Mobilization without Consolidation: Social Media and the Yellow Vests Protests

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Abstract

How do social media affect the way protest movements unfold? Drawing from the Yellow Vests episode in France, we show that the ease of coordination on social media may come at the expense of the ability to structure coherent political movements. Both daily time-series and instrumental variable estimates suggest that protests were planned online and later reinforced online activism. However, this rebound effect was a damp squib. Protests rapidly subsided, while a textual analysis of persistent online discussions reveals that anger at the government progressively replaced practical demands.

Keywords: Yellow vests; protests; social media; online mobilization

JEL Classification: F15; J40; J60; J80; C83.

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1 Introduction

Throughout the XXth century, the success of a protest movement depended on its ability to jointly appeal to four constituencies: the media, politicians, policy-makers, and its own motley coalition of members. The resulting tensions, which form the basis of Lipsky (1968)'s discussion of "protest as a political process", were dramatically altered by the irruption of social media in recent social unrest movements across the world.[1] This hybridization of online and offline activism raises many questions surrounding its efficacy (Earl and Kimport, 2013; Castells, 2015). On the one hand, new means of information sharing and coordination allow for more accessible movements where anyone can initiate or organize a protest. On the other hand, a strong dependency on a leaderless social media infrastructure, where anyone can voice their individual opinion, may dampen the ability to structure long-lasting, effective political campaigns.[2]

In this paper, we provide evidence that such a trade-off exists, using the French Yellow Vests movement as a case study. Our contribution is twofold. First, as in previous studies, we find that social media help organize protests,[3] and we furthermore provide *causal* evidence of a synergy between online and offline actions: street protests triggered additional mobilization online. Second, we depict different phases of the movement using textual analysis and find evidence of radicalization over time.

The Yellow Vests came into the spotlight on November 17, 2018 (hereafter, 11/17), with hundreds of road blockades across the country. However, those blockades were only the tip of the Yellow Vests iceberg. A petition, which had been dormant on the Change.org website for several months, gained sudden exposure in October 2018 and eventually garnered more than one million signatures. The movement also begat a new political affiliation system on Facebook, with the proliferation of dedicated groups with national, regional or local focus. By

[1] The importance of social media in the development of large protest movements has been investigated in theoretical (e.g., Little, 2016; Barbera and Jackson, 2020) and empirical studies (e.g., Acemoglu et al., 2018; Jost et al., 2018; Qin et al., 2017; Bursztyn et al., 2021; Enikolopov et al., 2020).

[2] As summarized by della Porta (2013), mobilization triggered by social media can be "very successful in terms of number, but tends to be more volatile and intermittent than in the past".

[3] We are the first to provide quantitative evidence on this fact for the Yellow Vests movement, which is still quite recent and understudied – see Bendali and Rubert (2020).

mid-December 2018, we counted over three-thousand groups and over four million members. While street protests rapidly subsided, the Yellow Vests remained very active on dedicated Facebook pages, where hundreds of thousands of posts were shared and commented on for several months.

To describe these dynamics, we bring together data on road blockades, geolocated petition signatories, activity on Facebook pages and groups, and comprehensive administrative data at the local level.[4] We first show that petition signatories and Facebook activism are strongly correlated with the occurrence of road blockades. The petition was mostly active prior to the first set of blockades, which suggests that it was primarily used as a signaling device for latent discontent within the population. Turning to Facebook, group creations prior to 11/17 indicate the social media platform served both as a signal extraction and a coordination device. Spatial regressions of the occurrence of a blockade in a municipality show that monitoring early online activities increases the variance explained in the data by 50%.

Interestingly, we also document a second wave of Facebook group creations following 11/17, which highlights the complementarity between online and offline activism (Bastos et al., 2015). We confirm this bidirectional pattern with an instrumental variable strategy based on the spatial dispersion of roundabouts, a peculiar feature of the French urban landscape that plausibly reflects idiosyncratic local urban planning preferences. Roundabouts were heavily targeted by protesters because they allow demonstrators to block several roads at a time and are easy to set camp on. We show that one local blockade triggers the creation of 0.74 additional local Facebook groups (on average and conditional on a broad range of confounding factors), which roughly corresponds to 500 new members joining the network of protesters.

This feedback loop fed the online side of the mobilization. However, the Yellow Vests failed to capitalize on this rebound effect to shape politics and policy in the long run. To better understand the evolution of the movement, we analyze a large corpus of messages and comments posted on Facebook pages. Relying on a customized topic model for short texts, we confirm that Facebook was first used as a means to organize protests and share demands. Yet,

[4] This data will be made publicly available upon publication.

as the blockades were lifted, main topics of interest progressively shifted away from practical demands and concerns toward police violence and government critiques, reflecting growing anger among remaining participants.

2 Brief history

The success of the Yellow Vests and the 11/17 blockades results from the combination of chance and the social media ecosystem – see the appendix for details. A petition against high gas prices was picked up by a local journalist on October 12. The article caught the eye of the wife of a truck driver who had been planning a blockade on Facebook with fellow angry car users and linked the petition on Facebook. Nine days and thousands of local signatures later, a national newspaper published the two stories and signatures skyrocketed all over the country.

On October 24, the yellow road security jacket, which every car owner is compelled by law to have in her trunk, was proposed as a rallying sign. On 11/17, hundreds of blockades took place across the country, organized by hundreds of thousands of protesters. As many of these blockades were quickly evacuated, the movement then resorted to more conventional weekly demonstrations in the main cities. A climax of violence was reached on December 1 in Paris. The following Saturday, police tanks were mobilized and 2,000 people were arrested. On December 10, President Macron presented a 10-billion-euro plan that significantly bent the government's budgetary policy, and asked for a compilation of lists of grievances (*Cahiers de doléances*, as took place during the French Revolution in 1789) from across the country, to be followed by hundreds of self-organized town halls meant to give anyone the opportunity to voice their concerns through a so-called "Great National Debate" (*Grand Débat National*).

This response was not inconsequential, but it did not tip the balance of power toward peripheral cities and rurality in the way that the Yellow Vests were hoping for. Some blockades turned into permanent campsites and weekly demonstrations continued for months, but the number of demonstrators soon became negligible (except in Paris where some large scale demonstrations still took place until March 2019). At the same time, polls indicate that public

support decreased in the French population, and the Yellow Vests ultimately failed to present a united front for the upcoming elections. The movement remains active online to this day, with sporadic protests (e.g., against sanitary lockdowns) where yellow vests are worn as a badge of honor. As such, this simple piece of garment has become a persistent and divisive icon in the French political landscape.

3 Data

Petition signatories signal a willingness to protest. We collected anonymized data on petition signatories from Change.org. The data includes city of residence and associated ZIP code. As of October 16, 2019, the petition garnered 1,247,816 signatures in total, including 1,043,337 with a valid ZIP code.

Self-declared blockades proxy the offline mobilization. Following a call for a national blockade of roads made on October 10 and the organization of several local demonstrations, a website (`www.blocage17novembre.fr`) was created to coordinate the actions planned for 11/17. It provided a map of the organized blockades, updated in real time, which we collected on the evening of November 16. This map documented 788 announced blockades in metropolitan France, which all pointed to precise road infrastructures and included specific descriptions of the planned events.[5] Many places were chosen for their potential to block traffic and economic activity.

Facebook groups and pages proxy the online mobilization. The main websites that were associated with the organization of the movement coordinated the demonstrations by listing local dedicated Facebook groups.[6] To document online mobilization, we therefore looked for all public Facebook groups related to the movement in the most comprehensive way. Using the methodology of Caren and Gaby (2011), we compiled a list of the Facebook groups that were still active one month after 11/17 by performing numerous search requests using a set of

[5] Note that these are declarations of an intent to demonstrate. Yet, as the map was created to coordinate the blockades, there was little incentive to falsely declare an intent to demonstrate.

[6] First `blocage17novembre.fr`, then `gilets-jaunes.com` and `giletsjaunes-coordination.fr`.

keywords linked to the movement – see the appendix. For each group, we recorded the name of the group, creation date, number of members, and number of publications. We identified 3,033 groups in total, with over four million members. Over two-thirds of the groups were associated with a geographical area and more than 40% of the total number of members belonged to these localized groups. Moreover, only 20% of the posts emanated from national groups, which suggests that localized groups were the most active type. We also identified 617 Facebook pages and used Netvizz to retrieve their content (Rieder, 2013): posts, comments and interactions (such as likes and shares).[7] This corpus features over 121,000 posts, 2.1 million comments and 21 million interactions.

