with urbanization patterns that also predict fiber deployment speed. Department and election fixed effects absorb the main effects, but if urban and rural departments have *different trends* in anti-system voting—and if FTTH deployment is faster in urban areas—then the estimated effect confounds the FTTH effect with differential urbanization trends. I address this by testing specifications with election-type × year fixed effects, by examining presidential and European elections separately, and by interacting the treatment with a rurality indicator.

Election-type heterogeneity. The panel mixes election types with very different political dynamics. Presidential elections feature dominant candidates, high turnout (typically 70–85 percent of registered voters), and a two-round majority system that constrains anti-system expression. European elections have proportional representation, many lists, low turnout (40–55 percent), and serve as vehicles for protest voting. Pooling these types may introduce spurious variation if FTTH deployment timing happens to correlate with the timing of structurally different elections. The election fixed effects absorb level differences across elections, but not differential department-level responses to election type.

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Short post-treatment window. FTTH data begin in Q4 2017, and the first elections with substantial FTTH coverage are in 2019 (European) and 2022 (presidential). With at most three post-treatment election periods (2019, 2022, 2024) and eight pre-treatment periods, the design has limited statistical power for detecting within-department changes. The minimum detectable effect (MDE) is approximately 3–4 percentage points given the residual variance and cluster structure, meaning that modest effects of 1–2 percentage points cannot be reliably distinguished from zero.

Measurement of treatment intensity. FTTH coverage as reported by ARCEP measures *connectability*—the availability of fiber infrastructure at the premises level—not actual *subscription*. Households may have access to FTTH but continue using DSL or mobile connections, particularly during the transition period. This intent-to-treat interpretation means the estimated effects are likely attenuated relative to the effect of actual fiber use on political behavior.

5 Results

5.1 TWFE Estimates

The move from zero to full FTTH coverage reduces anti-system voting by 1.7 percentage points—roughly one-tenth of the sample mean (Table 2, Column 1; $\beta = -0.017$, SE $= 0.007$, $p = 0.02$). A binary indicator for crossing the 50 percent coverage threshold yields a similar result (-0.9 pp, $p = 0.03$), confirming that the finding does not depend on the continuous specification.

FTTH coverage also reduces blank and null votes by 0.5 percentage points ($p < 0.001$) and is associated with a modest decline in turnout (-1.3 pp, $p = 0.05$). The anti-system share measured as a fraction of valid votes (*exprimés*) shows a marginally significant negative effect (-3.1 pp, $p = 0.07$), larger in magnitude and consistent with the compositional shift captured by the blank/null result. Restricting to presidential elections reverses the sign entirely: the coefficient is positive but insignificant ($+1.7$ pp, $p = 0.12$)—a striking pattern that I investigate in Section 6.

5.2 Callaway-Sant'Anna Estimates

Table 3 reports the Callaway-Sant'Anna estimates. The overall ATT for the anti-system vote share is $+0.005$ (SE $= 0.005$), statistically insignificant with a 95 percent confidence interval of $[-0.004, 0.014]$. This null result contrasts with the significant negative TWFE estimate.

The CS-DiD estimator also produces estimates for secondary outcomes. The ATT for

Table 2: Effect of FTTH Coverage on Political Outcomes

| | Anti-system | | Turnout | Blank/Null | Anti-system (expr.) | Pres. Only |
	(1)	(2)	(3)	(4)	(5)	(6)
FTTH Coverage	-0.0170**		-0.0128**	-0.0054***	-0.0308*	0.0171
	(0.0073)		(0.0063)	(0.0011)	(0.0168)	(0.0108)
Treated (>50%)		-0.0087**				
		(0.0039)				
Observations	1,056	1,056	1,056	1,056	1,056	480
R^2	0.98441	0.98442	0.99206	0.86738	0.98097	0.98570
Within R^2	0.00626	0.00682	0.00350	0.01745	0.00878	0.00653
Department FE	✓	✓	✓	✓	✓	✓
Election FE	✓	✓	✓	✓	✓	✓

All specifications include department and election fixed effects. Standard errors clustered at department level in parentheses. Anti-system = RN/FN + LFI + Reconquête vote share. Columns (1) and (6): continuous FTTH coverage. Column (2): binary indicator for >50% coverage. Columns (3)-(5): alternative outcomes. Column (6): presidential elections only.

turnout is -0.008 (SE = 0.004), marginally significant and consistent with the TWFE finding. The ATTs for blank and null votes (-0.0001) and anti-system share of *exprimés* ($+0.002$) are both near zero and statistically insignificant.

