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IS PARTICIPATORY DEMOCRACY IN LINE WITH SOCIAL PROTEST ? EVIDENCE FROM FRENCH YELLOW VESTS MOVEMENT

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Is participatory democracy in line with social protest ? Evidence from the French Yellow Vests movement[#]

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Abstract: Participatory democracy and public consultations are increasingly being used to shape public policy or resolve political issues. In France, the *Grand Débat* was launched in early 2019 as a democratic response to the Yellow Vests movement, a massive grassroots social protest. With more than 500,000 participants, the *Grand Débat* platform was interpreted as a popular success by the government and the media, but little is known about which citizens expressed their opinions online. Although participants on the platform were anonymous and only answered public policy questions, we are able to infer their support for the Yellow Vests movement by using a second platform (a Facebook app) that asks similar questions as well as support for the Yellow Vests. We find that a large majority of participants in the *Grand Débat* did not support the Yellow Vests movement, in contrast to the general population at the time. This is evidence of a strong self-selection of participants on political grounds, resulting in a biased representation of French public opinion.

Keywords: participatory democracy; social protest; public opinion; selection on observables and unobservables

JEL classification: D71; D72; C53

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1. Introduction

Most democracies have recently experienced a combination of low political trust, low electoral turnout, and a rise in political polarization, populist voting and anti-democratic attitudes (Guriev and Papaioannou, 2022 ; Mounk, 2018). Prominent examples of such patterns in Western democracies include the rise of the Five Stars movement in Italy in the 2010s, the Brexit vote in the United Kingdom in 2016, or the Yellow Vests movement in France in 2018-2019.

These events are consistent with opinion polls showing that, in most democracies, a growing proportion of citizens believe that political elites are corrupt, that their elected representatives promote their own interests, and that they do not care about or listen to ordinary people (Cevipof, 2023). As a result, the relationship between citizens and politicians has gradually shifted from an electoral, representative democracy to a more demanding and suspicious relationship of increased scrutiny and accountability (Rosanvallon, 2008). More generally, there is a growing demand among voters for greater involvement of lay citizens in policy-making, whether in the form of referendums, recall procedures, citizens' panels, public consultations or other forms of participatory democracy (Towfigh et al., 2016).

Whether online or offline, public consultations have clear theoretical advantages (OECD, 2020). They allow citizens to express their views, concerns and wishes in a variety of ways, on paper or verbally, publicly or anonymously. The topics for discussion can be much broader than those debated during election campaigns, and the level of information obtained from consultations can be much higher than that contained in a single ballot. Moreover, knowing what citizens think is a key component of political representation and accountability (Aragones and Sanchez-Pages, 2009). Although policymakers have access to a range of sources of information about people's views (including elections, opinion polls, the media, political engagement and lobbying), they often fail to keep track of citizens' opinions (Walgrave et al., 2023)[1]. Although it is part of their job to represent the political preferences of voters, elected officials are hardly better informed about public opinion than random citizens.

While public consultations and participatory democracy have clear potential to reduce the gap between people's opinions and how they are perceived by policy-makers, thereby improving political representation and accountability, they also have their own pitfalls and threats. The main caveat of such tools is undoubtedly the self-selection of participants, who are often free to choose whether or not to participate, which can lead to the risk of biased representation in favor of certain

[1] A recent survey of 866 elected representatives in four democracies (Belgium, Canada, Switzerland, Germany) shows that politicians are inaccurate in their assessments of where their fellow citizens stand on key policy issues (Walgrave et al., 2023).

groups and ideas[2]. For example, people with similar political interests and preferences may decide, individually or collectively, to participate in a public consultation that most other citizens neglect for one reason or another (because they do not know about it, do not care enough, feel incompetent, or disapprove the organizing institution). The diffusion of information about public consultations may also be stronger in some politically-engaged clusters of the population, turning such devices into echo chambers (Gorodnichenko et al., 2021). The resulting lack of political diversity not only gives a distorted picture of the true distribution of preferences in the population, but has also been found to be detrimental to deliberative democracy and knowledge creation (Shi et al., 2019).

The purpose of our contribution is to explore the undocumented question of who contributes to online participatory democracy. We shed light on this issue using the Yellow Vests protests as a case study. Initiated by an online petition posted in May 2018, this movement really emerged with mass demonstrations in mid-November 2018. Online and offline behaviors strongly interacted during this period, with social media acting as echo chambers to amplify mobilization toward radicalization (Boyer et al., 2022 ; Ramaciotti Morales et al., 2022). The protests were initially motivated by a hostile reaction to higher crude oil and fuel taxes, along with high cost of living and economic inequality. By the end of November, a list of about 40 demands was made public, covering a wide range of topics related to social and fiscal justice as well as democracy[3]. By the mid of December, the movement evolved and the main goal of the protests were about more direct democracy in France, particularly in the form of the citizen-sponsored referendums (*referendum d'initiative citoyenne)*. In response to the Yellow Vests crisis, the French President Emmanuel Macron announced in mid-December 2018 the organization of a *Grand Débat* (Great Debate) across the country, open to all French citizens.

The *Grand Débat* was presented as a consultative tool to end the Yellow Vests crisis. From mid-January to mid-March 2019, the *Grand Débat* invited all French citizens to express their views on four main topics : ecological transition, taxes and public spending, citizenship and democracy, public services. The two main consultation tools were local public meetings in city halls or schools with around 10,000 meetings involving 500,000 participants, and a digital platform (available online at granddebat.fr), which also attracted 500,000 contributors. On this platform, participants responded anonymously to a series of closed and open questions. The *Grand Débat* officially ended on 15 March 2019 (online participation continued until 18 March 2019), and the process

[2] This caveat probably explains why, since 2010, there has been a 'deliberative wave' in OECD countries, with an increasing number of deliberative institutions being set up, in which lay citizens are consulted extensively after random recruitment to ensure representativeness (OECD, 2020).

[3] See https://www.cnews.fr/france/2019-02-28/la-liste-des-revendications-des-gilets-jaunes-801586.

was officially closed with a press conference at the end of April. At that time, a reduction in income tax and the indexation of small pensions to inflation were announced.

Although the *Grand Débat* resulted in a number of policy proposals, some of which were implemented by the end of 2019, the representativeness of the responses given by participants on the *Grand Débat* online platform remains largely unknown. Using aggregate data at the county level, Bennani et al. (2019) show that counties with high participation rates were characterized by high median income, high education level and high vote share for President Macron, but this work does not allow for individual-level conclusions. Our work attempts to assess the possible selection of individual participants on political grounds. In the context of social events, we focus in particular on their support or opposition to the Yellow Vests movement. By definition, participants in the *Grand Débat* did not provide information on their support, nor on their individual characteristics, as they only answered policy-oriented questions. To reveal their attitudes, we take into account a complementary database from a Facebook application where participants (around 4,500) answered questions similar to those on the *Grand Débat* website and indicated their attitudes towards the Yellow Vests movement, along with some characteristics such as gender, age and education.

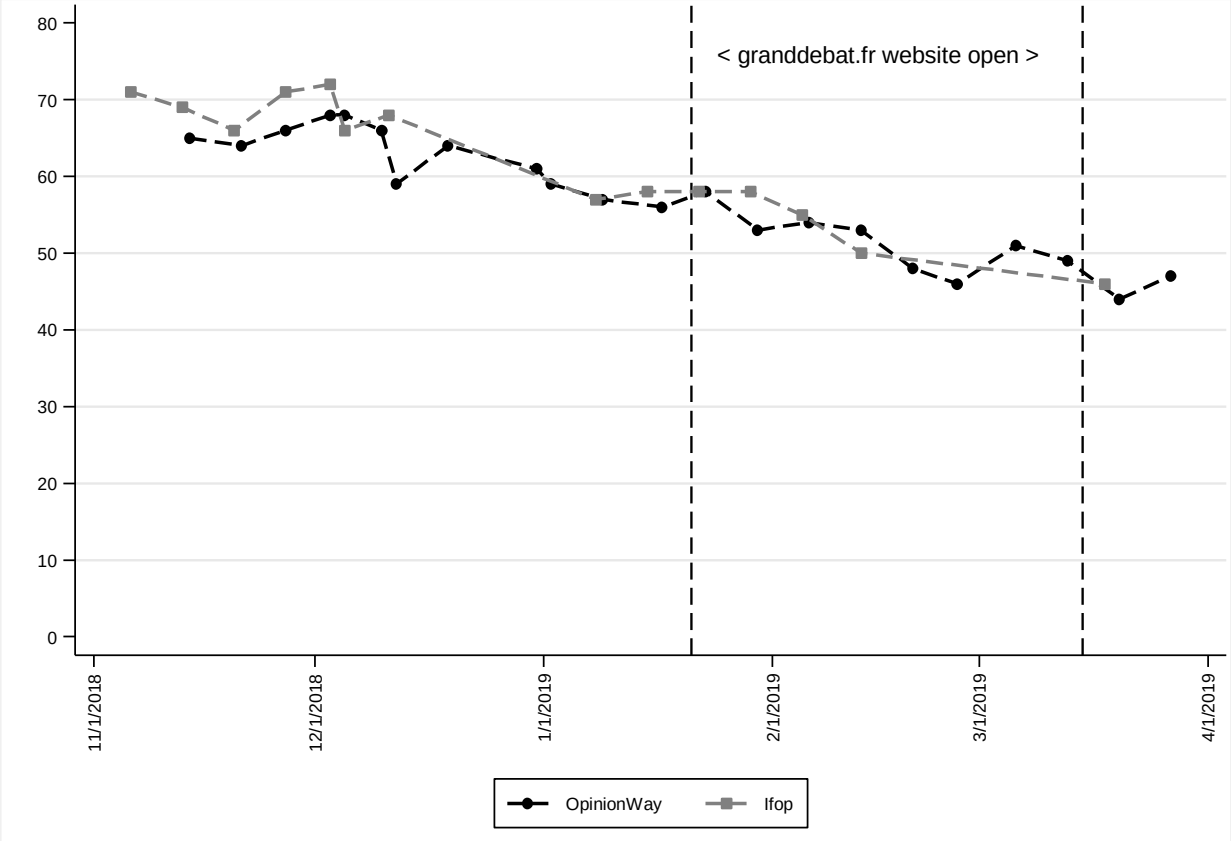
Our empirical strategy is as follows. On the basis of the Facebook data, we estimate a regression that explains support for the Yellow Vests as a function of answers to questions similar to those on the *Grand Débat* website. In an out-of-sample prediction approach, the estimated coefficients allow us to evaluate the estimated rate of support for the Yellow Vests among participants in the *Grand Débat*, knowing their own answers to the same questions. We then show how to incorporate into our econometric analysis the role of individual characteristics observed for Facebook participants and the influence of unobservables. The main conclusion of our empirical investigations is the evidence of a strong selection of participants in the *Grand Débat* with respect to their political positioning. In contrast to the general population, a large majority of participants in the *Grand Débat* did not support the Yellow Vests movement. This raises questions about the representativeness of the statements recorded by the official platform and, more generally, about the legitimacy of participatory democracy.