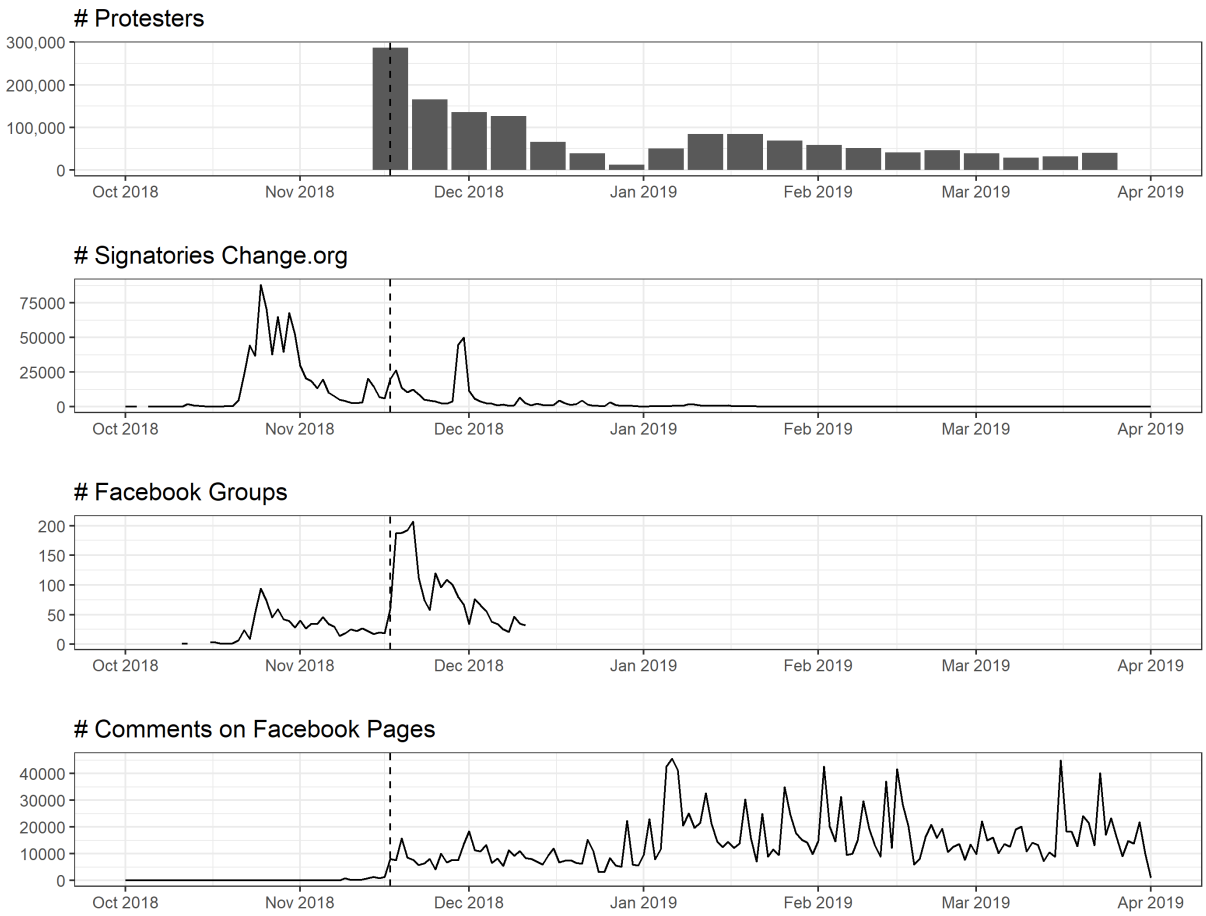
Stylized facts. The number of petition signatories, the number of Facebook group creations, and the number of interactions on Facebook pages are depicted as daily time series in Figure 1. While signatures mostly occurred before 11/17, there were two distinct episodes of group creation: a small one in the weeks prior to the blockades and a large one shortly afterward. This pattern suggests that some Facebook groups were used as a means to organize the blockades, but many of them served as virtual agoras that allowed protesters to continue demonstrating online after an initial mobilization in the streets. This hypothesis is corroborated by the evolution of the intensity of the discussions that took place on dedicated Facebook pages. Discussions gained in importance in January 2019 and, contrary to the weekly number of protesters, remained strongly active during the following months.

4 Online and offline mobilizations: a two-way street

We combine both the spatial and time dimensions of our data to dig deeper into the relationship between online and offline mobilizations. To that end, we focus on the lowest administrative level in France and build municipality-level variables of mobilization: the existence of a blockade, the petition signature rate per inhabitant, the number of Facebook groups (including groups of regional level apportioned by population) and the existence

[7] This type of Facebook data is no longer accessible because of recent changes to the website's API.

Figure 1: Evolution of online and offline mobilizations



Top panel: official number of demonstrators, by week; Second panel: daily number of petition signatures; Third panel: daily number of new Facebook groups created; Bottom panel: daily number of comments posted on Facebook pages. The dashed line corresponds to 11/17.
Source: Ministry of the Interior, Change.org and Facebook.com.

of a dedicated municipal group. The signature rate is a measure of discontent toward the government policy, while the Facebook indicators capture a mix of intensity in Facebook use and online mobilization. We distinguish between early (pre-11/17) and late (post-11/17) online mobilization.

Organizing blockades online. First, we check whether online mobilization is a good predictor of the occurrence of a protest by estimating a linear model of the probability that a given municipality experiences a blockade on 11/17. We use a wide set of controls that depict the socioeconomic, geographical and political characteristics of the municipality – see the appendix for the full list. The estimation results are displayed in Table 1.

Table 1: Probability of blockade in the municipality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Signature rate (pre-11/17)			0.014^a			0.011^a	0.010^a
			(0.003)			(0.002)	(0.002)
Number of groups (pre-11/17)				0.044^a		0.032^a	0.030^a
				(0.004)		(0.008)	(0.007)
Local group (pre-11/17)					0.380^a	0.125^b	0.121^b
					(0.024)	(0.062)	(0.057)
Roundabouts (Municipality)							0.011^a
							(0.004)
Roundabouts (LZ)							-0.111^a
							(0.018)
Controls	X	X	X	X	X	X	X
Fixed effects		LZ	LZ	LZ	LZ	LZ	LZ
Adjusted R-Squared	0.128	0.157	0.161	0.239	0.227	0.244	0.257
Within R-Squared		0.139	0.144	0.223	0.211	0.228	0.241

(i) OLS estimates of the probability that a municipality experiences a blockade (N=31,000); (ii) Signature Rate is the number of signatures by inhabitant prior to 11/17; Number of groups is the apportioned number of Facebook groups (from all geographical levels) prior to 11/17. Both variables are standardized. Local Group is a dummy variable for the existence of a specific municipal group prior to 11/17. (iii) Last column represents the first-stage estimates used in Table 2. The two instruments are the number of roundabouts per squared kilometer in the municipality and the corresponding average for all other municipalities in the LZ. Both variables are standardized. (iv) Standard errors clustered at the LZ level, with a: p< 0.01 and b: p<0.05.

Column (1) confirms that standard municipal characteristics explain little variation in the blockade probability. To account for time-invariant unobserved heterogeneity at the local level, we control for "Living Zone" (*bassins de vie*, hereafter LZ) fixed effects. Living zones are administrative units defined as the smallest territorial units in which residents have access to basic infrastructure and services and conduct a large part of their daily lives. We observe that 551 out of the 1,632 LZs experienced a blockade, which corresponds to half of the country's population. Column (2) shows that adding LZ fixed effects slightly increases the explanatory power of the model, though local characteristics explain the largest part of the observed variance in the data. Then, in Columns (3) to (6), we successively control for the petition signature rate, the number of Facebook groups in the region and the existence of a specific Facebook group in the municipality, all measured prior to the 11/17 protests. The three variables are positively correlated with the occurrence of a blockade. When we control

for the three variables simultaneously, the adjusted R-squared is 50% higher than in Column (2). This suggests measures of online activism are key to understanding the movement's early success in the streets.

Going back online keeps the protest alive. After confirming the strong correlation between early online mobilization and the protests, we turn to the impact of the protests on subsequent online mobilization. Given that blockades are driven by many unobservable factors (e.g. political sentiment, which is highly elusive), we resort to an instrumental variable strategy that relies on the local supply of easy-to-block locations: roundabouts.

The rationale for the instrument stems from the fact that calls for demonstrations urged protesters to block roundabouts, which, by design, allow to block several roads at a time and are equipped with a central median strip that is convenient to set camp on. The history of roundabouts makes it likely that the conditional distribution of local roundabout density reflects local idiosyncrasies. Roundabouts are partly a French architectural fad, invented in 1906 by the French urban planner Eugène Hénard.[8] While there are plausible reasons related to road safety to support them, roundabouts can almost always be replaced with traffic lights. A map of the prediction error of roundabout density at the municipality level, after an OLS regression including our controls, shows a seemingly random distribution – see the appendix. Column (7) in Table 1 shows that roundabouts played an important role in orchestrating the protests: we find that increasing the density of roundabouts in a municipality by one standard deviation increases the probability of a blockade by 1 p.p. However, this is not the whole story: since organizing a blockade requires significant manpower, protesters had to collude on a select number of blockades within their LZ. This spatial coordination problem suggests a second instrument, which is the mirror image of the first: the density of roundabouts in the other municipalities of the LZ. As shown in Column (7), an increase of one standard deviation in this variable decreases the blockade probability by 11 p.p.

Results illustrating the impact of the blockades on further online mobilization are displayed in Table 2. Column (1) shows that even though the bulk of petition signatures occurred

[8] There are over sixty-thousand roundabouts in France, which is four times more than the United Kingdom. One third of French municipalities have at least one.