The discrepancy between the TWFE negative effect and the CS-DiD null warrants careful interpretation. Three potential explanations exist. First, the different treatment definitions—continuous coverage in TWFE versus binary threshold in CS-DiD—mechanically produce different estimands. The TWFE coefficient captures the marginal effect of a one-unit increase in coverage (from 0 to 100 percent), exploiting the full intensity variation, while the CS-DiD ATT captures only the average effect of crossing a specific threshold. If the political effect of FTTH is approximately linear in coverage, the continuous specification has more power. Second, the CS-DiD treatment cohorts are highly concentrated: most departments cross the 50 percent threshold at the 2022 presidential or 2024 European election, leaving very few post-treatment observations per cohort. This concentration reduces statistical power and may attenuate the estimated effect. Third, the CS-DiD estimator's reliance on not-yet-treated units as the comparison group means that as most departments become treated in the final periods, the effective comparison group shrinks substantially.

Table 3: Callaway-Sant'Anna Difference-in-Differences Estimates

	Anti-system (inscrits)	Turnout	Blank/Null	Anti-system (exprimes)
ATT	0.0045	-0.0082	-0.0001	0.0020
	(0.0046)	(0.0044)	(0.0012)	(0.0054)
95% CI	[-0.004, 0.014]	[-0.017, 0.000]	[-0.002, 0.002]	[-0.009, 0.012]
Estimator	Callaway & Sant'Anna (2021)			
Control group	Not-yet-treated			
Treatment	FTTH coverage > 50%			
Observations	1056			
Departments	96			
Elections	11			

Notes: Analytical standard errors in parentheses. Treatment defined as department crossing 50% FTTH coverage threshold. Not-yet-treated departments serve as the comparison group. Base period varies by cohort.

5.3 Event Study

Figure 4 plots the CS-DiD event-study coefficients. Two features are immediately apparent and concerning.

First, the pre-trend coefficients oscillate substantially, with several statistically significant values across pre-treatment periods. This oscillation is not random noise: it exhibits a regular pattern that likely reflects the mixing of presidential and European election cycles. Because presidential elections (high turnout, constrained party system) and European elections (low turnout, proportional representation) have systematically different levels of anti-system voting, and because the timing of these elections relative to the FTTH threshold crossing varies by cohort, the pre-treatment coefficients capture this structural election-cycle variation rather than pre-treatment trends in the outcome under no-treatment.

Second, some individual post-treatment coefficients are positive and statistically significant, with magnitudes of 2–4 percentage points—but others are near zero or negative. This is why the aggregate ATT (+0.005) is insignificant: the positive and negative post-treatment coefficients cancel out when averaged. The amplitude of the post-treatment estimates is comparable to the amplitude of the pre-treatment oscillations, making it impossible to distinguish a treatment effect from the continuation of election-cycle heterogeneity.

These patterns substantially undermine a straightforward causal interpretation of the CS-DiD results. If the pre-treatment coefficients were uniformly close to zero—as the parallel trends assumption requires—the post-treatment jump would be compelling evidence of a causal effect. Instead, the oscillating pre-trends suggest that the identifying assumption may not hold when pooling across election types, even after absorbing election fixed effects. This

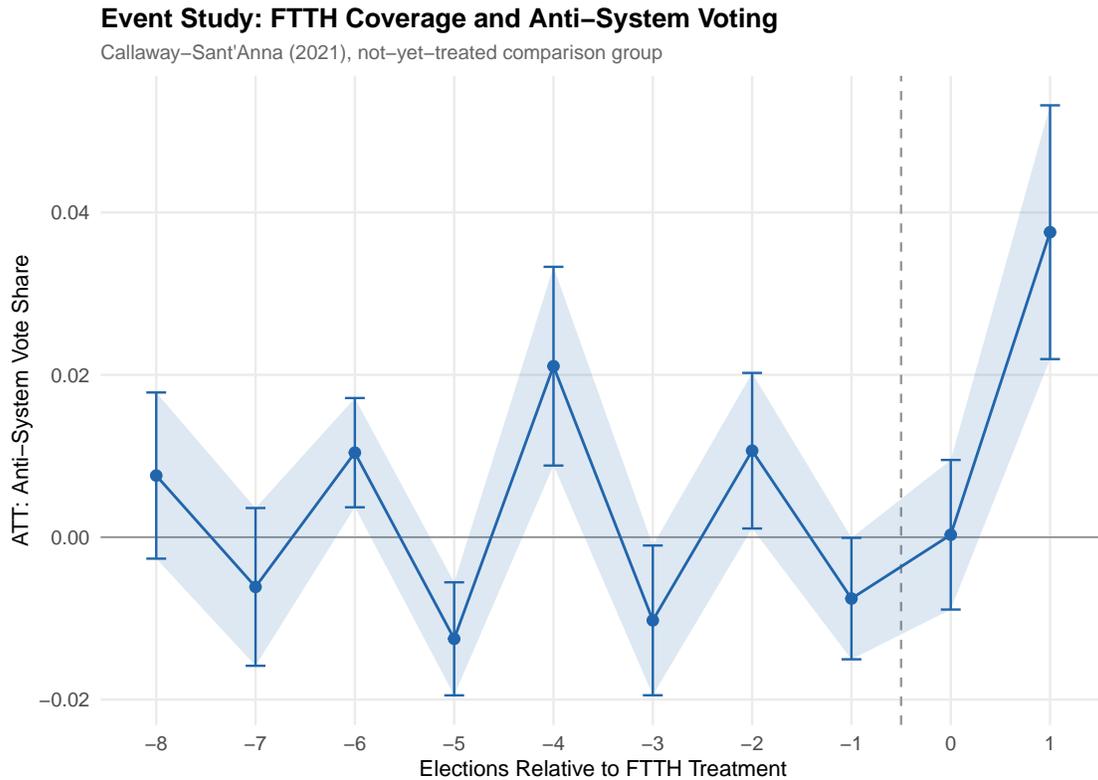is a fundamental limitation of the research design as implemented.