The remainder of our contribution is organized as follows. In Section 2, we briefly review the context that led to the emergence of the Yellow Vests movement in France and describe the two datasets used in our empirical analysis. In Section 3, we explain how the use of the Facebook data allows us to predict the level of support for the Yellow Vests among participants in the *Grand Débat*. In Section 4, we conduct several robustness checks to examine how our estimations may be affected by selection on either observables or unobservables. Finally, Section 5 concludes.

2. Context and data description

The Yellow Vests movement emerged in November 2018, and quickly transformed into a social protest unique in French history. Initially, the grassroots movement started with an online petition on the website change.org against a government decision to impose additional taxes on gasoline[4]. At the end of October 2018, the petition went viral on social media, particularly on Facebook. Online groups rapidly formed to protest against other recent reforms (in particular the lowering of speed limits and the increase in taxes on retirement pensions) and gained increasing support. On Saturday 17 November, online protesters turned into 300,000 street demonstrators by occupying round-blocks while wearing yellow vests. Many were first-time protesters with little to no political experience (Reungoat et al., 2020). These yellow vests became the symbol of a massive social protest that lasted more than six months and triggered unprecedented violence between demonstrators and police forces.

Figure 1. Support for Yellow Vests according to general population polls



Source: author's calculations, data from Ifop and OpinionWay.

[4] The petition was started by a citizen, Priscillia Ludosky. By March 2020, it had been signed by 1.2 million people (https://www.change.org/p/pour-une-baisse-des-prix-%C3%A0-la-pompe-essence-diesel). For further evidence, see https://en.wikipedia.org/wiki/Yellow_vests_protests.

In terms of public support, the movement was approved by a majority of the French population. In Figure 1, we present evidence of public support for the movement using data from two major polling agencies : Ifop and OpinionWay. We can see that the movement was initially supported by 65%-70% of the general adult population. Support declined in the following months, but remained remarkably high (above 50%) until mid-February 2019, despite repeated violent incidents in Paris and other large cities. The movement forced the government to backtrack on several policies and to propose new reform packages, notably a 10 billion euros plan to support low-income households and cut taxes.

In response to the first episodes of violence at the beginning of December 2018, President Macron decided to set up a *Grand Débat* for a period of two months, starting in January 2018. The *Grand Débat* revolved around four main themes: ecological transition, taxes and public spending, democracy and citizenship, and organization of State and public services. The two main tools were local public meetings, with around 10,000 meetings gathering 500,000 participants, and a digital platform available online at granddebat.fr[5].

For each of the four themes, participants using the *Grand Débat* website were asked a series of questions, with most often yes-no answers[6]. For example, in the module on ecological transition, there were 17 questions, of which 12 were closed and 8 open. The questions were about the possibility of making savings through one's own actions in favor of the environment, the awareness of public aid related to insulation and heating of houses as well as transport, the potential of oil taxes to change the behavior of users, the potential use of tax revenues on oil, the way of financing the ecological transition, measures to protect biodiversity and climate while keeping agricultural and industrial activities competitive in relation to foreign competitors. The module on taxes and public spending included 11 questions (6 open, 5 closed), the module about democracy and citizenship 34 questions (22 open, 12 closed), and the module on organization of State and public services 22 questions (9 open, 13 closed).

The official government platform granddebat.fr operated for two months, from January 21 to March 20, 2019. The website attracted a great deal of media attention in France, and also worldwide. According to the *Institut National de l'Audiovisuel* (National Audiovisual Institute), between November 2018 and March of 2019, about one in five topics on TV news was dedicated to the

[5] See Buge and Morio (2019) for a thorough legal and political discussion of the *Grand Débat*.

[6] See https://granddebat.fr/media/default/0001/01/39520feb60078392ddde45ddf9e29873e2ca8070.pdf, https://granddebat.fr/media/default/0001/01/d3d9143d11c4b6f28aabe71dfb9859aa03b236da.pdf, https://granddebat.fr/media/default/0001/01/cc2163b5498cec875689b34c7c18b7a21a25961b.pdf, https://granddebat.fr/media/default/0001/01/1c5eca558a413a22aace5918155f532b7c85eac8.pdf.

Yellow Vests movement[7]. The peak of media coverage on TV was reached in December with 842 reports, which corresponds to an average of 27 per day. More than 400,000 participants completed at least one closed question (N=410,675), but not all of them responded to all four themes : 351,313 responded to the first module, 343,592 to the second, 335,157 to the third and 333,793 to the fourth. In total, 275,637 respondent provided answers to all questions.

A crucial issue is that we have no information (neither demographic nor socio-economic) on the online respondents to the *Grand Débat*. Nor do we have any idea of their support for the Yellow Vests movement. This is a key concern, as we would like to know whether the responses to the *Grand Débat* can be considered representative of French public opinion. As shown in Figure 1, we only know that the Yellow Vests received between 45% and 60% of support in the general population during the period, with an average rate of 52% during the specific period of the *Grand Débat*.

Interestingly, the official government platform quickly inspired a non-profit organization called *Entendre La France* to launch a Facebook app aimed at making it easier for people to participate in the *Grand Débat*. Facebook members were able to contribute via this alternative, more user-friendly app, which acts as a chatbot. Although completely independent of the government, the app posed 14 questions that perfectly matched the questions asked in granddebat.fr, both in the wording of the questions and the answers : 6 related to the ecological transition, 1 to taxes and public spending, 5 to democracy and citizenship, and 2 to organization of State and public services. These questions along with possible answers are listed in Table 1. The sample of the Facebook respondents is much smaller. There were 15,645 respondents to at least one question on the app, but only 4,524 responded to all questions.

A unique feature of the Facebook app is that participants provided additional individual information. In particular, respondents indicated their affiliation to the Yellow Vests movement by answering the following question: 'What is your position regarding the Yellow Vests movement?'. Possible answers were 'active member', 'supporter' or 'non-supporter'. In the following, we will combine the first two categories to form the group of pro Yellow Vests. In addition, Facebook respondents provided some socio-demographic characteristics, in particular gender, age (in categories) and education. Among the 4,524 respondents to the set of 14 questions, 850 did not indicate whether they were for or against the movement and were therefore deleted. This leaves a Facebook sample of 3,674 respondents.

[7] See https://larevuedesmedias.ina.fr/gilets-jaunes-mediatisation-chaines-info-twitter.

Table 1. Similar questions on *Grand Débat* and Facebook App

Number	Question
Theme: ecological transition	
Q1	Do you think that your actions in favor of the environment can allow you to make savings? Yes / No [Q05, module *Transition écologique*, *Grand Débat*]
Q2	Do you think that taxes on diesel and petrol can help to change user behavior? Yes / No [Q11, module *Transition écologique*, *Grand Débat*]
Q3	Would you say that you are aware of the aid and schemes currently available from the State, local authorities, companies and associations for insulating and heating homes and for travel ? Yes / No [Q09, module *Transition écologique*, *Grand Débat*]
Q4	What should be the main purpose of the revenue from diesel and petrol taxes ? Reducing other taxes, such as income tax / Financing investments in favor of the climate / Financing aid to support the French population in the ecological transition [Q12, *module Transition écologique*, *Grand Débat*]
Q5	In your opinion, the ecological transition needs to be financed first and foremost: through the general government budget / through green taxes / both / I don't know [Q13, module *Transition écologique*, *Grand Débat*]
Q6	What should be done to protect biodiversity and the climate while maintaining agricultural and industrial activities competitive with their foreign, especially European, competitors ? Co-financing an investment plan to change production patterns / changing trade agreements / taxing imported products that damage the environment [Q15, module *Transition écologique*, *Grand Débat*]
Theme: taxes and public spending	
Q7	Would you be willing to pay a tax to encourage behavior that benefits the community, such as green taxation or taxes on tobacco or alcohol? Yes / No [Q10, module *Fiscalités et dépenses publiques*, *Grand Débat*]
Theme: democracy and citizenship	
Q8	Do you think it would be desirable to reduce the number of parliament members (deputies + senators = 925) ? Yes / No [Q07, module *Démocratie et citoyenneté*, *Grand Débat*]
Q9	Should voting be made compulsory ? Yes / No [Q09, module *Démocratie et citoyenneté*, *Grand Débat*]
Q10	Should there be more use of referendums at national level ? Yes / No [Q12 part A, module *Démocratie et citoyenneté*, *Grand Débat*]
Q11	Should there be more recourse to referendums at local level ? Yes / No [Q12 part B, module *Démocratie et citoyenneté*, *Grand Débat*]
Q12	Would you say that the application of secularism in France today is : satisfactory / to be improved / needs substantial change [Q17, module *Démocratie et citoyenneté*, *Grand Débat*]
Theme: organization of State and public services	
Q13	Do you think that there are too many administrative levels in France ? Yes / No [Q03, module *Organisation de l'Etat et des services publics*, *Grand Débat*]
Q14	Would you say that you are aware of the different administrative levels (State, local authorities such as the region, the commune, operators such as Pole Emploi or CAF) that manage the different public services in your area ? Yes / No [Q02, module *Organisation de l'Etat et des services publics*, *Grand Débat*]

Source: authors' presentation, the original questions are available on granddebat.fr.