Table 2: Blockades and further online mobilization

	Signature rate (post-11/17) (1)	Local group (post-11/17) (2)	# Members in LG (post-11/17) (3)	# Posts in LG (post-11/17) (4)
Local blockade	1.252^a	0.744^a	532.497^b	446.226^b
	(0.232)	(0.114)	(209.862)	(179.346)
Signature rate (pre-11/17)	0.483^a	-0.001	-1.849	-0.099
	(0.053)	(0.001)	(2.391)	(2.130)
Number of groups (pre-11/17)	-0.031^c	0.008	81.948^a	59.382^a
	(0.016)	(0.005)	(22.007)	(18.637)
Local group (pre-11/17)	-0.067	-0.088^b	-566.419^a	-411.531^a
	(0.104)	(0.043)	(119.876)	(112.848)
Controls	X	X	X	X
Fixed effects	LZ	LZ	LZ	LZ
Kleibergen-Paap F-stat	36.414	36.414	36.414	36.414
p-value Hansen	0.221	0.918	0.256	0.319

(i) 2SLS estimates (N=31,000) of the impact of the municipal blockade dummy on the signature rate per inhabitant post-11/17 (Column (1)), the creation of a local group post-11/17 (Column (2)) and the number of members (Column (3)) and posts (Column (4)) in these newly created local groups. (ii) Signature rates and Number of groups are standardized. (iii) Standard errors clustered at the LZ level, with a: p< 0.01, b: p<0.05 and c: p<0.1.

prior to 11/17, having a blockade increases the post-11/17 signature rate by 1.3 standard deviations. This result suggests that protests helped spread information about the Yellow Vests' demands, at a period (until the end of 2018) where support for the movement was still quite high in the population. We also find a strong positive impact of blockades on subsequent Facebook activity: a blockade in a municipality triggers the creation of 0.74 new local Facebook groups (Column (2)), which corresponds to 532 new members (Column (3)) and 446 messages (Column (4)).

These results are robust to a number of specification changes – see the appendix. They strongly suggest that the 11/17 protests triggered a new wave of online mobilization, especially on Facebook: the social network acted as a virtual agora where protesters who had met in the streets continued to meet and discuss for months. While most blockades were rapidly lifted following 11/17, this rebound effect kept the movement alive. By progressively morphing into a purely online movement with no organizational purpose, however, the movement changed in focus, as we show below.

5 The gradual radicalization of online discussions

We now turn to an analysis of the content of the last time series displayed in Figure 1 – the messages posted on the 617 identified Yellow Vests Facebook pages between November 2018 and April 2019. To do so, we uncover latent topical structures with natural language processing methods (Gentzkow et al., 2019). As standard topic models are known to perform poorly on social media posts, we rely on a topic model tailored to the analysis of short text snippets (Demszky et al., 2019) – see the appendix. In our main specification, we allow for 15 different topics, but similar results are found with alternative numbers of clusters. Resulting topics are displayed in Table 3 and grouped into five broad categories for interpretation. Approximately 15% of the sentences in the corpus are related to the 'organization' category, which confirms the role of Facebook in the organization and coordination of the movement.

Table 3: Results of the topic model

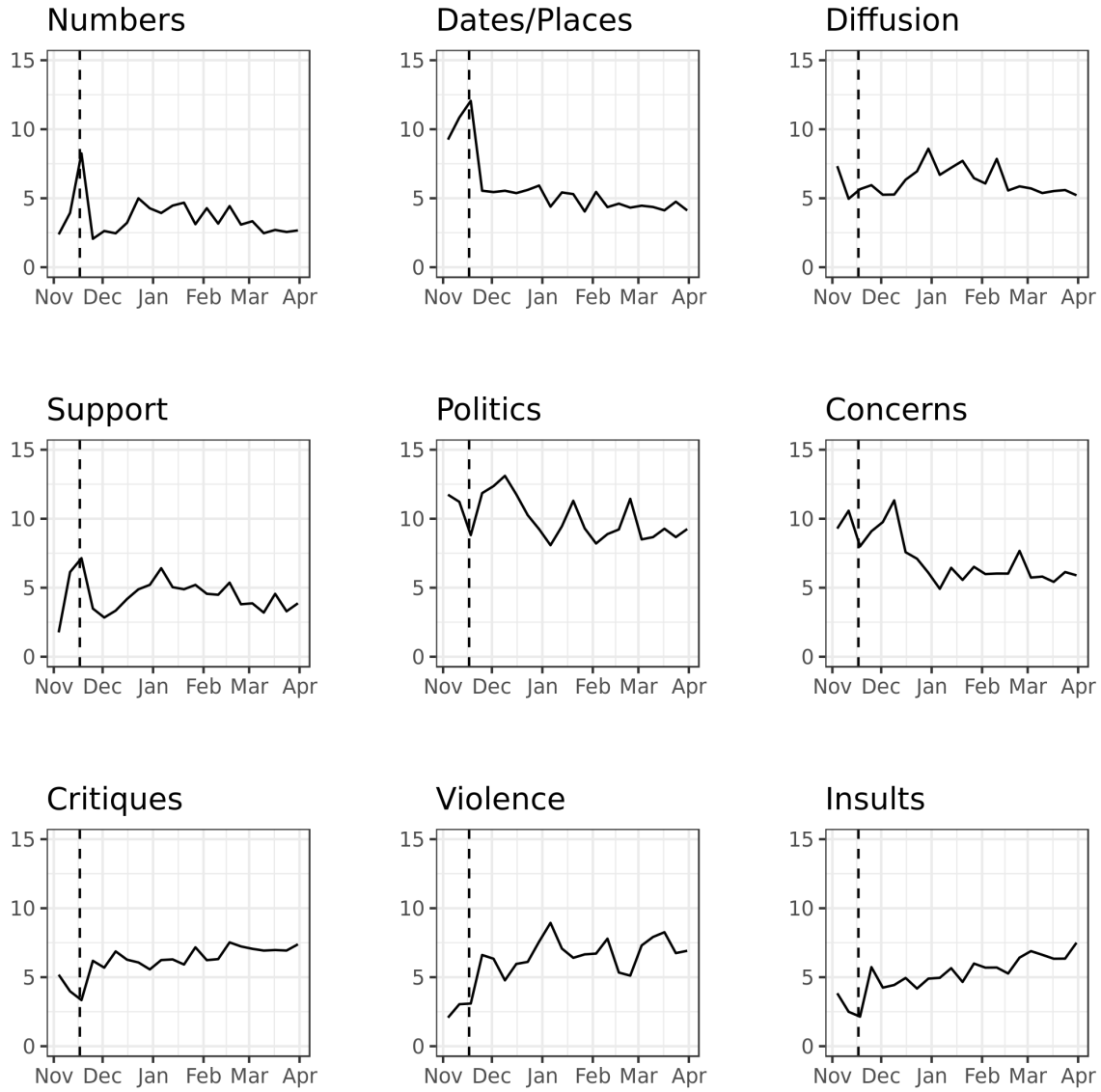
Category	Cluster Name	Associated words
Organisation	Numbers*	79, 82, 69, 78, 91, 04, 77, 41, 61, 47
	Dates/Places	caen, paris, alentour, dimanch, samed, orlean, vendred, aprem, nocturn, parv
	Diffusion	publ, verif, publi, diffus, information, inform, infos, verifi, twitt, enregist
Support	Support	bravo, courag, merc, felicit, soutien, formid, bravos, genial, sup, soutient
Claims	Politics	impose, polit, citoyen, processus, notr, rejet, global, democrat, oppos, institu
	Concerns	chomage, plafon, loyer, revenus, salair, salaire, reduct, compens, remuner, beneficiair
Conflict	Critiques	malsain, mediocrit, stupidit, bassess, pervers, afflig, hypocris, egocentr, malhonnetet, condescend
	Violence	polici, cr, flic, agresseur, polic, violent, agress, manifestants, fdo, innocent
	Insults	pourritur, connard, salopard, hont, ordur, merd, saloper, crevur, encul, batard
Miscellaneous	Socialization	bonsoir, bonjour, coucou, cc, bjr, salut, bsr, hello, bisous, slt
	Actions	pens, auss, mem, alor, oui, vrai, autr, comm, just, fair
	Names	hish, todaro, jessim, mecher, vlr, laurananouai, elliott, francesch, tiphan, alfonso
	Names/Hashtags	fauteurdetroubleorganiseparletat, lieudepouvoirinquietezero, demokraciat, yuz, tohl, antifaetbbdirig
	Pranks	mdr, chausset, toilet, lol, slip, fringu, fum, mdrrr, bross, petard
	Foreign Language	knowledgeispow, intensivierung, zerstor, tarikat, bindet, soyar, aangereden, gaynor, devletl, katled

(i) Associated words are the closest words to the cluster centroid (as measured by cosine similarity). * Most likely phone numbers or references to French counties. (ii) To give a sense of topical content, we translate the closest sentence to the cluster centroid for several topics: *Dates/Places:* "come in great numbers on Friday meeting 6.30pm Lille Opera"; *Diffusion:* "A message will be published as soon as we have precise information on all YV pages of the island"; *Support:* "Bravo bravo, good luck and thank you"; *Critiques:* "These actions are so hypocritical, it makes me sick".