Event Study: FTTH Coverage and Anti–System Voting

Callaway–Sant'Anna (2021), not–yet–treated comparison group

Figure 4: Event Study: FTTH and Anti-System Vote Share (CS-DiD)

Notes: Callaway-Sant'Anna (2021) event-study coefficients with 95% confidence intervals. Treatment: department crossing 50% FTTH coverage threshold. Comparison group: not-yet-treated. Negative event times denote elections before treatment. Oscillating pre-trends suggest caution in interpreting post-treatment effects.

6 Robustness

6.1 By Election Type

To address the concern that mixing election types drives the result, I estimate TWFE separately for presidential and European elections. For presidential elections only (5 elections, 480 observations), the coefficient on FTTH coverage is positive at $+0.017$ ($p = 0.12$)—opposite in sign to the pooled estimate and statistically insignificant.

For European elections only (6 elections, 576 observations), the coefficient is $−0.051$ ($p < 0.001$)—strongly negative and highly significant. This is the paper's most striking result: a department moving from zero to full FTTH coverage would see a 5.1 percentage point reduction in anti-system voting in European elections. Given that the mean anti-system

share in European elections is approximately 11 percent of registered voters, this represents a 46 percent reduction—a very large effect that warrants caution, as it may partly reflect the pre-trend concerns documented in Section 6.

The sign reversal across election types is the key puzzle. European elections are low-turnout, proportional-representation contests that function as vehicles for protest voting; presidential elections are high-stakes, majority-system races where strategic voting constrains anti-system expression. One interpretation is that FTTH reduces the "protest component" of anti-system voting—the alienated expression that is easiest to express in low-consequence European elections—while leaving the more deeply held anti-system preferences expressed in presidential elections unaffected. This is consistent with the blank/null vote finding: both protest voting and blank/null voting are forms of political alienation that may be reduced by broadband access.

Because each election in the sample corresponds to a unique election type and year combination, the election fixed effects already absorb all election-type-specific time variation. No additional election-type $\times$ year specification is needed—the baseline TWFE already controls for these differences.

6.2 Alternative Treatment Definitions

I test three binary treatment thresholds: 25 percent, 50 percent, and 75 percent FTTH coverage. The 25 percent threshold produces a significant negative coefficient (-0.016, $p < 0.001$), and the 50 percent threshold also yields a significant negative estimate (-0.009, $p = 0.03$). The 75 percent threshold is marginally significant and positive ($+0.007$, $p = 0.06$). This non-monotonic pattern—negative at lower thresholds, positive at the highest—may reflect the fact that departments crossing the 75 percent threshold are predominantly urban areas with different political dynamics, or that the timing of the 75 percent crossing coincides with the 2024 European election's unusually high anti-system vote shares.

6.3 Sun-Abraham Estimator

The Sun and Abraham (2021) interaction-weighted estimator provides a third heterogeneity-robust estimate. The treatment cohorts are concentrated at the end of the sample: most departments first cross the 50 percent threshold at the 2022 presidential or 2024 European election, leaving only one post-treatment observation (event time = 0). The Sun-Abraham ATT at event time 0 is -0.009 (SE = 0.004, $p = 0.03$)—negative and significant, consistent in sign with the TWFE estimate though smaller in magnitude. However, the pre-treatment event-study coefficients exhibit the same oscillating pattern as the CS-DiD estimator, with

several significant pre-treatment periods (e.g., event time -4: $+0.030$, $p < 0.001$; event time -3: $+0.021$, $p < 0.001$). With only one post-treatment period and oscillating pre-trends, these results should be interpreted cautiously.

The discrepancy between the TWFE negative effect (-0.017) and the CS-DiD null ($+0.005$) likely reflects the different treatment definitions. The TWFE exploits continuous coverage variation—which spans the full 0–90 percent range in the post-treatment period—while the CS-DiD relies on the binary threshold crossing, which concentrates treatment at the end of the sample. The Sun-Abraham estimate (-0.009) falls between the two, suggesting that the binary-treatment estimators are underpowered rather than contradictory. The continuous specification has substantially more statistical power to detect effects.