In Table 2, we compare the pattern of answers to the different questions Q1-Q14 given by respondents on the *Grand Débat* website and the Facebook website. For each question, we reject the null assumption of independence between the pattern of answers and the type of website. The gap is greater than 10 percentage points for 5 questions (Q2, Q7, Q10, Q11, Q13). It is maximal for

participants who answered 'yes' to an increased number of referendums at national level (52.6% on the *Grand Débat* against 76.4% on Facebook). In Table 3, we examine whether the answers to the various questions are influenced by support for the Yellow Vests movement. According to the Facebook data, 54.1% of respondents were in favor of the Yellow Vests movement (N=1,986). This result is consistent with the figures obtained from the polls, as shown in Figure 1.

Table 2. Answers to the *Grand Débat* and Facebook questions

Question	*Grand Débat* website				Facebook website			
	Answer 1	Answer 2	Answer 3	Don't know	Answer 1	Answer 2	Answer 3	Don't know
Q1	0.763	0.233	.	0.005	0.729	0.256	.	0.016
Q2	0.436	0.560	.	0.004	0.335	0.656	.	0.009
Q3	0.417	0.580	.	0.003	0.393	0.590	.	0.016
Q4	0.119	0.351	0.516	0.014	0.083	0.400	0.489	0.029
Q5	0.229	0.121	0.586	0.064	0.211	0.133	0.628	0.027
Q6	0.315	0.129	0.541	0.015	0.318	0.115	0.538	0.029
Q7	0.404	0.576	.	0.020	0.548	0.422	.	0.030
Q8	0.865	0.127	.	0.009	0.786	0.186	.	0.028
Q9	0.570	0.420	.	0.009	0.600	0.390	.	0.010
Q10	0.526	0.463	.	0.011	0.764	0.221	.	0.016
Q11	0.798	0.192	.	0.009	0.908	0.079	.	0.013
Q12	0.318	0.483	0.181	0.018	0.281	0.454	0.239	0.026
Q13	0.867	0.121	.	0.012	0.735	0.229	.	0.036
Q14	0.667	0.328	.	0.005	0.728	0.269	.	0.003

Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.

As shown in Table 3, some questions are particularly good examples of the polarization of opinion between supporters and non-supporters of the Yellow Vests. Consider question Q2, which asks whether oil taxes can influence individual transport behavior. While the average proportion of Facebook respondents answering 'no' is 65.6% for the whole sample, the proportion is 82.1% for the pro Yellow Vests against 46.3% for the anti Yellow Vests. Looking at the *Grand Débat* sample, the proportion of respondents answering 'no' to this question is 56.0%. This suggests that the opinion of the participants in the *Grand Débat* is closer to that of the anti Yellow Vests than the pro Yellow Vests. We find similar results when we look at question Q10 (increased use of national referendums). Conversely, the opposite pattern is observed for questions Q5 (who should pay for the ecological transition), Q7 (willingness to pay more taxes to encourage beneficial behaviors) or Q9 (compulsory voting).

Table 3. Answers to the Facebook questions and support for the Yellow Vests

Question	Support for the Yellow vests				No support for the Yellow vests			
	Answer 1	Answer 2	Answer 3	Don't know	Answer 1	Answer 2	Answer 3	Don't know
Q1	0.710	0.269	.	0.020	0.750	0.239	.	0.011
Q2	0.167	0.821	.	0.012	0.531	0.463	.	0.006
Q3	0.408	0.573	.	0.020	0.376	0.611	.	0.012
Q4	0.091	0.367	0.501	0.042	0.073	0.438	0.476	0.013
Q5	0.264	0.116	0.584	0.036	0.149	0.153	0.680	0.018
Q6	0.286	0.128	0.554	0.032	0.355	0.099	0.519	0.027
Q7	0.449	0.513	.	0.038	0.664	0.315	.	0.021
Q8	0.781	0.191	.	0.027	0.791	0.180	.	0.028
Q9	0.553	0.435	.	0.012	0.655	0.337	.	0.008
Q10	0.919	0.065	.	0.015	0.581	0.403	.	0.016
Q11	0.958	0.029	.	0.014	0.850	0.139	.	0.012
Q12	0.236	0.449	0.282	0.033	0.334	0.460	0.188	0.018
Q13	0.703	0.251	.	0.045	0.771	0.203	.	0.026
Q14	0.721	0.274	.	0.005	0.736	0.264	.	0.001

Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.

3. Estimating the Yellow Vests support on the *Grand Débat*

Our aim is to assess the intensity of support for the Yellow Vests among participants in the *Grand Débat*, an information that is not available on this website. For that purpose, we exploit the fact that the Facebook website contains both information on support for the Yellow Vests and a series of questions similar to those on the *Grand Débat* website. The problem is thus one of out-of-sample prediction. By estimating the relationship between support for the Yellow Vests and the 14 questions asked on the Facebook site, we can use the estimated parameters to predict support for the Yellow Vests movement from the answers given to the questions on the *Grand Débat* website.

For the presentation, let YV be a variable measuring support for the Yellow Vests movement. We denote pro respondents by $YV = 1$ and cons respondents by $YV = 0$. Let $Q_{k,j}$ be a set of dummy variables such that $Q_{k,j} = 1$ if the respondents provide answer j to question k, with $k = \{1, \dots, 14\}$ and $j = \{1, \dots, J_k\}$. For 10 of the 14 questions, j can only take three values ("yes", "no", or "don't know") and the value of J_k is 4 for the remaining questions. We express the probability of support $\Pr(YV = 1)$ as a function of the different answers using a linear probability model with robust standard errors[8]:

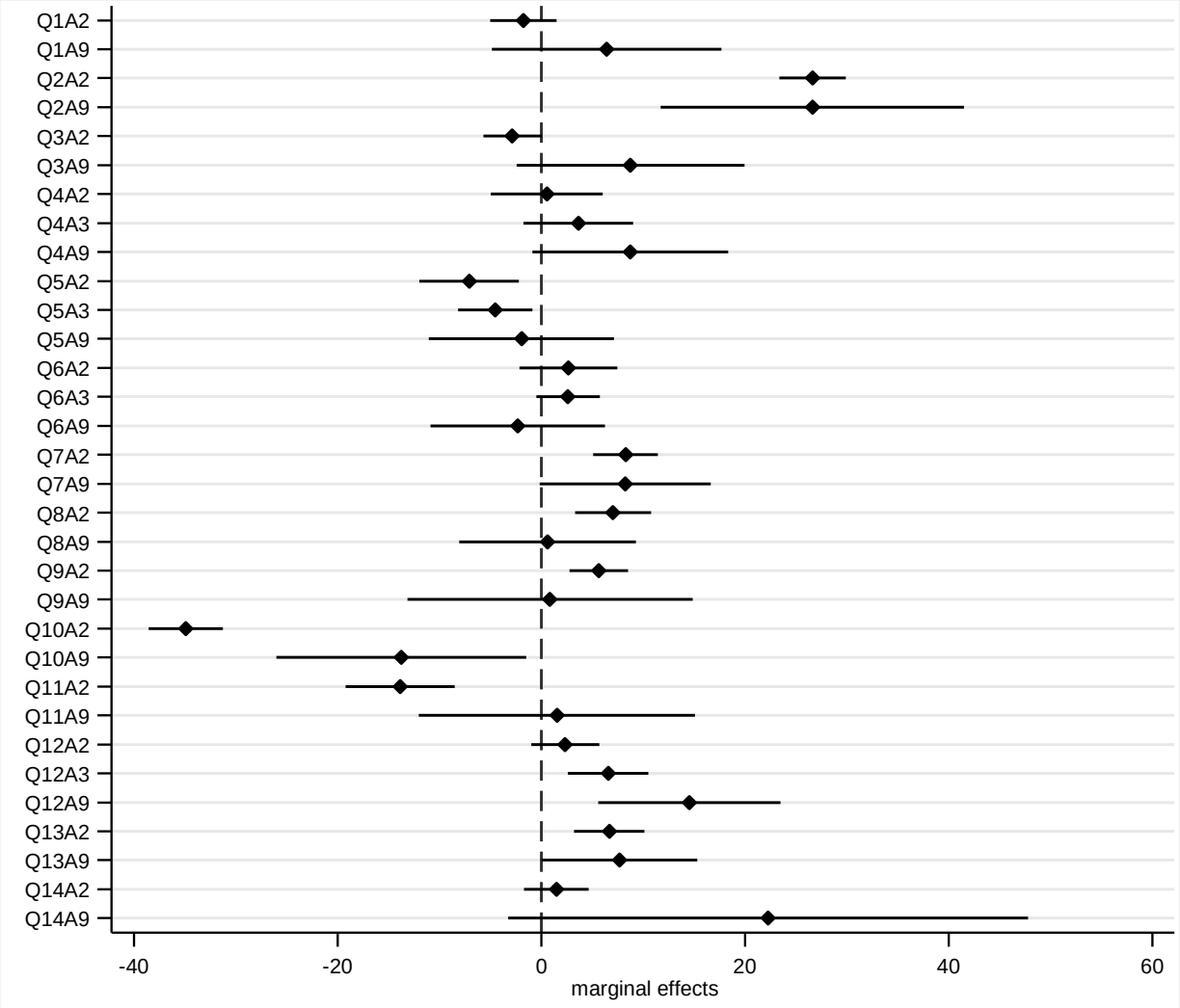
$$YV = \alpha + \sum_{k=1}^{14} \sum_{j=2}^{J_k} \delta_{k,j} Q_{k,j} + \varepsilon \quad (1)$$

where α is a constant, the $\delta_{k,j}$ are parameters to be estimated, and ε is a residual perturbation with

[8] For the sake of robustness, we have also estimated Probit regressions to explain the probability of supporting the Yellow Vests. Unsurprisingly, the results are very similar (available upon requests).

$E(\varepsilon) = 0$. For each question Q_k, we consider the modality $j = 1$ as the reference answer, and there are 32 parameters $\delta_{k,j}$ to be estimated. An important concern in (1) is that we do not take into account individual demographic and economic characteristics, as this information is not available on the *Grand Débat* website. We will investigate this issue in detail in Section 4. For ease of interpretation, we present the marginal effects associated with the different questions $Q_{k,j}$ in Figure 2. The detailed estimates are reported in column 1 of Table A1 in the appendix.

Figure 2. Marginal effects on probability of Yellow Vests support



Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: marginal effects from linear probability models, with robust standard errors. Q refers to the question (from Q1 to Q14), A refers to the answer, A1 is the reference category (0 by construction), A2 the second answer, A3 the third answer, and A9 refers to "don't know".