However, as shown in Figure 2, messages related to the coordination of offline activities

(topics 'Numbers' and 'Dates/Places') peak around 11/17, before a sharp decrease in subsequent months.[9] Similarly, messages related to economic concerns represent 10% of the corpus up until early December – when the government announced several measures to sustain households' purchasing power – but are subsequently halved. Conversely, messages related to critiques and violence increase over time (topics 'Violence', 'Insults' and 'Critiques').

Figure 2: Evolution of Topics



Weekly shares associated with the nine topics of interest – see Table 3. The dashed line corresponds to 11/17. The share of messages associated to violence is below 2.5% in early November and is consistently above 5% after December 10.

[9] This is not the case of the topic 'diffusion', which also relates to the organization of online mobilization and remains fairly stable over the period.

Overall, these results show that as the movement unfolded, antagonistic messages tended to replace messages related to the movement's organization and demands. Interestingly, the share of supportive messages remained stable over the period, which seems to indicate that support for the movement did not fade away among participants. To further investigate the text corpus, we use reactions to posted messages as a proxy for positive and negative sentiment – see the appendix. Consistent with a deterioration of the situation between the government and protesters, negative sentiment increases over the period. This increase is not driven by sadness reactions, but mostly by anger reactions.

6 Conclusion

With the help of a constellation of dedicated local Facebook groups, the Yellow Vests managed to put together a nationwide protest that targeted a distinctive suburban infrastructure: the roundabout. By lowering signal extraction and coordination costs, social media allow for new geographies of mobilization, which do not require the high human densities of urban centers but instead emerge at the fringes of metropolitan economies. However, the early success of the movement may have carried the seeds of its own demise. Blockades triggered additional online mobilization, which fed into a digital echo chamber that radicalized over time and cut ties with the movement's original goals. Historically, nonviolent and violent activism have had very different implications for electoral results (e.g., Wasow, 2020; Converse and Pierce, 1986).[10] Though the Yellow Vests' long-run political impact remains to be seen, the inability to structure a coherent political force for subsequent elections suggests that the ease of coordination via social media may come at the cost of aggregating heterogeneous and often conflicting political preferences.

[10]Some studies have intended to assess the gains from online and offline electoral campaigning during elections. For example, Bond et al. (2012) and Broockman and Green (2014) show a small, if not zero, effect of social media on turn-out and electoral preferences during elections. Conversely, ground work seems to be quite effective (Braconnier et al., 2017).

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Supplementary Appendix to *Mobilization without Consolidation: Social Media and the Yellow Vests Protests*

(not for publication)

In this Appendix, we present additional details on the chronology of the Yellow Vests movement (Section A), the data-collection process (Section B), the content analysis of Facebook pages (Section C) and the statistical analysis on the interplay between online and offline mobilization (Section D).

A Context

A.1 Chronology of events

Gas prices, speed limit, and general discontent. In 2015, then-President François Hollande decided to gradually implement a carbon tax on top of the existing gas tax, in order to make diesel and gasoline after-tax prices converge.The carbon tax was confirmed in 2017 by newly-elected President Emmanuel Macron, even though oil prices had been increasing since 2016 and car-related expenses had been increasing for several years.[1] A few months later, in January 2018, Prime Minister Édouard Philippe decided to decrease the speed limit on secondary roads from 90 km/h to 80 km/h, citing road safety concerns. This latter decision was not part of Emmanuel Macron's campaign manifesto and triggered the organization of many traffic slowdown protests throughout the country.[2] The new 80 km/h regulation went into effect on July 1, 2018.

By the end of the summer holidays, the yearly increase in the carbon tax was confirmed in the 2019 budget despite growing discontent,[3] particularly among motorists.[4] A well-known association of car users, "40 millions d'automobilistes" launched the initiative "Coup de Pompe"

[1] In 2018, the Automobile Club Association estimated that car-related expenses (including gas, insurance, tolls, fines, technical control) had increased by 3% to 4.6% in a single year; see https://www.automobile-club.org/espace-presse/communiques/l-aca-publie-les-resultats-du-budget-de-l-automobiliste-2018.

[2] See, for example, http://www.leparisien.fr/societe/vitesse-limitee-a-80-km-h-des-milliers-de-motards-en-colere-contre-la-securite-rentiere-27-01-2018-7526337.php.

[3] See, for instance, https://www.lemonde.fr/societe/article/2018/12/05/niveau-de-vie-les-10-graphiques-de-la-colere_5392911_3224.html

[4] See, for example, https://www.francetvinfo.fr/economie/transports/prix-des-carburants/recit-mobilisation-du-17-November-comment-les-gilets-jaunes-ont-fait-le-plein-pour-bloquer-la-france_3030251.html, https://www.lemonde.fr/les-decodeurs/article/2019/10/22/un-an-apres-retour-sur-les-six-jours-qui-ont-vu-emerger-le-mouvement-des-gilets-jaunes-sur-facebook_6016485_4355770.html, or https://fr.wikinews.org/wiki/Cat%C3%A9gorie:Mouvement_des_gilets_jaunes.

encouraging everyone to send their gas bill to the President. Several petitions were also launched online to alert the government of the impact of gas prices on purchasing power. Other initiatives surfaced on social networks, including videos totaling millions of views.[5] Although these various individual initiatives were pointing out the same discontent, they failed to coordinate and gain momentum.

The Seine-et-Marne cluster. On October 12, a local newspaper in the Seine-et-Marne département (located in the Greater Paris area) reported on a petition launched by a local motorist, Priscilla Ludosky.[6] The petition was initially created in May 2018 on the platform Change.org[7] and had garnered fewer than 1,000 signatures by the time of the article. The day following the article's publication, the number of signatories in Seine-et-Marne tripled. Meanwhile, an association of car users called "Muster Crew" was planning to block the Parisian ring road to protest against the increase in compulsory car-related expenses.[8] The protest was scheduled on November 17. Eric Drouet, a Seine-et-Marne resident, was the leader of this initiative. He shared the Press article about Ludosky's petition on the Facebook account of his association.

The movement goes national. On October 21, *Le Parisien*, a national newspaper, wrote an article about the petition, where it was explicitly linked with the planned blockade.[9] The petition was then reported on extensively in the media and the number of signatures skyrocketed, reaching 724,225 by November 16. The call for a mobilization on 11/17 started to generate interest on the Internet, where several videos were posted, mostly on Facebook or YouTube, to urge people to join the movement. A video published by Frank Buhler, from the southern département of Tarn-et-Garonne, soon went viral.[10] On October 24, Ghislain Coutard, a resident of the southern city of Narbonne, suggested that supporters should put their high-visibility vest under their windshield as a rallying sign.[11] This vest has been mandatory to carry in cars since 2008 and is called a "*gilet jaune*" in French. The large responses both to the petition and to the call to block the Parisian ring rapidly prompted people to plan their own local events for 11/17.

A website (`www.blocage17novembre.fr`) was created to coordinate the mobilization. It provided a map of the organized blockades, updated in real time. As of November 16, the map documented

[5]The video that received the largest audience was uploaded by Jacline Mouraud and totaled 6 million views by the end of year 2018; see `https://www.facebook.com/J.Mouraud/videos/10218147874947841/`

[6]See `https://actu.fr/ile-de-france/savigny-le-temple_77445/seine-marne-une-habitante-savigny-temple-lance-une-petition-contre-prix-lessence_19032915.html`.

[7]See `https://www.change.org/p/pour-une-baisse-des-prix-%C3%A0-la-pompe-essence-diesel`.

[8]Note that the group's name and members have changed since the initial announcement of the event; see `https://www.facebook.com/pages/category/Nonprofit-Organization/Blocage-National-Contre-La-Hausse-Du-Prix-Du-Carburant-195576681346661/`.

[9]See `http://www.leparisien.fr/economie/consommation/sa-petition-contre-la-hausse-des-carburants-fait-le-plein-21-10-2018-7924635.php`.

[10]See `https://www.facebook.com/PourNotrePatriePatriosphereInfo/posts/2219587064971757?__tn__=-R`.

[11]See `https://www.facebook.com/ghislain.coutard/videos/10216601170797079/`.

788 proposed blockades. Most locations for their potential to block traffic and economic activity, but the main targeted infrastructure was the roundabout (*rond-point* in French). Some large cities had multiple blocking points – for example one in the city center and another in the outskirts, close to a shopping mall. The demonstrators wore the gilet jaune, giving the movement a strong visual identity. Many blockades took place in areas with no history of demonstration. In the absence of a national coordination, police officers simply recorded undeclared demonstrations and reported traffic violations. The Ministry of Interior reported that approximately 300,000 demonstrators had participated in the first Saturday of action.[12] The success of this day fostered the planning of following events, subsequently referred to as "Acts", on both existing and new Facebook groups.