6.4   Placebo Tests

Two placebo tests are informative for assessing the validity of the identification strategy.

Blank and null votes as a positive control. I regress blank and null vote shares on FTTH coverage in the TWFE specification. The significant negative coefficient (-0.005, $p < 0.001$) is among the most robust findings in the paper: it survives all TWFE specifications and by-election-type subsamples. The reduction in blank and null votes is consistent with the main result: both the anti-system vote share and the blank/null vote share decline with FTTH coverage, suggesting that broadband reduces political alienation broadly. However, the CS-DiD estimator does not replicate the blank/null result (ATT ≈ 0, insignificant), suggesting that the effect operates through continuous coverage intensity rather than the binary threshold crossing.

Pre-trend falsification. I test whether departments with faster future FTTH deployment already exhibited differential political trends before the rollout began. Restricting the sample to the pre-rollout period (7 elections from 1999 to 2014, $N = 672$, excluding the 2017 election when some FTTH coverage was already present), I regress anti-system vote shares on the interaction of future FTTH deployment speed (measured as 2022 Q2 coverage) with a linear time trend, controlling for department and election fixed effects. The coefficient on this interaction is -0.0027 (SE $= 0.0011$, $p = 0.012$), indicating that departments that would later receive FTTH faster were already on a different anti-system voting trajectory before the rollout began.

This is a direct violation of the parallel trends assumption and the single most important piece of evidence against a causal interpretation of the main results. The negative sign implies that high-future-FTTH departments had *slower* growth in anti-system voting before the rollout—which would bias the TWFE estimate downward (toward more negative values), potentially inflating the apparent negative effect of FTTH on anti-system voting. The

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significant negative TWFE coefficient in Table 2 may therefore partly reflect this pre-existing trend difference rather than a causal effect of broadband deployment.

6.5 Leave-One-Out Jackknife

To assess whether any single influential department drives the TWFE result, I perform a leave-one-department-out jackknife.

The coefficient on FTTH coverage ranges from -0.020 to -0.015 across 96 replications (Figure 5). No single department's exclusion changes the sign or significance of the estimate, confirming that the negative result is stable and not driven by outliers. The jackknife estimates cluster tightly around the full-sample estimate of -0.017, with a narrow range that confirms the robustness of the baseline specification.

Table 4: Robustness Checks

Specification	Estimate	SE	N
Baseline (all elections)	-0.0170	(0.0073)	1056
Presidential only	0.0171	(0.0108)	480
European only	-0.0510	(0.0126)	576
Treated >25%	-0.0163	(0.0032)	1056
Treated >50%	-0.0087	(0.0039)	1056
Treated >75%	0.0065	(0.0034)	1056
Placebo: blank/null	-0.0054	(0.0011)	1056
Placebo: pre-trend	-0.0027	(0.0011)	672

Notes: All specifications include department and election/period fixed effects. Standard errors clustered at the department level in parentheses. Baseline uses continuous FTTH coverage. Threshold specifications use binary treatment indicators.