According to the data, many answers are strongly and significantly correlated with support for the Yellow Vests. On average, people who give a negative answer to question Q2 (answer A2) on the

potential for behavioral effects of the gasoline tax are 26.6 percentage points more likely to be pro Yelllow Vests than people who give a positive answer (answer A1, the reference category), holding all other answers constant. Two other questions have a very strong polarization effect between supporters and opponents of the Yellow Vests. On average, people who are against more national (Q10) or local (Q11) referendums are 34.9 points and 13.7 points less likely to support the Yellow Vests movement. When excluding the 'don't know' answers, we find that nine marginal effects among the different answers are statistically different from zero (at the five percent level).

Our results suggest that the different questions Q1 from Q14 are strong predictors of respondents' attitudes towards the Yellow Vests movement. Moreover, the R^2 of the OLS regression is 0.281, suggesting that the model explains a substantial amount of heterogeneity in support for the Yellow Vests across respondents. We explore this issue further by investigating the quality of in-sample prediction. We proceed as follows. Using the Facebook data, we begin by sorting randomly the sample of respondents. We then estimate the OLS equation (1) on the first 2000 observations, which is approximately half of the sample. We obtain estimated values $\hat{\alpha}$ and $\hat{\delta}_{k,j}$ for the parameters α and $\delta_{k,j}$. For the remaining subsample (which includes observations 2001 to 3674), we calculate the predicted probability $\widehat{YV} = \hat{\alpha} + \sum_{k=1}^{14} \sum_{j=2}^{J_k} \hat{\delta}_{k,j} Q_{k,j}$. We classify respondents with $\widehat{YV} > 0.5$ as Yellow Vests supporters. Finally, we use a bootstrap procedure with 2500 replications to obtain standard errors and confidence intervals.

We present our results in column 1 of Table 4. The average in-sample predicted probability $\overline{\widehat{YV}}$ is 0.542, which is very close to the average observed support (0.535). Using the classification $\widehat{YV} = 1$ when $\widehat{YV} > 0.5$, the average proportion of supporters $\overline{\widehat{YV} = 1}$ is 0.615. The bootstrapped standard error is very low (0.016), so the confidence interval is between 0.585 and 0.646. We also calculate the false negative and false positive error rates using the threshold probability set at 0.5. We obtain a proportion of correct predictions equal to 0.747. Among respondents who are not correctly classified, the proportion of false positives (observed non-supporters predicted as supporters) is about twice as high as that of false negatives (0.167 against 0.086).

We then use the estimated parameters to make out-of-sample predictions, i.e. we predict the support for the Yellow Vests for each respondent on the *Grand Débat* website using their various answers to questions Q1 to Q14 as explanatory variables. For each respondent, we calculate $\Pr(\widehat{YV} = 1)$ and classify as Yellow Vests supporters those with $\Pr(\widehat{YV} = 1) > 0.5$. The corresponding results are shown in column 2 of Table 4. We find that the average predicted probability of support for Yellow Vests $\overline{\widehat{YV}}$ is 0.412. This is 13.0 percentage points lower than the predicted rate of Facebook respondents. The gap is even larger (more than 20 percentage points) when

considering the outcome $\overline{\mathbb{I}_{\widehat{YV}>0.5}}$. Furthermore, the average predicted support for the *Grand Débat* is estimated very precisely, with a confidence interval ranging from 0.375 to 0.411.

Table 4. In-sample and out-of-sample predictions of yellow vests support

Variables		(1) In-sample prediction	(2) Out-of-sample prediction
Average observed $\overline{YV}$	Estimate	0.535	
	Bootstrapped st. error	0.014	
	Confidence interval	[0.507;0.562]	
Average predicted $\overline{\widehat{YV}}$	Estimate	0.542	0.412
	Bootstrapped st. error	0.010	0.009
	Confidence interval	[0.523;0.561]	[0.395;0.429]
Average predicted $\overline{\mathbb{I}_{\widehat{YV}>0.5}}$	Estimate	0.615	0.393
	Bootstrapped st. error	0.016	0.009
	Confidence interval	[0.585;0.646]	[0.375;0.411]
Correct predictions	Estimate	0.747	
	Bootstrapped st. Error	0.012	
	Confidence interval	[0.723;0.772]	
False negative	Estimate	0.086	
	Bootstrapped st. Error	0.009	
	Confidence interval	[0.069;0.103]	
False positive	Estimate	0.167	
	Bootstrapped st. Error	0.011	
	Confidence interval	[0.145;0.188]	

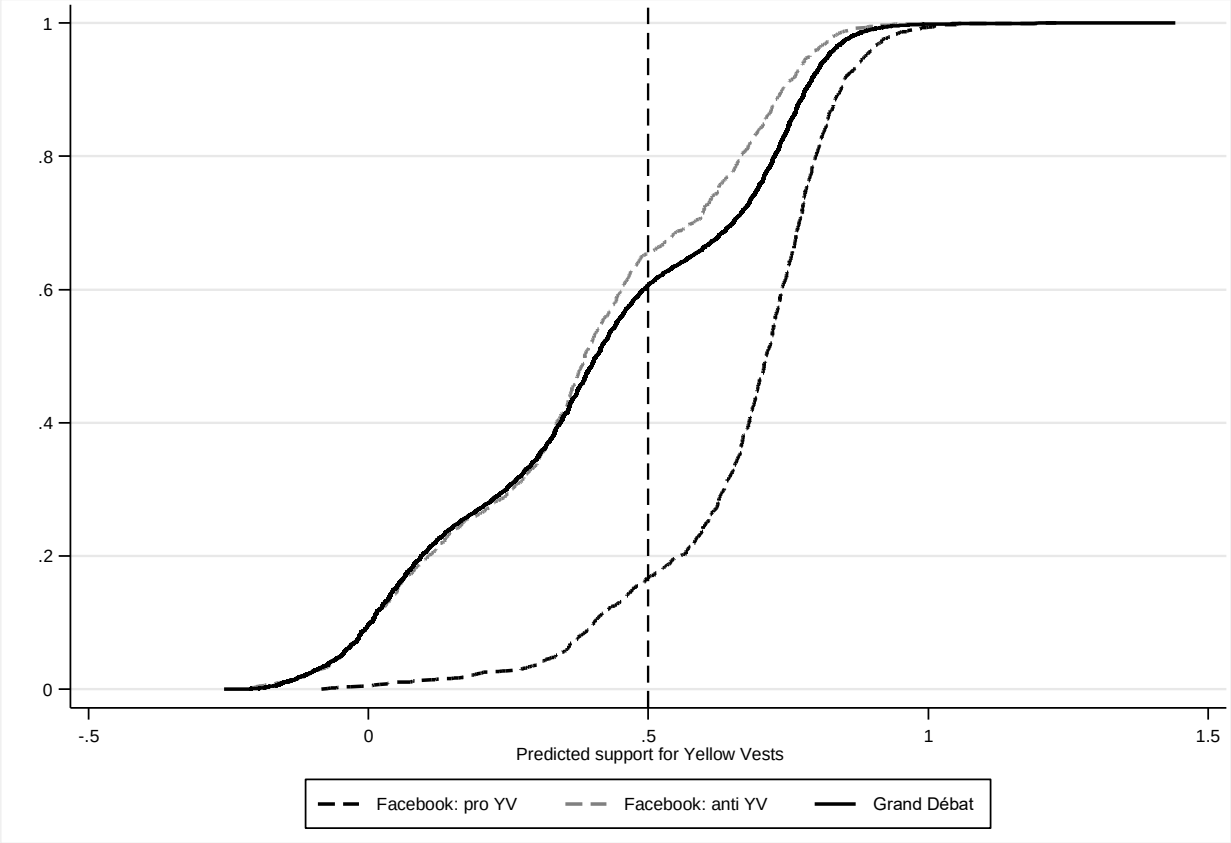
Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: standard errors are bootstrapped using 2500 replications.

An important finding is that the predicted rate of support for the Yellow Vests is much lower than the average rate of support measured by surveys of the general adult population over the same period. As shown in Figure 1, the average support was around 52% at that time. As it stands, our results indicate that in terms of individual propensity to contribute to the *Grand Débat* website, people who did not support the Yellow Vests movement were 67.3% more likely to contribute to the governmental platform than people who supported the Yellow Vests ((1-0.393)/(1-0.520)/(0.393/0.520))=1.673).

In Figure 3, we plot the cumulative densities obtained from the predicted probability of supporting the Yellow Vests for three different samples: supporters of the Yellow Vests from Facebook, opponents to the Yellow Vests from Facebook, and participants in the *Grand Débat*. Our results show that there is a clear opposition between pro and anti Yellow Vests respondents from the Facebook application, and that participants in the *Grand Débat* appear much closer to anti Yellow Vests respondents than to pro Yellow Vests respondents. We use two-sample Kolmogorov-

Smirnov tests to test the equality of the distributions of the predicted probabilities between the different samples. We find a distance of 0.088 when comparing the Facebook opponents to the Yellow Vests and the participants in the *Grand Débat*. This distance is about five times higher (0.443) when comparing the Facebook supporters of the Yellow Vests and the participants in the *Grand Débat*.

Figure 3: Cumulative densities of predicted probabilities of support for the Yellow Vests



Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: the predicted probabilities are calculated from linear probability models.

4. Robustness to selection on observables and unobservables

There are two types of selection that can affect the predicted probabilities of support for the Yellow Vests. The first is selection on observables, corresponding to observable characteristics (usually at the individual level) measured in a survey. The second is selection on unobservables, such that respondents self-select on the basis of one or many criteria that remain unknown to the econometrician. We successively examine how these two types of selection may influence our main conclusion, according to which respondents to the *Grand Débat* website are on average against the Yellow Vests movement.

So far, we have neglected the role of demographic and socio-economic characteristics in explaining support for the Yellow Vests based on responses to the 14 questions. Suppose that there is a vector of individual characteristics X that influence support for the Yellow Vests. For example, in the Facebook survey, there is information on gender, age and education level. Table 5 shows that these characteristics influence the likelihood of supporting the Yellow Vests movement (column 3). While on average men are slightly more supportive of the movement than women (+4.6 points, 56.1% against 51.5%), there are significant differences according to age. Support is higher among those aged 25-34 (62.1%) and 35-44 age (61.1%), while it is much lower among those aged 65 and over (46.6%). Finally, support for Yellow Vests falls sharply with the level of education : 75.1% for those without a Baccalauréat compared with 34.8% for those with a master degree.