A month of major mobilization. The first Act was the peak of the offline mobilization, and was followed by a steady decrease in participation on each Saturday following 11/17 (see Figure 1). The Ministry of Interior reported an important number of law violations in low-density areas and small cities during the first Saturday of protests. However, on December 1, violence reached a climax around the symbolic round-about of the Arc de Triomphe in Paris (as well as in some mid-sized French cities), with substantial material damage. The Puy-en-Velay prefecture was partially burned down.[13]

The events of December 1 received considerable media coverage. As shown in Figure 1, almost nobody signed the Change.org petition afterwards. On December 8, police tanks were mobilized, the Élysée Palace was reinforced by steel fences and 2,000 people were arrested by the police, allegedly as a precaution.[14] Two days later, Emmanuel Macron announced a 10-billion euro plan[15] and the organization of a national debate ("Grand Débat National") to give protesters an opportunity to express their concerns. The following Act of the Gilets jaunes was particularly calm and violence decreased sharply during the holidays. In parallel with street demonstrations, some roundabouts were transformed into permanent camps. During the first two months of the movement, 10 people died, mostly while attempting to block traffic.[16] Many demonstrators were critically injured and international observers alarmed the French government about this unprecedented situation.[17]

[12]"France Police - Policiers en colère" (a police association supporting the movement) reported over a million of protesters.

[13]For a brief summary of events, see https://www.lefigaro.fr/actualite-france/2018/12/01/01016-20181201LIVWWW00026-en-direct-gilets-jaunes-un-nouveau-samedi-de-manifestations-en-france-et-sur-les-champs-elysees.php and https://fr.wikinews.org/wiki/Gilets_jaunes_:_samedi_1er_d%C3%A9cembre_2018.

[14]See https://fr.wikinews.org/wiki/Gilets_jaunes_:_samedi_8_d%C3%A9cembre_2018.

[15]See http://www.assemblee-nationale.fr/dyn/15/dossiers/mesures_urgence_economiques_sociales?etape=15-PROM. and https://www.ipp.eu/en/publication/the-2019-french-budget-impacts-on-households/

[16]See http://www.leparisien.fr/faits-divers/gilets-jaunes-dix-morts-le-lourd-bilan-d-un-mouvement-tres-accidentogene-22-12-2018-7975038.php.

[17]See https://www.amnesty.fr/liberte-d-expression/actualites/usage-excessif-de-la-force-lors-des-manifestations, https://www.europarl.europa.eu/doceo/document/TA-8-2019-0127_EN.pdf?redirect and https://www.ohchr.org/EN/NewsEvents/Pages/DisplayNews.aspx?NewsID=24166&LangID=E.

Follow-up and decline of the movement. After the holidays, the government decided to evacuate the remaining camps on the roundabouts and protesters began to concentrate in large cities, where their numbers were much lower than during the first month (despite a temporary increase on January 12). Impressed by the political impact of the movement, labor unions had started supporting the mobilization at the end of 2018, and offered to supervise the organization of the demonstrations in the absence of a clear organizational structure. Since the beginning of the movement, however, participants had rejected the idea of having a leader or a spokesperson. This feature made it particularly difficult for the government to negotiate with the demonstrators and put a clear end to the protest.[18]

From the onset of the movement, the demands and composition of its protesters evolved significantly. Initially fueled by anger towards fiscal reforms, the movement progressively evolved into a full-blown protest against the government and the political class. Concerns related to direct democracy and parliamentary oversight emerged and received some support from the population. On January 15, the government launched the Grand Débat, the purpose of which was to acknowledge grievances on four broad topics proposed by Emmanuel Macron: taxes, ecology, democracy and public services.[19] Some Gilets jaunes reacted by launching an alternative platform with their own debate called *Vrai Débat* (literally, "True Debate"). The Grand Débat ended on March 15. The next day, an unauthorized demonstration on the Champs Elysées led to major acts of vandalism, including the burning of a famous restaurant (the Fouquet's) and the ransacking of many luxury stores. However, this surge was short-lived and the following Saturdays were far more quiet. On April 25, Emmanuel Macron held a press conference following up on the Grand Débat and, among other proposals, announced a reduction of the income tax and the re-indexing of small pensions to inflation.

In the following months, symbolic actions tended to replace weekly demonstrations and often targeted Emmanuel Macron's public appearances.[20] At the end of the year, groups of Gilets jaunes took active part in the widespread demonstrations against the pension reform.[21] The movement remains active to this day, as shown by several unauthorized protests against government restrictions during the Covid-19 lockdown, where yellow vests were used as breathing masks.[22]

[18] A branch of the Gilets jaunes that was seeking for a more structured movement created the so-called "Assembly of the Assemblies" (*Assemblée des Assemblées* in French), which brought together representatives from dozens of delegations, without major result.

[19] See https://www.elysee.fr/emmanuel-macron/2019/01/13/lettre-aux-francais.

[20] See http://www.leparisien.fr/economie/14-juillet-des-gilets-jaunes-sur-les-champs-elysees-drouet-nicolle-et-rodrigues-interpelles-14-07-2019-8116374.php and https://www.lefigaro.fr/actualite-france/eric-drouet-evacue-du-salon-de-l-agriculture-lors-de-la-visite-de-macron-20200222.

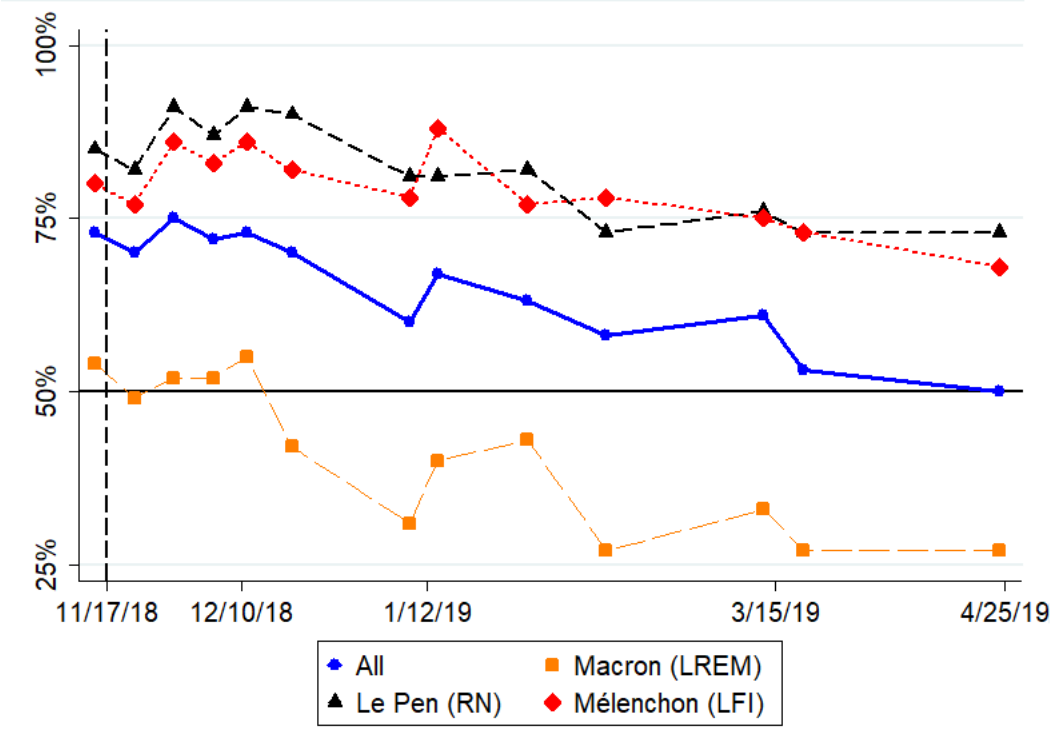
[21] See https://www.lefigaro.fr/actualite-france/reforme-des-retraites-syndicats-et-gilets-jaunes-manifestent-en-france-des-tensions-a-paris-20191228.

[22] See https://www.20minutes.fr/societe/2780391-20200516-deconfinement-quelques-centaines-gilets-jaunes-bravent-interdiction-manifester.

A.2 Polls on the evolution of support for the movement

We now report polling results on the evolution of public support for the Gilets jaunes movement. Data comes from ELABE, a polling institute which conducted several surveys between November 2018 and April 2019 for the news Channel BFMTV.[23]

Figure A.1 – Evolution of the support for the Gilets jaunes



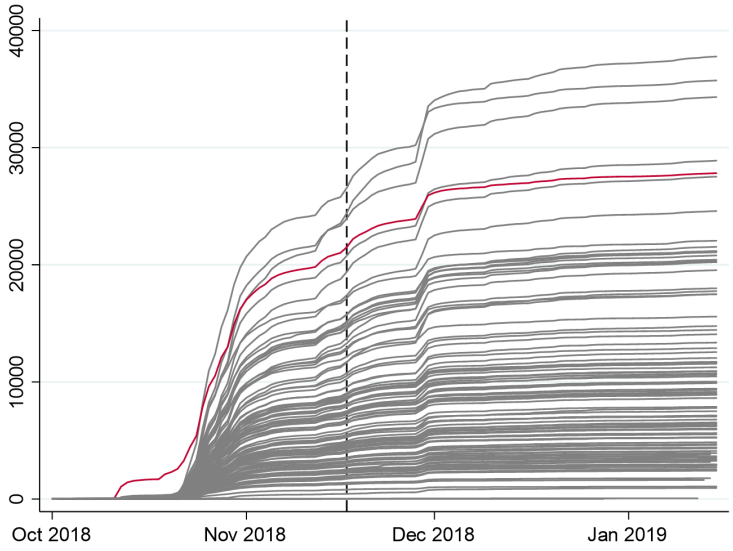
Notes: Share of respondents who declared they were supportive or sympathetic to the Gilets jaunes movement, according to their votes in the first round of the 2017 presidential election. The solid blue line corresponds to the full sample; dashed lines correspond to sub-samples who have voted for Le Pen (far-right, in black), for Mélenchon (far-left, in red) and for Macron (orange). Sample size is between 980 and 1,010 for the full sample and around 200 for each of the three su-bsamples. Confidence intervals are not reported. The vertical dashed line corresponds to 11/17.
Source: ELABE, polls from 11/14/2018, 11/21/2018, 11/28/2018, 12/5/2018, 12/11/2018, 12/19/2018, 1/9/2019, 1/14/2019, 2/13/2019, 3/13/2019, 3/20 /2019 and 4/24/2019.