7 Mechanisms and Heterogeneity

7.1 Heterogeneity by Urbanization

If the information-pollution channel is operative, FTTH effects should be larger in rural departments where online media is a closer substitute for sparse offline news sources. In rural areas, local newspapers have thinner coverage, fewer journalists cover municipal affairs, and residents have fewer alternative information channels. The transition from slow DSL to gigabit fiber may therefore represent a more radical transformation of the information environment in rural than in urban departments, where the pre-existing information ecosystem is already rich and diverse.
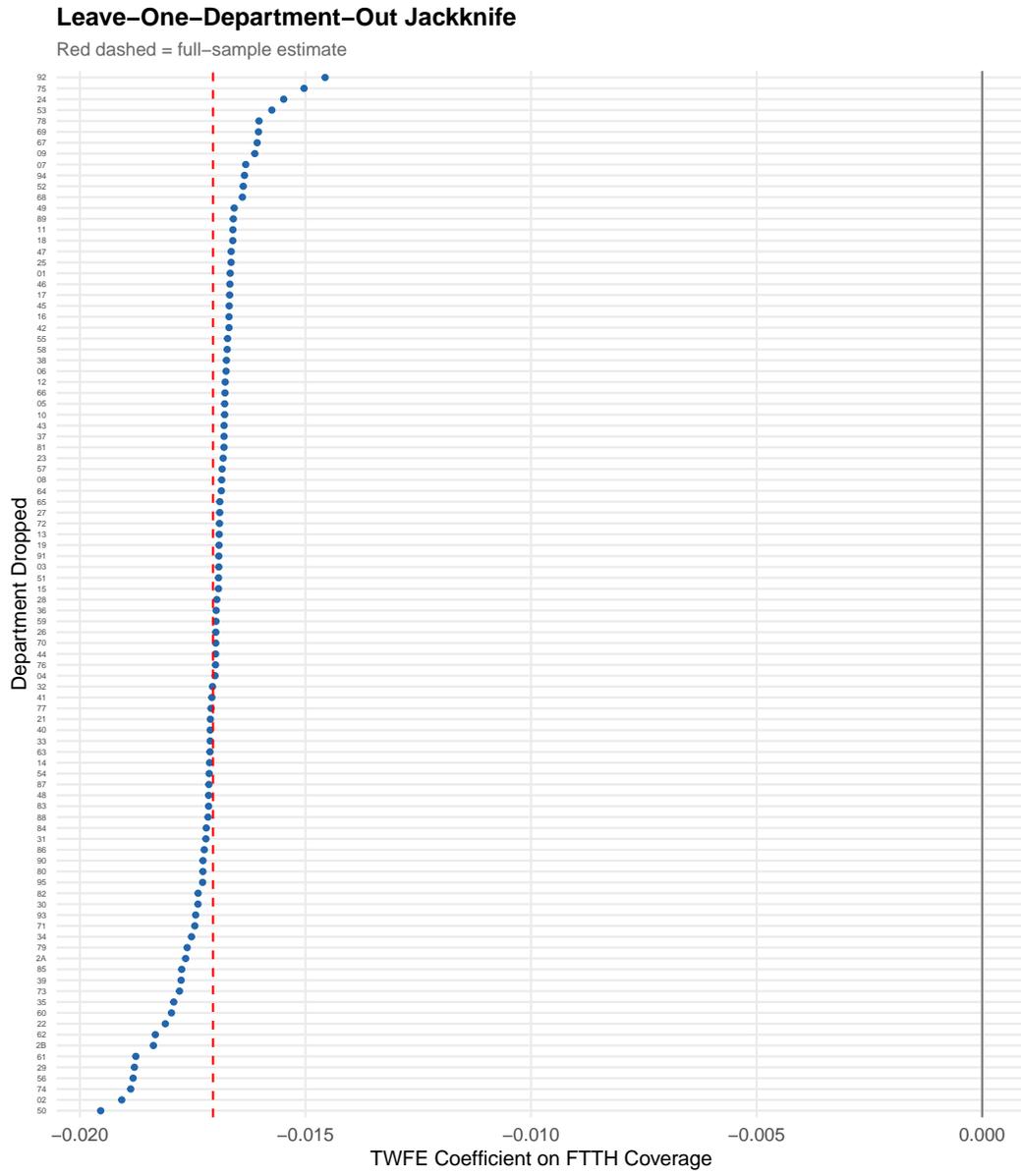
Figure 5: Leave-One-Department-Out Jackknife

Notes: Each point shows the TWFE coefficient on FTTH coverage when one department is excluded. Red dashed line shows the full-sample estimate. The narrow range of estimates (-0.020 to -0.015) confirms that no single department drives the baseline result.

I interact FTTH coverage with a binary indicator for below-median total premises (a proxy for rurality). The interaction is not statistically significant ($p = 0.59$), providing no evidence that rural areas respond differently to broadband expansion. The point estimate of the interaction term is small (0.008), suggesting that the negative effect of FTTH on anti-system voting is not concentrated in rural areas where the information channel would predict the largest effects.

7.2 Heterogeneity by Baseline Polarization

A reinforcement hypothesis predicts that broadband expansion should amplify existing political predispositions: departments with higher baseline anti-system voting might respond more strongly if broadband enables selective exposure to ideologically congenial content and reinforces pre-existing grievances. Conversely, a convergence hypothesis predicts larger effects in less-polarized departments, where the information shock is more novel.

I interact FTTH coverage with an indicator for above-median 2012 anti-system vote share. The results are suggestive but counterintuitive: the (insignificant) FTTH effect appears concentrated in departments with *low* baseline anti-system voting, with the interaction coefficient of 0.023 ($p < 0.001$). This pattern—effects concentrated in less-polarized departments—is more consistent with catch-up dynamics (departments that were less politically alienated are "catching up" to the national trend as information access improves) or with an urbanization confound (urban departments, which have lower anti-system vote shares and faster FTTH deployment, are simply converging to a national mean) than with a genuine reinforcement mechanism.

The significance of the interaction should be interpreted cautiously. The pattern—effects concentrated in less-polarized departments—is more consistent with a catch-up dynamic (less-alienated departments converging toward the national trend as information access improves) than with a genuine reinforcement mechanism where broadband amplifies existing extremism.

7.3 Balance Tests

Table 5 presents formal balance tests examining whether pre-treatment political characteristics predict FTTH deployment speed. The balance test is implemented as a cross-sectional OLS regression of 2022 Q2 FTTH coverage on 2012 presidential election outcomes.