Table 5. Descriptive statistics of the sample

Variables		Facebook sample			French population
		(1) Proportion in Sample	(2) Proportion of missing	(3) Support for Yellow Vests	(4) Proportion in population
Gender	Male	0.409	0.149	0.561	0.477
	Female	0.591	0.149	0.515	0.523
Age	18-24	0.576	0.144	0.516	0.103
	25-34	0.229	0.144	0.621	0.150
	35-44	0.073	0.144	0.611	0.159
	45-54	0.059	0.144	0.551	0.171
	55-64	0.040	0.144	0.543	0.160
	65+	0.023	0.144	0.466	0.258
Education	Less than Baccalauréat	0.062	0.042	0.751	0.521
	Baccalauréat	0.207	0.042	0.613	0.172
	Undergraduate	0.347	0.042	0.580	0.110
	Graduate	0.353	0.042	0.413	0.092
	Postgraduate	0.032	0.042	0.348	0.105
All				0.541	

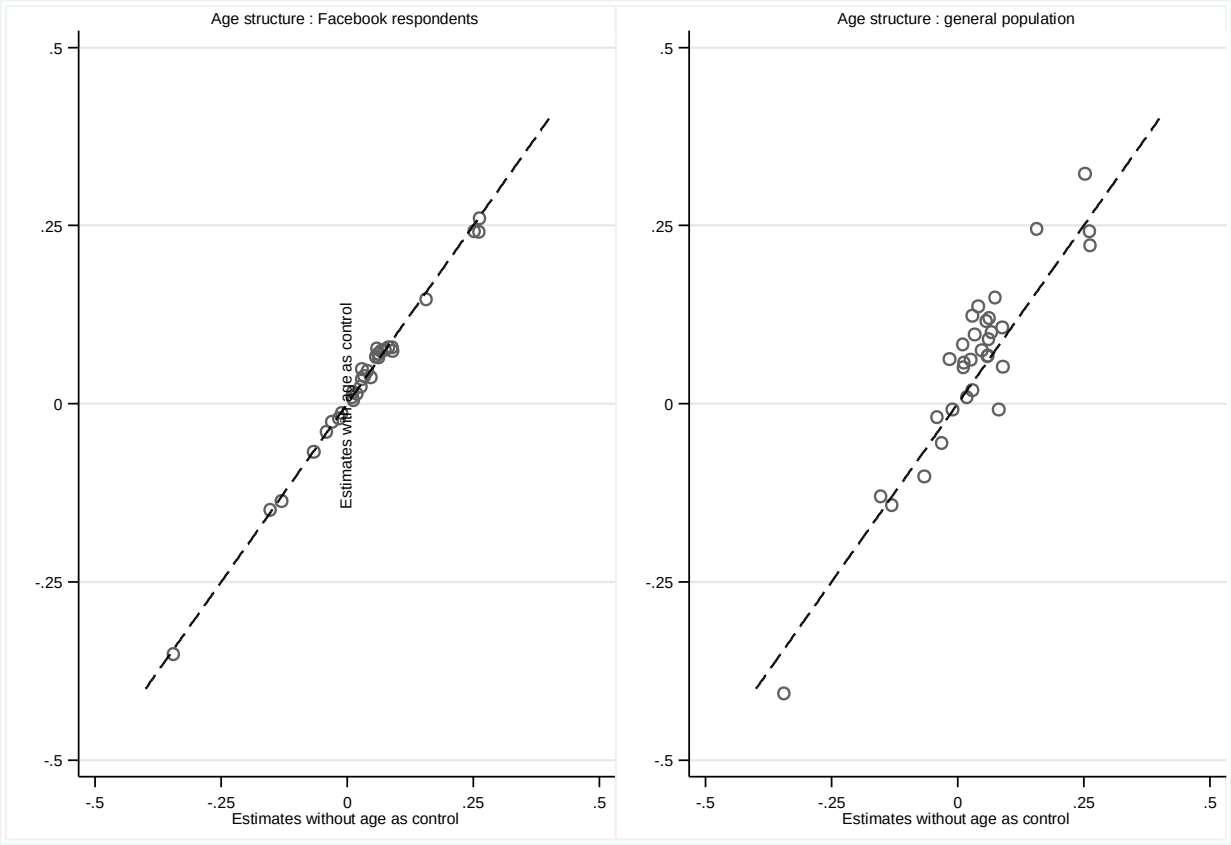
Source: authors' calculations, data from granddebat.fr, the Facebook app *Entendre la France* and INSEE.
Note: statistics for the French population were calculated for people at least 18 for gender and age using data from https://www.ined.fr/fichier/s_rubrique/156/fm_t6.fr.xls. Statistics were calculated for people at least 15 for education using data from https://www.insee.fr/fr/statistiques/6455246?geo=FRANCE-1.

The omission of the covariates X in the explanation of YV is likely to bias the estimates obtained for the constant α and the various coefficients $\delta_{k,j}$ in equation (1). We assume for the moment that the coefficients $\delta_{k,j}$ simply have a direct effect on YV, so that they can be introduced in an additive form in the regression. The correctly specified model to control for this individual observable heterogeneity is :

$$YV = \alpha + \sum_{k=1}^{14} \sum_{j=2}^{J_k} \delta_{k,j} Q_{k,j} + X\beta + \varepsilon \quad (2)$$

As shown in column (3) of Table 5, both age and education seem to play a very influential role in explaining the support for Yellow Vests. In the following, we first include only age as a control variable in the vector X. Later, we extend our framework to the case of multiple control variables.

Figure 4. Comparison of marginal effects from linear models, without and with age as control



Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.

We estimate the corresponding regression on the 3146 Facebook respondents for whom age information is available. The results are shown in column 2 of Table A in Appendix. As a first step, we re-estimate the model without age on this subsample. The R^2 is equal to 0.272 (it was 0.281 for the full Facebook sample). The introduction of age as an additional regressor hardly improves the goodness of fit, as the R^2 increases to 0.278. The profile obtained for age is inverted U-shaped: compared to 18-24 year olds, the probability of supporting the movement is +8.5 points for the 25-34 age group, +10.0 points for the 35-44 age group and +7.4 points for the 45-54 age group (there is no significant relationship beyond 55 years). In the left part of Figure 4, we compare the estimates obtained for the different coefficients $\widehat{\delta_{k,j}}$ depending on whether or not we control for

age to explain support for the Yellow Vests[9]. Our results show that not accounting for age has very little impact on the influence of the answers to the Q_k questions on support for the Yellow Vests: the R^2 of a regression explaining the coefficients $\widehat{\delta_{k,j}}$ net of the age effect as a function of the coefficients $\delta_{k,j}$ without controlling for age is 0.986 (with $t = 72.37$).

We then examine the extent to which taking age into account is likely to change the estimated support rate on the *Grand Débat* website. At the individual level, by definition, we cannot calculate $YV = 1$ for respondents on the *Grand Débat* since age is not observed for them. However, by estimating a linear probability model, we can calculate this probability for a given age structure of the population. From (2) expressed as $YV = \alpha + \sum_{k=1}^{14}\sum_{j=2}^{J_k}\delta_{k,j}Q_{k,j} + X\beta + \varepsilon$, it follows that $E[YV] = \alpha + \sum_{k=1}^{14}\sum_{j=2}^{J_k}\delta_{k,j}E\left[Q_{k,j}\right] + E[X]\,\beta$. We perform the out-of-sample prediction in two steps. In a first step, the linear model is estimated on the Facebook sample, from which we deduce the estimated parameters $\hat{\alpha}^{FB}$, $\widehat{\delta_{k,j}}^{FB}$ and $\hat{\beta}^{FB}$. In a second step, these parameters are applied to the *Grand Débat* sample : the empirical counterparts of the different $E[Q_{k,j}]$ are the means $\overline{Q_{k,j}}^{GD}$ of the *Grand Débat* respondents and the empirical counterpart of $E[X]$ is the age structure $\bar{X}^{FB}$ of the Facebook respondents. The estimated average rate of support for the Yellow Vests is $\widehat{\overline{YV}}^{GD} = \hat{\alpha}^{FB} + \sum_{k=1}^{14}\sum_{j=2}^{J_k}\widehat{\delta_{k,j}}^{FB}\overline{Q_{k,j}}^{GD} + \bar{X}^{FB}\hat{\beta}^{FB}$. Note that, by definition, the age structure $\bar{X}^{GD}$ remains unknown and is therefore approximated by $\bar{X}^{FB}$.

In Panel A of Table 6, we estimate the linear probability model on the Facebook respondents for whom age is available (3146 observations), but without including age as an explanatory factor (column 1). We split the sample in two : the first 1600 respondents are used to estimate the model and the in-sample prediction rate is calculated using the remaining 1546 observations. For Facebook respondents, the in-sample predicted rate of support for the Yellow Vests is 0.530 with a standard deviation of 0.011, and the out-of-sample predicted rate for *Grand Débat* respondents is 0.414 with a standard deviation of 0.010. In column 2, we introduce age as a control in an additive manner. Both the in-sample and out-of-sample predicted rates of support for the Yellow Vests are almost identical. For respondents in the *Grand Débat*, the confidence interval ranges between 0.391 and 0.429. This means that, on average, participants in the *Grand Débat* did not support the Yellow Vests movement.

[9] Again, we estimate linear probability models, so the coefficients are also marginal effects.

Table 6. In-sample and out-of-sample support for the Yellow Vests, with and without age

Variables	(1) Without age	(2) With age	(3) With age interacted with questions
Panel A. Without reweighting			
A1. In-sample prediction			
Point estimate	0.530	0.530	0.526
Standard error	0.011	0.011	0.012
Confidence interval	[0.508;0.551]	[0.508;0.552]	[0.504;0.549]
A2. Out-of-sample prediction			
Point estimate	0.414	0.410	0.411
Standard error	0.010	0.010	0.010
Confidence interval	[0.395;0.433]	[0.391;0.429]	[0.391;0.430]
Panel B. With reweighting			
B1. In-sample prediction			
Point estimate	0.524	0.524	0.448
Standard error	0.026	0.026	0.030
Confidence interval	[0.473;0.576]	[0.473;0.575]	[0.389;0.506]
B2. Out-of-sample prediction			
Point estimate	0.435	0.436	0.441
Standard error	0.015	0.015	0.019
Confidence interval	[0.407;0.464]	[0.407;0.465]	[0.404;0.477]

Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: standard errors of the different predicted rate of support for the Yellow Vests are bootstrapped with 2500 replications.