[23]Other institutes, such as ODOXA, IFOP or OPINIONWAY also conducted polls, with similar results, as can be seen on the dedicated Wikipedia page (`https://fr.wikipedia.org/wiki/Mouvement_des_Gilets_jaunes`).

B Data

B.1 Change.org

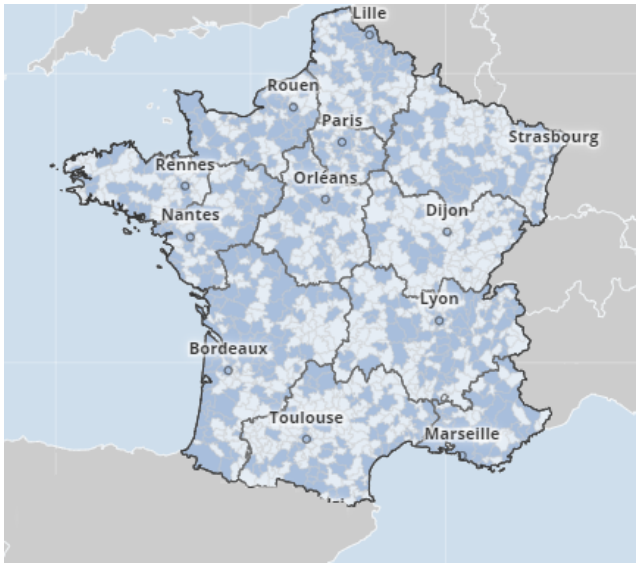
Figure A.2 – Cumulative distribution of petition signatories, by département



Notes: The first département to take off is Seine-et-Marne (in red), where the petition initiator lived and where the local newspaper wrote the first article on 10/12. The national newspaper which reported the story did so on 10/21. The dashed line corresponds to 11/17.
Source: Change.org.

B.2 The 11/17 Blockades

Figure A.3 – Blocking half of France at first try



Notes: Darker areas are consolidated municipalities affected by a blockade on 11/17.
Source: Blockade map.

B.3 Facebook

Data collection Because of the limitations of the Facebook API, we had to look for groups and pages manually, between December 12 and December 15, 2018 for groups and between March 21 and March 23, 2019 for pages. We used Netvizz to retrieve content between April 2 and April 10, 2019. We use a keyword search approach to find Facebook groups and pages, performing requests on Facebook's search engine and manually retrieving results. These searches were performed using temporary sessions in order to minimize bias induced by Facebook's algorithm.

For groups, our aim was to retrieve as many groups linked to the Gilets jaunes as possible. To this end, we started by searching for the keywords "gilet jaune" and "hausse carburant", both on their own and associated with the following further keywords :

- The codes and names of the départements;
- The names of the former and current regions;
- The names of all municipalities with more than 10,000 inhabitants.[24]

Then, we performed further searches with the keywords "hausse taxes", "blocage", "colere" and "17 novembre", associated with the names of the French départements, the names of the former and current regions, and the same list of municipalities as before.

Finally, we performed searches for the following keywords: "gillet jaune", "gilets jaune", "manif 17 novembre", "manif 24 novembre", "manif 1 decembre", "manif 8 decembre", "macron 17 novembre", "macron 24 novembre", "macron 1 decembre", "macron 8 decembre","blocus 17 novembre", "blocus 24 novembre", "blocus 1 decembre", "blocus 8 decembre", "blocage 17 novembre", "blocage 24 novembre", "blocage 1 decembre", "blocage 8 decembre".

For Facebook pages, as our aim was not to retrieve the entire universe of active Gilet jaunes communities but simply a sample of messages large enough to perform text analysis, we relied on a smaller number of searches, searching for the keywords "gilet jaune" and "blocage hausse carburant" on their own or associated with:

- The codes and names of the départements;
- A list of the largest cities.[25]

[24]Restricting the keywords used to these large municipalities is necessary as the number of municipalities in France is very high. It might introduce a bias towards groups associated to denser areas. Fortunately, this bias is reduced by a characteristic of Facebook's algorithm: when searching for groups and pages associated with a municipality on the platform, Facebook also retrieves results associated to nearby municipalities.

[25]The complete list of further keywords used is the following: paris; marseille; lyon; toulouse; nice; nantes; strasbourg; montpellier; bordeaux; lille; rennes; reims; le havre; saint etienne; toulon; grenoble; dijon; angers; villeurbanne; le mans; nimes; aix en provence; brest; clermont ferrand; limoges; tours.

Additional details on Facebook pages. Contrary to groups, Facebook pages, which are public, have been used more often to share stories about the protests, videos and political contents. As shown in Table A.1, posts can be separated into four types: *Statuses* (messages posted by users, without any additional content), *Links* (either to other Facebook posts or to external content), *Photos* (mostly caricatures or texts incorporated in a picture, such as quotes and jokes) and *Videos* (mostly of the ongoing protests and video selfies of protesters documenting the movement):

Table A.1 – Posts types in our dataset

Type of message	Number of posts	%
Status	31,541	26.0
Link	30,391	25.1
Photo	29,934	24.7
Video	29,248	24.1
Total	121,114	100

Notes: Facebook classifies posts into statuses (text content), images, videos (directly uploaded to Facebook, including live streams) and links (which correspond to contents external to Facebook shared on the platform, e.g. news articles, petitions, external videos...).
Source: Facebook.com

We retrieved the domain name of each shared link. Table A.2 lists the 13 most-linked domains. A substantial number of links come from self-mediation of the movement by the yellow vests themselves, with *Gilets jaunes actu* media.

Table A.2 – The 13 most-shared domain names

Link domain	Links	Shares	Comments	Reactions	Likes	Type
youtube.com	6,669	29,034	8,442	49,249	32,390	video
francetvinfo.fr	1,249	25,512	7,898	34,566	14,466	national tv news
gilets-jaunes-actu.fr	766	102	55	478	323	gilets jaunes media
ouest-france.fr	688	24,218	4,608	29,718	17,799	regional newspaper
lemonde.fr	625	46,895	6,973	42,285	18,911	national newspaper
francais.rt.com	590	22,123	5,824	30,898	15,699	online news
france3-regions.	560	37,470	4,892	32,757	16,363	regional tv
bfmtv.com	553	36,455	10,309	40,782	19,483	national tv news
20minutes.fr	545	38,528	8,164	37,883	15,958	free newspaper
mesopinions.com	542	11,064	3,434	14,063	10,893	petition
lefigaro.fr	488	31,051	8,716	32,895	13,446	national newspaper
l.leparisien.fr	434	20,921	6,876	25,642	9,305	national newspaper
francebleu.fr	407	25,322	3,650	23,460	12,371	regional radio

Notes: From each post, we extracted links to external content and retrieved the domain name associated with each link. For each domain name, we show the total number of links to this address contained in the posts of our dataset, the total number of times these posts were shared, and the total number of comments, reactions and likes to these posts. We also provide a brief description of each domain.
Source: Facebook.com.

Geocoding of Facebook groups. In their names, most Facebook groups mention a geographic area. We geolocate them relying on a character-based matching method. We use two data sources: a database of French localities, and a list containing the names of all Facebook groups we documented. We proceed in four steps:

1. **Preprocessing** – We remove accents and punctuation from the text and lower-case all characters. In French, it is common to replace some words with an abbreviation ('saint' becomes 'st', 'sainte' becomes 'ste'). We replace all abbreviations relating to 'saint' and 'sainte' by their associated full-length word. After manual inspection, we also remove misleading numbers and commune names.[26]

2. **Matching** – For each Facebook group, we list all names of municipalities, départements, and regions, as well as all the administrative geographic identifiers that appear in the group name.

3. **Choice of the best candidate** – We prefer complete names matched over geographic numeric identifiers, and we prefer matches at the most fine-grained geographic level. If several cities appear in the name of the Facebook group, we take the longest match (in terms of characters in the string).[27]

4. **Manual check** – We conduct manual check and adjustment for mismatching or unmatched, as some names were, for instance, the name of inhabitants instead of the name of the location names or some major infrastructure like "Pont de Nomandie".

Summary statistics. We provide here additional summary statistics on the spatial hierarchy of Facebook groups and how this differs between groups created before the blockades and those created after the blockades.