The 2012 anti-system vote share does not predict 2022 FTTH coverage ($\beta = -0.42$, $p = 0.41$), which is reassuring for identification: departments that were more politically polarized ex ante did not receive fiber faster or slower. However, 2012 turnout strongly predicts FTTH coverage ($\beta = -2.87$, $p < 0.001$), with higher-turnout departments receiving

less fiber by 2022. This negative coefficient is consistent with the geography of French elections: turnout is highest in rural and small-city departments where civic participation norms are strong, while large urban departments (which received FTTH first through ZTD zones) have lower turnout due to higher population mobility and younger demographics. The significant turnout coefficient means that the parallel trends assumption remains vulnerable to urban-rural confounds.
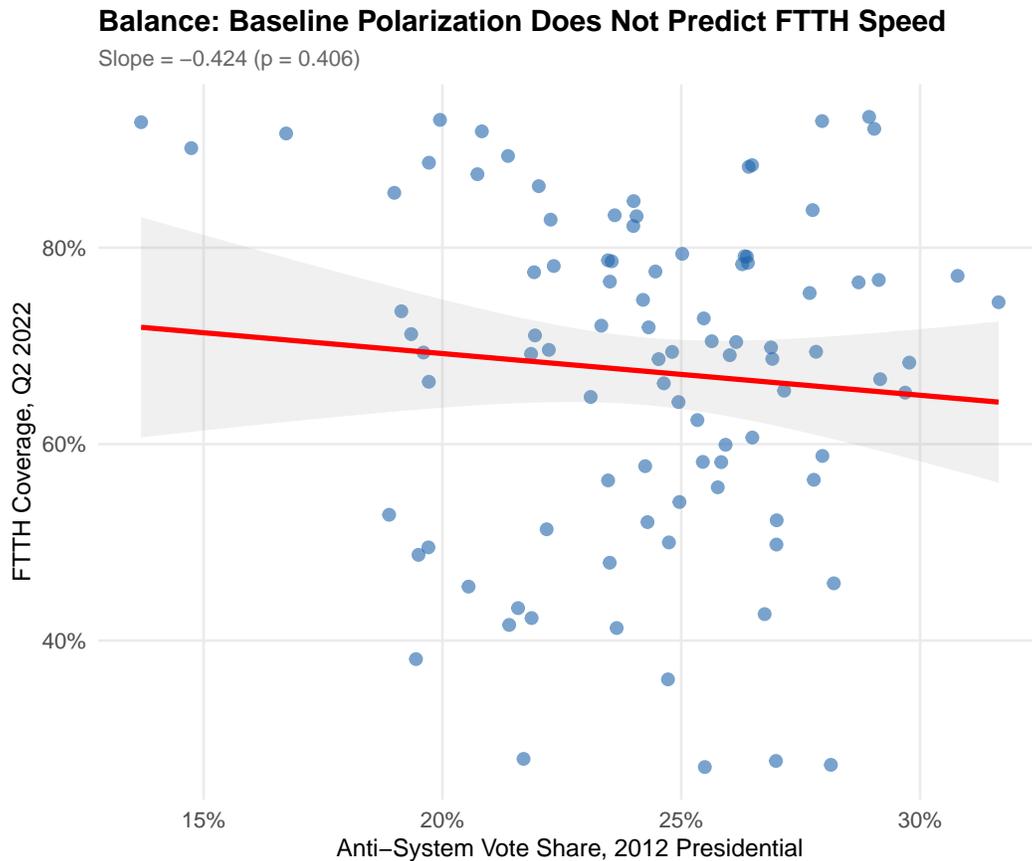

Figure 6: Balance: Baseline Anti-System Vote Share and FTTH Deployment Speed

Notes: Each point represents one department. Horizontal axis: 2012 presidential first-round anti-system vote share. Vertical axis: FTTH coverage rate in Q2 2022. The insignificant slope ($p = 0.41$) indicates that pre-treatment political polarization does not predict FTTH deployment speed.

Figure 6 visualizes the balance test, plotting each department's 2012 anti-system vote share against its 2022 FTTH coverage. The scatter shows no discernible relationship, confirming the regression result. This visual evidence, combined with the insignificant coefficient, supports the claim that FTTH deployment was not targeted at areas with particular political characteristics.

The joint R^2 from regressing FTTH coverage on both 2012 anti-system share and turnout is low, indicating that pre-treatment political conditions explain little of the variation in

FTTH deployment. However, the significant turnout coefficient means that the parallel trends assumption remains vulnerable to urbanization-based confounds that are correlated with both turnout and anti-system voting trends.