A limitation of equation (2) is that age is only supposed to have a direct effect on support for the Yellow Vests. However, it is possible that age influences this support not only directly, but also indirectly via the answers to the different questions Q_j (so in a multiplicative rather than additive way). To account for these indirect effects, we add a series of interaction terms that cross each response to the different questions with the different age categories :

$$YV = \alpha + \sum_{k=1}^{14}\sum_{j=2}^{J_k} \delta_{k,j} Q_{k,j} + X\beta + \sum_{k=1}^{14}\sum_{j=2}^{J_k} \gamma_{k,j} Q_{k,j} X + \varepsilon \quad (3)$$

where the coefficients $\gamma_{k,j}$ measure the effect of the interaction terms between age categories and each question response. If the in-sample estimation procedure does not change, the out-of-sample calculation must be adjusted because of the crossed terms $Q_{k,j}X$. Using a linear model, it follows that $E[YV] = \alpha + \sum_{k=1}^{14}\sum_{j=2}^{J_k} \delta_{k,j}\, E[Q_{k,j}] + E[X]\beta + \sum_{k=1}^{14}\sum_{j=2}^{J_k} \gamma_{k,j} E[Q_{k,j}X]$. The last term $E[Q_{k,j}X]$ involves some covariance terms since $E\left[Q_{k,j}X\right] = E\left[Q_{k,j}\right]E[X] + cov\left[Q_{k,j}X\right]$. Estimation of (3) using OLS gives $\hat{\alpha}^{FB}$, $\widehat{\delta_{k,J}}^{FB}$, $\hat{\beta}^{FB}$ and $\widehat{\gamma_{k,J}}^{FB}$. We apply these coefficients to the *Grand Débat* sample, taking as empirical counterparts $\overline{Q_{k,J}}^{GD}$ for $E\left[Q_{k,j}\right]$, $\bar{X}^{FB}$ for $E[X]$, and $\overline{Q_{k,J}}^{GD}\bar{X}^{FB} + \overline{cov\left[Q_{k,J}X\right]}^{FB}$ for $E\left[Q_{k,j}X\right]$. The results reported in column 3 of Table 4 show that the inclusion of indirect effects has very little impact on the

estimated out-of-sample rate of support for the Yellow Vests, which is now 0.411 (with a confidence interval ranging between 0.391 and 0.430).

In the results in Panel A of Table 6, the age structure chosen for the participants in the *Grand Débat* is that of the participants in Facebook. Although we will never know the "true" age structure of the participants in the *Grand Débat*, it is likely to be different from the age structure in Facebook, where the participants are likely to be relatively younger. As shown in Table 5, the Facebook sample is dominated by young people: 57.6% of respondents were aged between 18 and 24 and 22.9% were aged between 25 and 34. These proportions are very different from those observed for the French population as a whole. According to official national statistics[10], the 18-24 and 25-34 age groups accounted for 10.3% and 15.0% among those aged 18 and over (column 4, Table 2). If, for example, the participants in the *Grand Débat* are on average older, this may affect the predicted rate of support for the Yellow Vests.

We first assume that the participants in the *Grand Débat* have the same age structure as the French population. We then use entropy balancing (Hainmueller, 2012 ; Hainmueller and Xu, 2013), which consists in reweighting the observations of a control group by assigning weights to them in such a way that, after reweighting, the selected moments (mean, variance, ...) of the distribution of the explanatory variables of the control group are the same as those of the distribution of the explanatory variables of the treated group. In our setting, the control population consists of Facebook participants. It is reweighted so that its age structure corresponds to that of the French population. The advantage of balancing entropy is that it is pre-processed and any weighting scheme can be chosen to replicate any population structure. The results of the estimations are shown in Panel B of Table 6.

In column 1, we estimate a regression explaining support for the Yellow Vests, with weights obtained by entropy balancing and corresponding to the age structure of the population. Age is excluded from the list of control variables. The point estimate for the in-sample prediction is 0.524 and the point estimate for the out-of-sample prediction is 0.435. This is 2.1 percentage points higher than the out-of-sample prediction obtained from the unweighted data. In column 2, we introduce age as control in an additive way. This has no effect on the point estimate obtained. Finally, if age is allowed to affect support both directly and indirectly (through the answers to the Q_j questions), the predicted out-of-sample support rate is 0.441 with a standard deviation of 0.019. Participants in the *Grand Débat* remain, on average, rather unfavorable to the movement.

In panel B of Table 6, the age structure of the *Grand Débat* respondents was supposed to be that of the French population. While it is not possible to assess the relevance of this assumption (the age

[10] See https://www.ined.fr/fr/tout-savoir-population/chiffres/france/structure-population/population-ages/ and in particular https://www.ined.fr/fichier/s_rubrique/156/fm_t6.fr.xls. The population in metropolitan France is estimated at 65,096,768 in 2019. The number of people aged at least 18 is 51,108,919.

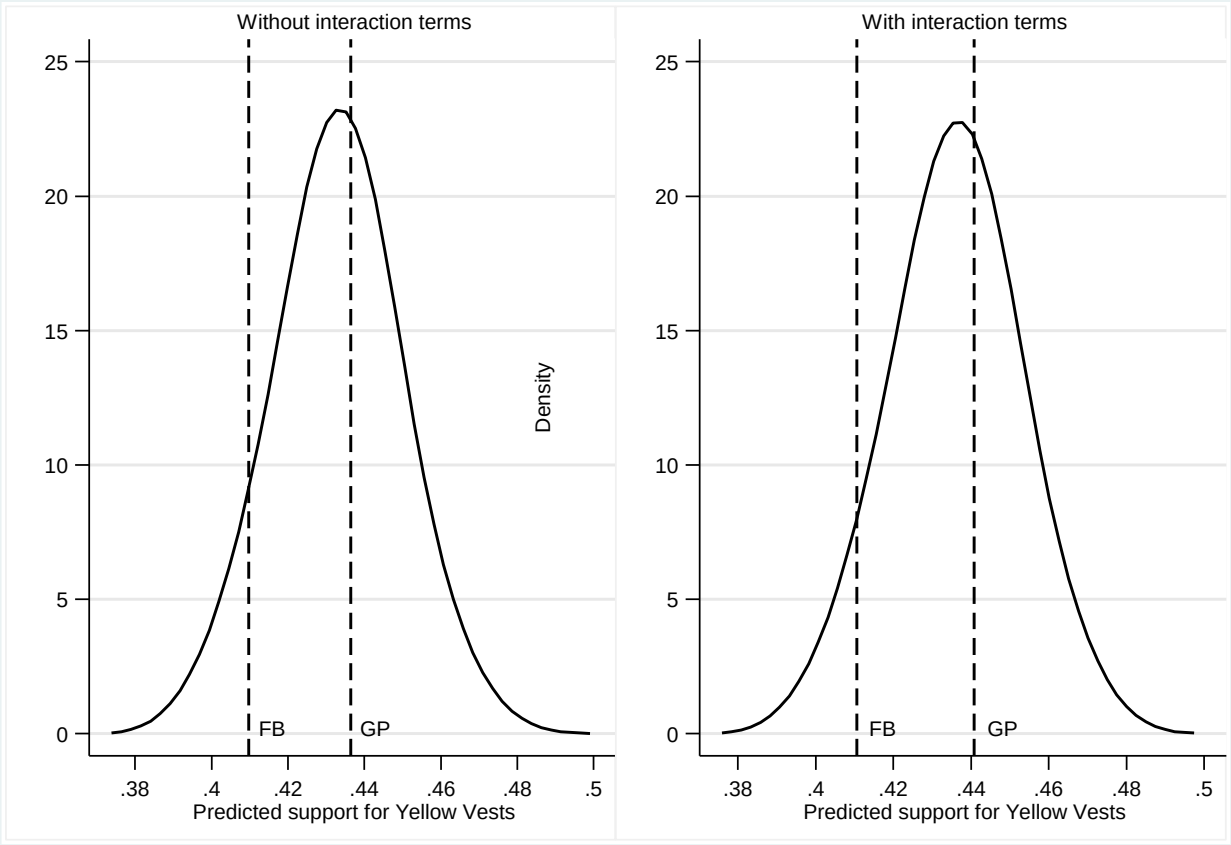
structure in the Grand Débat is, by definition, unknown), we can check the extent to which our estimates are sensitive to the chosen age structure. It is possible to calculate the out-of-sample support rate for any simulated age structure of *Grand Débat* respondents. The limitation of this exercise is the number of possible combinations. Let f_c^t be the theoretical weight of the age group f_c^t with $c = 1, \dots, 6$. This weight is such that $0 \leq f_c^t \leq 1$ with the constraint $\sum f_c^t = 1$. There are 21 possible cases when the chosen step for f_c^t is 0.5, 126 with a step of 0.25, 2783 with a step of 0.1, 49772 with a step of 0.05, 1111820 with a step of 0.025, and 91973826 with a step of 0.01. For each simulated age structure, it is necessary to calculate what the support rate for the Yellow Vests would be if the population had the same age structure as the simulated one. This requires performing entropy balancing for each case and then estimating the out-of-sample prediction based on the answers to the questions using the *Grand Débat* data.

In what follows, we simulate fictitious age structures with a step size of 0.05 (49772 cases). In Figure 4, we plot the distribution of the point estimates obtained for the out-of-sample prediction. We also show the point estimates obtained using the Facebook age structure on the one hand and the French general population age structure on the other. The exercise is carried out twice, once allowing only a direct age effect and once allowing both a direct and an indirect age effect. The main result is that the upper limit of the distribution of point estimates is always below 0.5. In other words, there is indeed minority support for the Yellow Vests, regardless of the simulated age structure of the population. The robustness of this result is due to the fact that support for the Yellow Vests follows a non-linear, concave function, which essentially limits the potential for selection on age to bias our baseline result. The age structure of Facebook leads to an average support located on the left side of the distribution (below the first quartile), while the age structure of the general population leads to a predicted support around the median. Finally, comparing the models with and without terms crossing age and Q_j questions shows that the density is slightly higher in the presence of interaction terms for support rates around 0.46-0.47 than without interaction terms.