Table A.3 – Characteristics of Facebook groups

Targeted Audience	Groups	Members	Publications
National	520 (64%)	2,381,562	264,034
Regional	171 (81%)	249,516	138,367
Departemental	724 (81%)	528,500	336,437
Local	1,608 (65%)	949,342	714,882
Total	3,033 (70%)	4,109,325	1,453,878

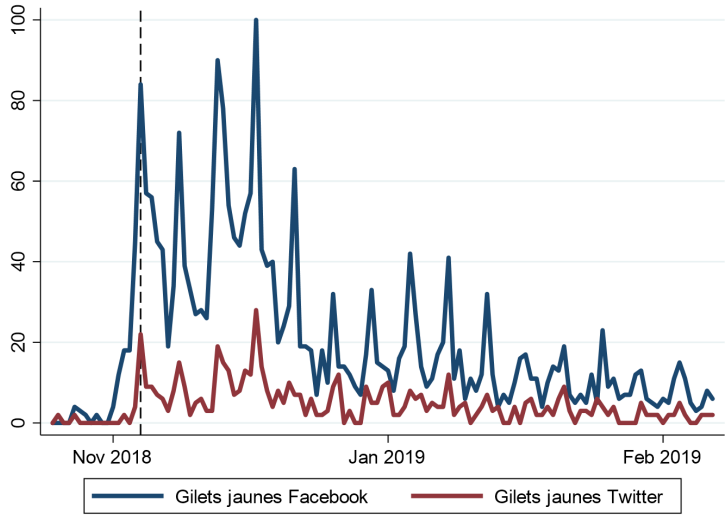
Notes: Number of groups (in parentheses, share of the number of groups created after 11/17), Number of members and Number of Publications (this number is capped to 10,000 publications per group by Facebook). Total includes 10 "foreign" groups, 9 of which created after 11/17, including 405 members and associated with 158 publications.
Source: Facebook.com

[26] We remove the following tokens: 'loire','contre','azur','pont','grand'. We also remove 11, 17 and 18 as these numbers generally refer to the date of the first mobilization and not a geographic area.

[27] This simple rule largely reduces the number of false positives. Note also that, as multiple cities may have the same name, we consider a version of the matching where we drop all homonyms, and a version of the matching in which we associate the Facebook group to the most populated city.

Blockades and interest for Facebook groups.

Figure A.4 – Evolution of Google searches



Notes: Index of Google Search intensity for the keywords "Gilets jaunes Facebook" and "Gilets jaunes Twitter". The dashed line corresponds to 11/17.
Source: Google Trends.

C Textual analysis

C.1 Topical structures of online messages

We first remove emojis, links, accents, punctuation, Facebook notifications (e.g., "Gilets jaunes changed their profile picture") and stopwords from the corpus. We also lower-case the text and stem words. We choose to work with unigrams at the sentence level. We then produce word embeddings for the corpus and represent each sentence as a vector in the embedding space. We train a Word2Vec model using Gensim's implementation, with moving windows of eight tokens and ten iterations of training. We build sentence embeddings as the weighted average of the constituent word vectors, where the weights are smoothed inverse term frequencies (to assign higher weights to rare/distinctive words). The resulting embeddings are useful because they can be used for interpretable dimension reduction. We use vector clustering in the embedding space for this purpose. The goal is to have different clusters for different topics in the text. We rely on the K-Means algorithm, and use the ten closest words to the cluster centroids to label topics. We also considered alternative labeling options, such as term frequency - inverse cluster frequency, which yield similar results.[28]

[28] As K-Means assigns every vector to a cluster, some sentences could be forcefully assigned to an irrelevant topic. To limit false assignments, we manually inspect topic coherence and choose a maximum distance to the centroid accordingly. If a sentence embedding is further away from the centroid than this threshold, it is labeled as noise. As results are left unchanged even when forcefully assigning all sentences to a cluster, graphs are shown assuming no false assignments.

Table A.4 – Results of the Topic Model for Alternative Numbers of Clusters

Panel 1: Results of the Topic Model for 5 clusters

Associated words
mem, cel, autr, auss, pens, puisqu, uniqu, evident, comm, simpl
connard, merd, flic, salopard, putain, encul, pourritur, mec, hont, saloper
04, nantes, 82, 08, chambery, 05546, 82518, caen, orlean, 47
devam, czowiek, yuz, destekliyor, saulzuis, pagesmickael, ediyoruz, culan, crnlbenjamin, kut
bravo, courag, merc, soutien, felicit, genial, sup, formid, bonsoir, bonjour

Panel 2: Results of the Topic Model for 10 clusters

Associated words
chomage, loyer, renouvel, plafon, reduct, revenus, remuner, transports, annuel, salaire
bravo, courag, merc, felicit, soutien, formid, bravos, genial, soutient, sup
auss, mem, pens, alor, autr, comm, vrai, oui, just, gen
mdr, petard, cailloux, attrap, chausset, bouteil, gazeux, lacrymos, chop, lol
polit, impose, oppos, processus, global, contest, politique, rejet, cel, democrat
coisinh, acknowledged, gruesome, wochentakt, libro, corseg, knowledgeispow, aangereden, intensivierung, gaynor
yuz, czowiek, devam, pagesmickael, chstmarc, kut, destekliyor, crnlbenjamin, lyhugo, nagl
bonjour, bonsoir, liv, page, mp, disponibl, partag, pag, gabin, infos
04, 77, 82, colmar, 08, bezi, 91, 78, 79, 69
pourritur, hont, connard, salopard, ordur, merd, saloper, crevur, minabl, honteux

Panel 3: Results of the Topic Model for 20 clusters

Associated words
coherent, global, processus, object, necessair, essentiel, structur, sembl, representativit, defin
fauteurdetroubleorganiseparletat, lieudepouvoirinquietezero, yuz, antifaetbbdirig, demokraciat, tohl
oui, lol, mdr, ok, ouais, ben, ouai, pk, bin, sais
connard, merd, encul, baltringu, salop, batard, pourritur, crevur, fdp, bouffon
illegal, judiciair, delit, condamn, poursuit, juridict, jurisprudent, procedur, sanction, penal
courag, bravo, soutien, courage, lach, soutient, respect, coeur, fier, cur
hish, todaro, jessim, mecher, vlr, laurananouai, elliott, francesch, tiphan, alfonso
bonsoir, bonjour, coucou, cc, salut, bjr, bsr, hello, slt, bisous
cr, flic, matraqu, polici, chargent, frapp, matraque, tabass, projectil, gaz
honteux, hont, ecoeur, lament, horribl, honte, inadmissibl, degout, ecur, degueul
mergu, chausset, toilet, saucisson, tomat, congel, whisky, sperm, gobelet, rhum
violenc, violent, gj, violences, casseurs, violents, violence, provoqu, radicalis, decredibilis
asserv, peupl, franc, dictateur, destructeur, elit, oligarch, dictat, gouvern, dirig
publ, infos, publi, liv, verif, diffus, facebook, twitt, information, enregistr
chomage, plafon, loyer, revenus, salair, salaire, euros, reduct, compens, remuner
gruesome, coisinh, wochentakt, libro, knowledgeispow, acknowledged, corseg, intensivierung, auen, aangereden
caen, alentour, dimanch, paris, orlean, samed, vendred, aprem, nocturn, nim
pens, mem, auss, alor, vrai, comm, autr, fair, encor, just
79, 82, 78, 69, 91, 04, 77, 41, 61, 47
bravo, merc, felicit, sup, genial, courag, formid, bravos, magnif, superb

Notes: Clusters selected by the custom topic model when restricting the number of clusters to 5, 10 and 20. Associated words are the closest words in the embedding to the cluster centroid (as measured by cosine similarity).
Source: Facebook.com

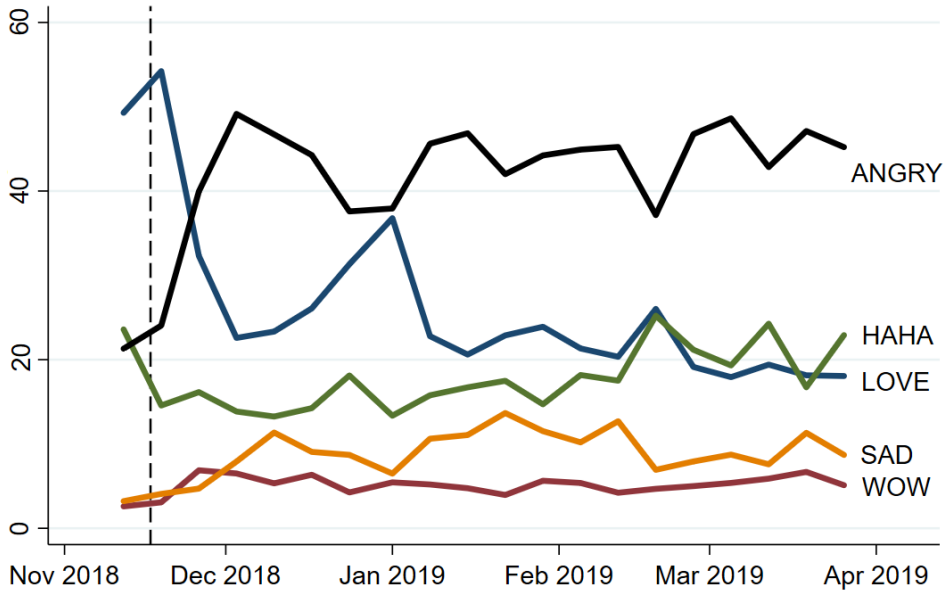
C.2 Sentiment analysis

The classical approach to sentiment analysis is dictionary-based. To determine which words are used in which context, one has to rely on "training sets", where messages have been manually labeled as positive, negative or neutral. This method has some drawbacks in the context we are interested in:

- Irony (a well-known feature of the French psyche) can lead to poor predictions. The following messages may be classified as positive by the method described above despite being negative: "Making America Great Again gave us everything but good"; "Congratulations to the government, #1 in keeping peaceful demonstrators out of the streets".
- Training sets in French are not as widely available as in English.
- Training sets are often extracted from very different contexts (for example, movie reviews).