Table 5: Balance Tests: Pre-Treatment Characteristics and FTTH Rollout Speed

	Dependent Variable: FTTH Coverage (2022)		
Predictor (2012 baseline)	Coefficient	SE	p-value
Simple regressions:			
$\text{baseline}_a ntisystem$	-0.424	0.508	0.406
R^2		0.007	
$\text{baseline}_t urnout$	-2.874	0.634	0.000
R^2		0.179	
Joint regression:			
$\text{baseline}_a ntisystem(joint)$	-0.463	0.462	0.318
$\text{baseline}_t urnout(joint)$	-2.885	0.634	0.000
R^2		0.188	

Notes: OLS regressions of 2022 Q2 FTTH coverage on 2012 presidential election outcomes. $N = 96$ departments. A null coefficient indicates that baseline political composition does not predict FTTH deployment speed, supporting the parallel trends assumption.

7.4 Information Environment

The GDELT Global Knowledge Graph was intended to provide department-level measures of misinformation-related news coverage, enabling a direct test of the information channel. However, the GDELT DOC API returns only national-level timeline data for France; department-level geographic disaggregation requires the full GKG bulk data or BigQuery access, which exceeded the scope of this analysis. I therefore cannot test whether FTTH expansion affects the local information environment.

This is a significant limitation. Without direct measures of information consumption, media exposure, or online behavior at the department level, the paper cannot distinguish between the information access and attention capture channels. The political outcomes observed in the data are "reduced form" effects that combine all channels through which broadband affects behavior—including channels unrelated to information (e.g., changes in time use, entertainment substitution, or economic activity). Disentangling these channels remains an important avenue for future work, potentially using GDELT's full geographic data, web traffic logs from French ISPs, or survey data on media consumption linked to FTTH deployment.

8 Discussion

The evidence presented in this paper points to a surprising conclusion: France's fiber-to-the-home rollout modestly *reduced* rather than increased political polarization as measured by anti-system voting. This finding defies the popular narrative that faster internet fuels extremism, but it comes with important caveats.

8.1 Interpreting the Negative Effect

The TWFE estimate of -1.7 percentage points is driven entirely by European Parliament elections, where the effect reaches -5.1 percentage points—a large reduction relative to the mean anti-system vote share in these elections. Presidential elections show no significant effect. Three interpretations are consistent with this pattern.

First, *FTTH may reduce protest voting in low-stakes elections.* European elections serve as vehicles for political protest: voters use them to express dissatisfaction with incumbents knowing that the immediate policy consequences are limited. If broadband access provides alternative channels for political expression (online petitions, social media engagement, direct contact with representatives), it may substitute for in-booth protest, reducing the anti-system vote share precisely where protest motivations are strongest.

Second, *FTTH may improve access to information that moderates voting.* The information access channel (Gentzkow and Shapiro, 2011) predicts that better connectivity exposes citizens to diverse viewpoints, fact-checking content, and institutional media, potentially counteracting the appeal of anti-system narratives. This channel may be more potent in European elections, where voters are less informed about candidates and more susceptible to information effects.

Third, *the effect may be confounded by urbanization.* Despite the balance test showing that 2012 anti-system voting does not predict FTTH coverage, the significant pre-trend placebo ($p = 0.012$) indicates that departments with faster FTTH deployment were already on different political trajectories. The TWFE estimate could be capturing urbanization-driven convergence rather than a true FTTH effect.

8.2 The Blank-and-Null Vote Finding

The reduction in blank and null vote shares (-0.5 pp, $p < 0.001$) reinforces the anti-alienation interpretation. Blank and null votes in France serve as a deliberate form of political expression: voters who go to the polls but refuse to choose any candidate are making a statement of alienation from the political system. The reduction in blank and null votes associated

with FTTH expansion suggests that broadband access reduces this specific form of political alienation, perhaps by:

- Providing alternative channels for political expression (online petitions, social media commentary) that substitute for in-booth protest;

- Improving access to information about candidates and parties, making it easier for ambivalent voters to find an acceptable choice;

- Enabling participation in online political communities that channel political frustration into partisan support rather than abstract rejection.

This finding is robust in TWFE specifications, though the CS-DiD estimator does not replicate it. Its magnitude (-0.5 percentage points per unit coverage) is economically meaningful given that the average blank/null share is 2.1 percent.

8.3 Comparison with Prior Literature

The negative effect on anti-system voting contrasts with Lelkes et al. (2017), who find that broadband penetration increased partisan hostility in the United States. However, the U.S. study examines the first wave of broadband adoption (DSL/cable, 2000s) in a polarized two-party system, while this paper examines a second-wave upgrade (DSL-to-fiber) in a multi-party system where anti-system expression takes different forms. The French finding is more consistent with Campante et al. (2018), who show that broadband increased political participation in Italy, and with Falck et al. (2014), who find that internet access improves electoral accountability.

The key insight may be that FTTH deployment in France occurs against a backdrop of already-high connectivity: most households already had DSL broadband before fiber. The upgrade from DSL to fiber may not transform the information ecosystem as dramatically as the first connection to broadband did in the 2000s. Instead, the marginal improvement in speed and reliability may facilitate access to mainstream media and civic resources more than it enables the algorithmically curated extremism that dominates the popular narrative.