This approach can be extended to multiple explanatory variables. Suppose we have several variables X_k, such that each variable X_k has several modalities c with $c = \{1, \dots, c_k\}$. For each variable, we simulate fictitious weights f_{k,c_k}^t with $\sum f_{k,c_k}^t = 1$. The data allow us to simultaneously consider the effects of sex (2 groups), age (6 groups) and education (5 groups). The difficulty then lies in the very large number of possible cases. With our three variables, the number of scenarios is 945 with a step of 0.5, 44100 with a step of 0.25, and 2,883,746 with a step of 0.1. So we use the following strategy to account for the gender-age-education triplet. First, we simulate a series of 100,000 draws of $\{f_{k,c_k}^t\}$ such that each draw contains 13 different proportions. Second, for each draw, we apply entropy balancing to find a reweighting scheme that makes the Facebook sample similar to the simulated average combination

of gender, age and education. Third, based on the estimated reweighted regression, we predict the support rate for the Yellow Vests using the *Grand Débat* sample.

Figure 4. Distribution of support for Yellow Vests for general population age structure

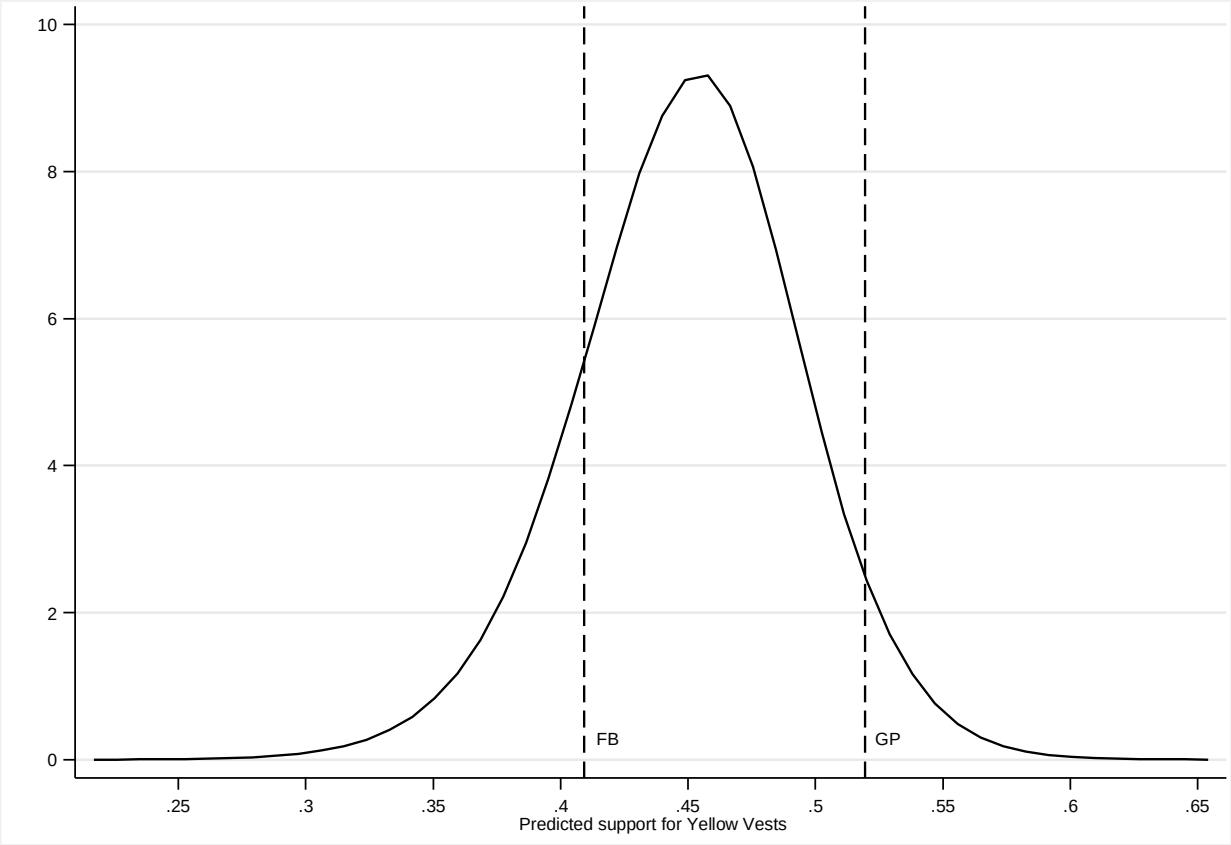


Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: the distribution is obtained from 49772 simulated cases. FB is the point estimate obtained from the age structure of the Facebook participants, GP is the point estimate obtained from the French general population.

The results are presented in Figure 5. A linear regression explaining support for the Yellow Vests for the Facebook sample as a function of responses to the questions Q_j, gender, age, and education leads to a small increase in R^2 (from 0.278 for the model without gender and education to 0.281). With the average characteristics of the sample, the estimated probability of supporting the Yellow Vests movement is 0.409 when controlling for gender, age, and education. This is lower than the same probability obtained without gender and education (0.435). This point estimate is in the left part of the distribution of the values obtained, whose mode is around 0.45. However, there is now a small fraction (10.84%) of cases where the estimated probability is greater than 0.5 and only 4.43% of cases where it is greater than 0.52 (the average support rate throughout the period in France). In certain scenarios where individual characteristics positively correlated with support for the Yellow Vests have large weights, for example being a man between 25 and 34 years old and having a low level of education,

the estimated support for the Yellow Vests can become the majority. Nevertheless, the most frequently observed cases remain those of minority support for the Yellow Vests movement.

Figure 5. Distribution of support for Yellow Vests with simulated gender, age and education structure



Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: the distribution is obtained from 100000 simulated cases. FB is the point estimate obtained from the gender, age, and education structure of the Facebook participants, GP is the point estimate obtained from the gender, age, and education structure of the French general population.

So far, we have shown that selection on observables has little to no effect on the minority support rate for the Yellow Vests among participants in the *Grand Débat*. We now examine the extent to which selection on unobservables can affect our results regarding the estimation of the predicted support rate. Starting from the regression model (1) without individual characteristics, we assume that there is an unobserved confounding factor $\mathcal{C}$ that influences the probability of supporting the Yellow Vests:

$$YV = \alpha + \sum_{k=1}^{14} \sum_{j=2}^{J_k} \delta_{k,j} Q_{k,j} + \omega \mathcal{C} + \varepsilon \quad (4)$$

This confounder may be correlated with the different responses to the questions Q_j, which could bias the estimated parameters $\hat{\delta}_{k,j}$ and thus the estimated probability $\Pr(\widehat{YV} = 1)$. There are two distinct sources of heterogeneity. First, the marginal effect of the confounder $\mathcal{C}$, measured by the coefficient ω,

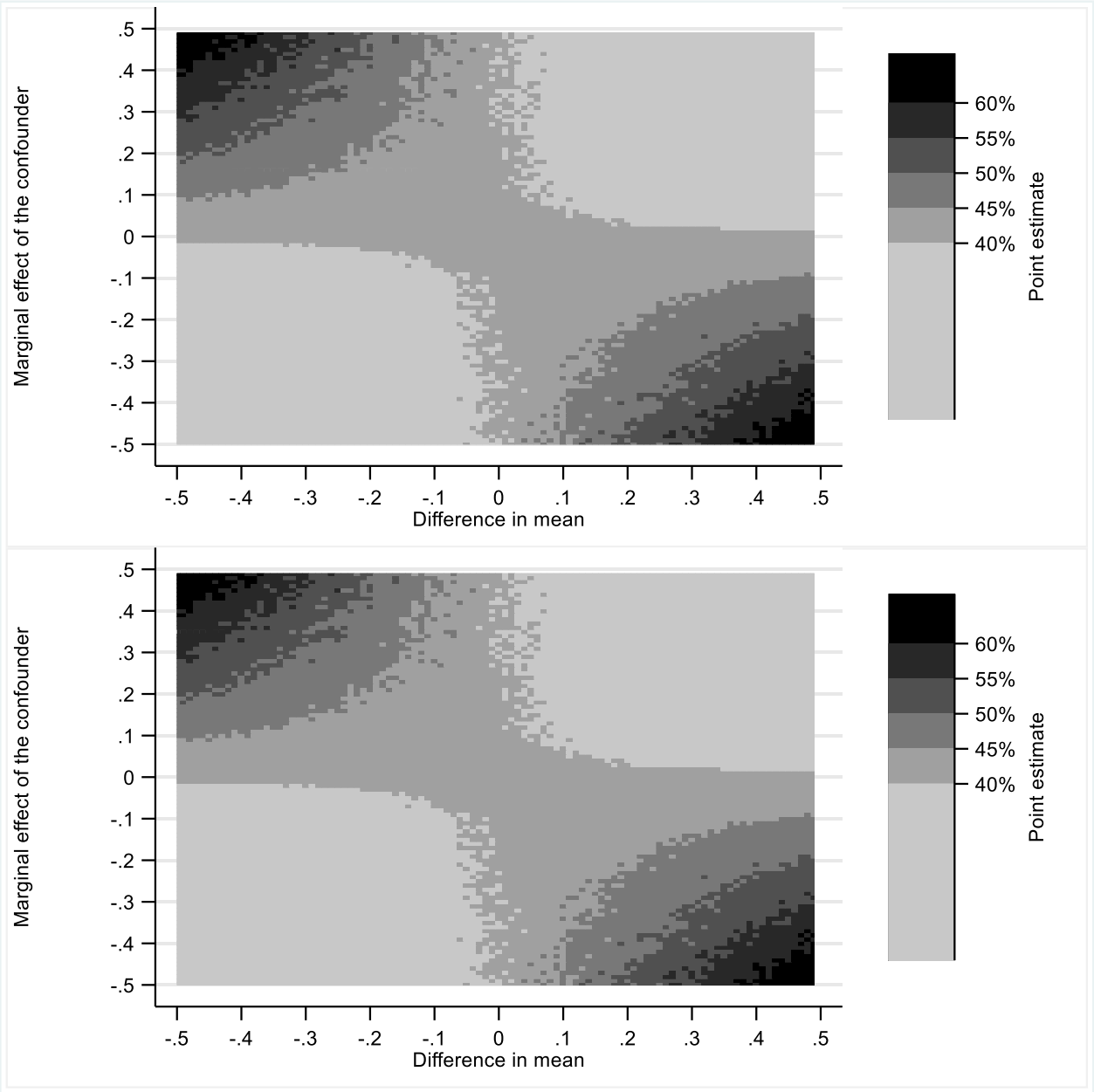
may be more or less important. Second, the confounder may have a different distribution between the Facebook and *Grand Débat* samples. We proceed as follows.