To overcome these problems, we take advantage of the fact that users can react to Facebook posts, using the following reactions: *love, haha, wow, angry, sad*. For each post in our corpus, we compute the weekly share of each of these reactions, displayed in Figure A.5.

Figure A.5 – Evolution of sentiment on Facebook pages



Notes: Weekly share of reactions to Facebook posts (in %). The dashed line corresponds to 11/17.
Source: Facebook.com.

D Additional statistical results

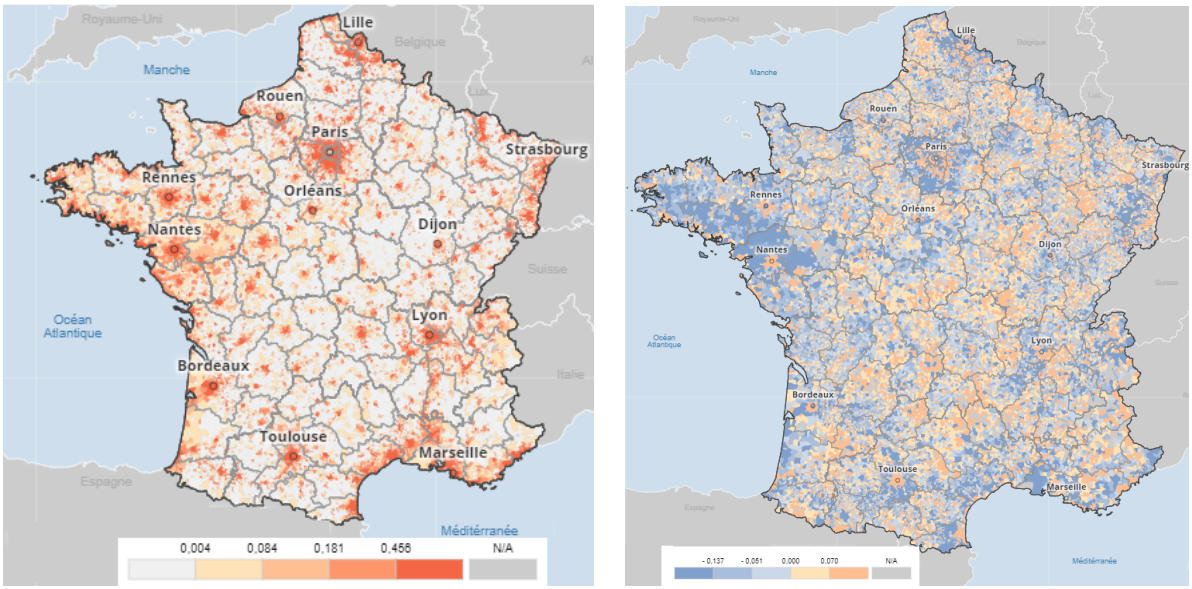
D.1 Control variables

The set of municipal controls included our regressions may be grouped as follows:

- **Geography** includes the population of the municipality, its density, the distance to the closest city with over 20,000 inhabitants and 100,000 inhabitants.
  Source: Census (RP, complementary exploitation), 2016, INSEE.
- **Transport** includes the shares of the employed population commuting by car and public transportation, as well as the median commuting distance.
  Source: Census 2016, INSEE. Déclarations Annuelles de Données Sociales (DADS), 2015, INSEE.
- **Economy** include the local unemployment rate, the fraction of employees with a non-permanent contract, mean income, and population immigrant share.
  Source: Census 2016, INSEE. DADS, 2015, INSEE.
- **Occupation** includes the share of the different *catégories socio-professionelles* defined by INSEE: executive, independent, middle-management, employee, manual worker and agriculture.
  Source: Census 2016, INSEE.
- **Age** includes the shares of the population in the following groups: 18-24 y.o.; 25-39 y.o.; 40-64 y.o.; over 65 y.o.
  Source: Census 2016, INSEE.
- **Education** includes the shares of the population without the high-school diploma, and with a university degree.
  Source: Census 2016, INSEE.
- **Vote** includes the vote share for the five major candidates in the 2017 presidential election (Macron, Le Pen, Fillon, Mélenchon, Hamon), as well as the share of abstention.
  Source: Ministry of the Interior.
- **Signature** is the local signature rate of the Change.org petition before 11/17.
  Source: Change.org.
- **LZ** is a set of 1,596 dummies for Life Zones.

D.2 Instrumental variable

Figure A.6 – Gross and conditional roundabout density



Notes: left panel shows the density of roundabouts by municipality. Our dataset counts 63,383 roundabouts in mainland France, with 11,198 municipalities with at least one roundabout, and 23,232 without. Average roundabout density is 0.12/km^2; right panel shows the residual from an OLS regression of roundabout density at the municipality level on the set of municipal controls.

D.3 Additional regression results

Table A.5 – Probability of blockade in the LZ

	(1)	(2)	(3)	(4)	(5)	(6)
Signature Rate (pre-17/11)			0.047^a			0.042^a
			(0.016)			(0.016)
Number of Groups (pre-17/11)				0.002		-0.052^a
				(0.014)		(0.015)
Local Group (pre-17/11)					0.144^a	0.200^a
					(0.030)	(0.032)
Fixed effects		Dept	Dept	Dept	Dept	Dept
Adjusted R-Squared	0.358	0.394	0.398	0.393	0.405	0.412
Within R-Squared		0.385	0.390	0.385	0.397	0.405

Notes: (i) OLS estimates of the probability a life zone experienced a blockade (N=1,628); (ii) signature rate per inhabitant pre-11/17 and number of groups includes regional groups apportioned by population. Both variables are standardized. Local Group is a dummy for existence of a specific LZ group pre-11/17. (iii) Dept. stands for départements (counties). (iv) Standard errors clustered at the LZ level, with a: p< 0.01 and b: p<0.05.

Table A.6 – Impact of blockades on further online mobilization: robustness

	Signature Rate (post-17/11)	Local Group (post-17/11)	Nb. Members in LG (post-17/11)	Nb. Posts in LG (post-17/11)
		A. Without municipal controls		
	(1)	(2)	(3)	(4)
Blockade	1.468[a]	0.761[a]	660.328[a]	573.132[a]
	(0.122)	(0.043)	(88.727)	(78.286)
Kleibergen-Paap F-stat	79.848	79.848	79.848	79.848
p-value Hansen	0.503	0.683	0.165	0.280
		B. Only municipal instrument		
	(1)	(2)	(3)	(4)
Blockade	1.590[a]	0.759[a]	304.004	299.372
	(0.385)	(0.202)	(297.839)	(247.562)
Kleibergen-Paap F-stat	15.389	15.389	15.389	15.389
		C. Only LZ instrument		
	(1)	(2)	(3)	(4)
Local Blockade	1.111[a]	0.738[a]	628.599[a]	507.990[a]
	(0.247)	(0.117)	(219.494)	(179.327)
Kleibergen-Paap F-stat	52.025	52.025	52.025	52.025
		D. Surroundings defined at the employment area level		
	(1)	(2)	(3)	(4)
Blockade	1.097[a]	0.921[a]	395.916	361.398
	(0.306)	(0.158)	(636.879)	(465.389)
Kleibergen-Paap F-stat	14.171	14.171	14.171	14.171
p-value Hansen	0.297	0.598	0.995	0.898
		E. Alternative outcomes		
	Log. Nb. Sign. (post-17/11)	Nb. Local Group (post-17/11)	Log Nb. Members in LG (post-17/11)	Log Nb. Posts in LG (post-17/11)
	(1)	(2)	(3)	(4)
Blockade	0.746[a]	0.726	4.070[a]	3.913[a]
	(0.189)	(0.615)	(0.642)	(0.614)
Kleibergen-Paap F-stat	36.414	36.414	36.414	36.414
p-value Hansen	0.378	0.614	0.943	0.922

Notes: (i) 2SLS estimates of the impact of the municipal blockade dummy on the same outcomes as in Table 2 except panel E, where outcomes are the log number of signatures post-11/17, the number of local groups post-11/17, the log number of members in local groups post-11/17 and the log number of posts in local group post-11/17. (ii) Panel A: no control for municipal characteristics; Panel B: Instrument is roundabout density in municipality; Panel C: Instrument is roundabout density in other municipalities in the LZ; Panel D: Spatial aggregation is employment area (N=297) instead of life zone (N=1596); (iii) Standard errors clustered at the LZ (employment area in Panel D) level, with a: p< 0.01, b: p<0.05 and c: p<0.1.