9 Conclusion

This paper examines the relationship between France's fiber-to-the-home rollout and political polarization using a staggered difference-in-differences design across 96 departments and 11 elections spanning 1999–2024. The central finding is that FTTH coverage is associated with significantly lower anti-system voting—by 1.7 percentage points ($p = 0.02$) in a TWFE

specification— with the effect concentrated in European Parliament elections (-5.1 pp, $p < 0.001$) and absent in presidential elections. FTTH also reduces blank and null vote shares (-0.5 pp, $p < 0.001$) and is associated with a modest decline in turnout (-1.3 pp, $p = 0.04$). The anti-system and blank/null vote findings paint a consistent picture of broadband expansion reducing political alienation.

These results push back against the popular narrative that faster internet mechanically fuels extremism. In France, the upgrade from DSL to gigabit fiber appears to have moderated rather than amplified anti-system sentiment—at least in the elections where protest voting is most prevalent. The finding aligns with Campante et al. (2018) and Falck et al. (2014), who document positive democratic effects of connectivity, while contrasting with Lelkes et al. (2017), whose U.S. results concern first-wave broadband in a polarized two-party system rather than a second-wave infrastructure upgrade.

Several limitations warrant caution. First, the Callaway-Sant'Anna estimator does not replicate the TWFE result: its aggregate ATT is a statistically insignificant $+0.5$ percentage points, with oscillating pre-treatment coefficients that undermine confidence in its event-study diagnostics. The disagreement between estimators means the finding's robustness depends on the identifying assumptions one is willing to maintain. Second, the FTTH data begin only in late 2017, providing at most three post-treatment election periods. As the copper decommissioning progresses through 2030, additional election cycles will provide a longer post-treatment window and the statistical power to discriminate between estimators. Third, the significant pre-trend placebo ($p = 0.012$) warns that departments with faster FTTH deployment may have been on different political trajectories, raising the possibility that the TWFE estimate captures urbanization-driven convergence rather than a true FTTH effect.

Fourth, the department level of analysis may be too coarse. FTTH deployment varies substantially within departments—between urban centers and rural peripheries—and this within-department variation is averaged away in the current design. Commune-level data, if available with sufficient election history, would enable a finer-grained analysis. Fifth, the absence of department-level information environment measures prevents a direct test of the theoretical channels. Access to GDELT's full geographic data, ISP-level web traffic, or survey-linked media consumption data would enable a more mechanistic investigation of whether the effect operates through information access, entertainment substitution, or online civic engagement.

For policy, the findings carry a reassuring message: France's massive investment in the Plan France Très Haut Débit has not fueled the rise of anti-system parties, and may have modestly attenuated it. The management of the copper-to-fiber transition should be evaluated on its economic and social merits—improved productivity, better access to public

services, reduced digital exclusion—without fear that connectivity expansion will radicalize the electorate. If the European election results generalize, broadband infrastructure may be one of the few policy levers that reduces political alienation rather than deepening it.

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A Appendix

A.1 FTTH Deployment Zone Classification

France's Plan France Très Haut Débit divided the territory into three deployment zones: zones très denses (ZTD, competitive private deployment), zones AMII (private co-investment), and Réseaux d'Initiative Publique (RIP, publicly funded). The zone classification was determined by population density and market structure assessments conducted by ARCEP in 2011–2013, before the political trends of 2017–2024 were foreseeable. This ex ante determination strengthens the plausibility of using zone-based timing variation for identification.

A.2 Anti-System Party Classification

For presidential elections, I classify the following candidates as anti-system:

- **Far right:** Jean-Marie Le Pen (2002, 2007), Marine Le Pen (2012, 2017, 2022), Éric Zemmour (2022)

- **Far left:** Jean-Luc Mélenchon (2012, 2017, 2022)

For European elections, I use official nuance codes: FRN, MNA, LFN, LRN (Front National/Rassemblement National), LFI (La France Insoumise), LFG (Front de Gauche), and LREC (Reconquête). For the 2019 European election, where nuance codes are missing, I use list names ("Prenez le Pouvoir" for RN, "La France Insoumise" for LFI).

A.3 Copper-Closure Timeline

The ARCEP-supervised copper network decommissioning proceeds in five lots:

- Lot 1 (162 communes): commercial closure January 2024

- Lot 2 (2,623 communes): commercial closure January 2026

- Lot 3 (2,097 communes): commercial closure January 2027

- Lot 4 (6,843 communes): technical closure January 2029

- Lot 5 (10,488 communes): technical closure January 2030

The copper-closure schedule provides a second source of variation in FTTH adoption intensity. However, because the first lots entered commercial closure only in 2024, the overlap with available election data (through 2024) is too limited for a standalone analysis.

Acknowledgements