We generate a confounder $\mathcal{C}^{GD}$ such that $\mathcal{C}^{GD} \sim N(0;1)$ for *Grand Débat* respondents and a confounder $\mathcal{C}^{FB}$ such that $\mathcal{C}^{FB} \sim N(c;1)$ for Facebook respondents, where c can be either positive or negative. The confounder $\mathcal{C}$ is such that $\mathcal{C} = \mathcal{C}^{FB} * \mathbb{I}^{FB} + \mathcal{C}^{GD} * \mathbb{I}^{GD}$. For each pair (ω', c'), we estimate the linear regression (4) subject to the constraint $\omega = \omega'$ for the Facebook sample. The estimated coefficients $\hat{\alpha}$ and $\hat{\delta}_{k,j}$ (as well as ω') are then used to calculate the predicted value $\Pr(\widehat{YV} = 1)$ for the *Grand Débat* sample. This procedure is repeated for a large range of values of (ω, c). For ω, the estimation of the linear model (1) indicates that the coefficients $\hat{\delta}_{k,j}$ vary between -0.344 and 0.326. We consider a marginal effect ranging between -0.5 and +0.5 for the confounder, which is almost 50% higher than the most influential covariate. Such magnitudes are economically extremely large, as they correspond to a situation where a one-unit increase in the confounder (i.e. one standard deviation) affects the probability of support by an average of 50 percentage points after controlling for the other explanatory variables. For c, the comparison of the centered means for $Q_{k,j}$ obtained from the Facebook and *Grand Débat* samples gives differences between -0.518 and 0.337. We choose to vary c between -0.5 and +0.5. For each variable ω and c, we use a step of 0.01 to calculate the predicted support, so there are 10000 possible combinations.

The results are presented in Figure 6. In the upper part, we do not account for demo-economic variables to explain support for the Yellow Vests. A first finding is that in a very large majority of possible combinations (ω, c), the predicted support is in the minority. The proportion of cases for which the estimated probability $\Pr(\widehat{YV} = 1)$ is greater than 0.5 is only 14.01% of the 10000 combinations, and 10.25% if we refer to the average support rate of 52% in the general population.

A second finding is that the conditions for support for the movement to be in the majority are very specific. The marginal effect of the confounder ω and the expectation c must be negatively correlated, and the intensity of these two terms must be sufficiently large. If the marginal effect of the confounder is at most 20 percentage points, then the predicted support is in the majority only 0.1% of the time. If the marginal effect is 30 points or less, which is the highest marginal effect for a response to any question Q, then the predicted support is in the majority only 3.9% of the time. In the lower part of Figure 6, we replicate the same exercise controlling for gender, age and education. This has very little effect on our results : the proportion of cases for which the estimated probability $\Pr(\widehat{YV} = 1)$ is greater than 0.5 is 12.69% of the 10000 combinations. The proportion is 9.35% if the threshold level is set at 52%, as in the general population.

Figure 6. Sensitivity of estimated support for Yellow Vests to confounding bias



Source : authors calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: the different point estimates of support for the Yellow Vests are obtained from simulations with different combinations of the confounder's influence.

5. Concluding comments

In recent years, many democracies have experienced a growing disconnect, with citizens feeling that their elected representatives do not care about them. This has led to a new demand for participatory democracy and public consultation, either through public meetings or online platforms. However, little is known about who is inclined to participate in these new forms of consultation.

In this paper, we investigate self-selection in online participatory democracy, using as a case study the Yellow Vests movement of social protest that began in the fall of 2018. Specifically, we study the self-selection of participants in the online platform associated with the *Grand Débat*, which was launched in the first quarter of 2019 and attracted nearly 500,000 contributors. Online participants in the *Grand Débat* provided answers to questions about ecological transition, taxes and public spending, citizenship and democracy, and public services, but they were not asked about individual characteristics or political attitudes. We address this unobservability problem by using a complementary survey from a Facebook app to examine whether participants in the *Grand Débat* were similar to the general population in their support for the Yellow Vests movement.

Our main finding is that, unlike the general adult population, participants in the *Grand Débat* were not supporters of the Yellow Vests movement. Without controlling for individual characteristics, people who opposed the Yellow Vests were two-thirds more likely to participate in the *Grand Débat* online than people who supported the Yellow Vests. We examine the robustness of our main conclusion to selection issues on either observable or unobservable characteristics. Since age or education had a strong influence on attitudes toward the Yellow Vests, we turn to entropy balancing and simulation techniques to predict the support rate for any age structure or for any combination of characteristics (gender-age-education in our setting) of the participants. We also consider the influence of a potential confounder and use simulations to investigate how large the marginal effect of this confounder must be to reverse our main result. In all our simulations, we conclude that the participants in the *Grand Débat* did not support the movement except under very specific and rather unrealistic conditions.

As they stand, our findings do not imply that participatory democracy is inherently bad or that all public consultations are doomed. Rather, they suggest that even large and apparently successful public consultation initiatives by politicians can lead to deeply biased views of the public opinion due to the unknown selection of participants. Failure to account for such selection is potentially harmful, as governments may be tempted to implement public policies in response to these public consultations that do not reflect the will of most citizens, potentially exacerbating inequalities and political disengagement (Theodossiou and Zangelidis, 2020). Overall, politicians should pay very close attention to the representativeness of citizens in participatory democracy. The problem of selection could be solved by a random selection when recruiting participants to ensure inclusiveness and representativeness, which would enhance the quality of deliberation, but the reluctance of some citizens to participate in such participatory mechanisms is undoubtedly a concern.

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Appendix. Linear probability estimates of the support for Yellow Vests

Table A. Estimates of the Yellow Vests support

Variables		(1) OLS without control		(2) OLS with age		(3) OLS with age interacted	
		coef	t-value	coef	t-value	coef	t-value
Q1A2		-0.017	(-1.04)	-0.013	(-0.72)	-0.023	(-0.96)
Q1A9		0.064	(1.24)	0.070	(1.13)	0.069	(0.86)
Q2A2		0.266***	(15.23)	0.260***	(14.37)	0.294***	(12.73)
Q2A9		0.266***	(3.58)	0.242***	(2.89)	0.195	(1.40)
Q3A2		-0.028*	(-1.94)	-0.025	(-1.57)	-0.018	(-0.85)
Q3A9		0.088*	(1.86)	0.077	(1.21)	0.097	(1.26)
Q4A2		0.006	(0.19)	0.005	(0.17)	-0.018	(-0.47)
Q4A3		0.036	(1.29)	0.037	(1.24)	0.031	(0.79)
Q4A9		0.087**	(1.99)	0.074	(1.42)	0.079	(1.00)
Q5A2		-0.071***	(-2.86)	-0.067**	(-2.46)	-0.108***	(-2.90)
Q5A3		-0.045**	(-2.47)	-0.039*	(-1.94)	-0.070***	(-2.58)
Q5A9		-0.019	(-0.40)	0.010	(0.18)	0.002	(0.03)
Q6A2		0.027	(1.05)	0.038	(1.44)	0.004	(0.12)
Q6A3		0.026*	(1.65)	0.024	(1.35)	-0.005	(-0.21)
Q6A9		-0.023	(-0.53)	-0.021	(-0.44)	-0.101	(-1.60)
Q7A2		0.083***	(5.01)	0.079***	(4.51)	0.063***	(2.70)
Q7A9		0.082*	(1.91)	0.079*	(1.73)	0.086	(1.51)
Q8A2		0.071***	(3.74)	0.066***	(3.14)	0.071***	(2.78)
Q8A9		0.006	(0.15)	0.016	(0.34)	0.055	(0.93)
Q9A2		0.057***	(3.84)	0.065***	(4.07)	0.049**	(2.36)
Q9A9		0.009	(0.14)	0.046	(0.59)	-0.005	(-0.05)
Q10A2		-0.349***	(-19.14)	-0.351***	(-16.79)	-0.318***	(-11.20)
Q10A9		-0.137**	(-2.18)	-0.137*	(-1.94)	-0.240**	(-2.57)
Q11A2		-0.139***	(-5.47)	-0.149***	(-4.98)	-0.154***	(-3.81)
Q11A9		0.015	(0.24)	0.049	(0.64)	0.116	(1.29)
Q12A2		0.023	(1.37)	0.034*	(1.86)	0.047*	(1.93)
Q12A3		0.066***	(3.21)	0.074***	(3.40)	0.076***	(2.66)
Q12A9		0.145***	(3.50)	0.147***	(2.92)	0.119	(1.46)
Q13A2		0.067***	(3.74)	0.070***	(3.65)	0.056**	(2.40)
Q13A9		0.077**	(2.15)	0.076*	(1.81)	0.022	(0.40)
Q14A2		0.015	(0.93)	0.014	(0.81)	0.005	(0.21)
Q14A9		0.223***	(2.61)	0.242*	(1.69)	0.044	(0.20)
Age	25-34			0.085***	(4.46)	0.062	(0.57)
(ref : 18-24)	35-44			0.100***	(3.27)	-0.218	(-1.10)
	45-54			0.074**	(2.17)	-0.149	(-0.82)
	55-64			0.034	(0.85)	-0.197	(-0.84)
	65+			0.062	(1.16)	-0.039	(-0.11)
Constant		0.345***	(8.72)				
Number of observations		3674		3,146		3,146	
R^2		0.281		0.278		0.310	

Source: authors' calculations, data from granddebat.fr and the Facebook app *Entendre la France*.
Note: estimates from linear probability models, with Q refers to the question (from Q1 to Q14), A refers to the answer, A1 is the reference category (0 by construction), A2 the second answer, A3 the third answer, and A9 refers to "don't know".

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