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Facebook Causes Protests

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Abstract

The Internet and social media have been considered crucial determinants of recent political turmoil and protests. To estimate the causal impact of Facebook on collective action for a large set of countries, we use its release in a given language as an exogenous source of variation in access to social media where the language is spoken. Using country-, subnational-, and individual-level data, we show that Facebook has had a significant and sizable positive impact on citizen protests. Complementary findings show that reverse causality and correlated changes in protest reporting are not driving these results. Facebook's effect is particularly important in countries with: underlying conditions that facilitate using the technology (more Internet access), grievances (economic downturns), few other opportunities to coordinate action against authorities (no freedom of assembly, repression of the opposition), and factors that make the country more conflict prone (natural resource abundance, denser urban populations). The effect is also stronger in countries with either very low or very high levels of accountability. Finally, we find that Facebook impacts individuals with very different characteristics; we detect no evidence of displacement in other forms of political participation or news consumption; and we document an increase in individuals' perceived freedom to express what they think, to join political organizations, to vote, and to voice their political opinions.

Keywords: Collective action, Protests, Social media, Facebook
JEL Classification: D70, L82, D80

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Facebook Produce Protestas*

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Abstract

El internet y las redes sociales han sido señalados como determinantes cruciales de las protestas y la agitación política recientes. Para estimar el efecto causal de Facebook en la acción colectiva para una muestra amplia de países, usamos el lanzamiento de versiones de la plataforma en lenguajes específicos como fuente de variación en el acceso a las redes sociales donde se hablan esas lenguas. Utilizando datos a nivel de país, subnacionales, e individuales, mostramos que Facebook tuvo un efecto significativo y considerable en las protestas ciudadanas. Resultados complementarios indican que estos efectos no están explicados por causalidad inversa o cambios en los reportes de protestas. Además, el efecto de Facebook es particularmente importante en países con condiciones que facilitan usar la tecnología (más acceso a internet), agravios (recesiones económicas), pocas alternativas para coordinar la acción contra las autoridades (ausencia de libertad de asociación y represión de la oposición), y factores que hacen a los países más proclives al conflicto (abundancia de recursos naturales y poblaciones urbanas más densas). También es más fuerte en países con muy buenas o muy malas instituciones de rendición de cuentas. Finalmente, el efecto se observa para individuos con características muy diversas, no detectamos ninguna evidencia de reducción en otras formas de participación política o consumo de noticias, y documentamos un incremento en la libertad que perciben los individuos para expresar lo que piensan, unirse a organizaciones políticas, votar, y expresar sus opiniones políticas.

Palabras Clave: Acción colectiva, Protestas, Redes sociales, Facebook
Clasificación JEL: D70, L82, D80

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1 Introduction

The political events that took place in the Middle East in 2011 coincided with the expansion of information technologies to create a widespread perception that the Internet, and social media in particular, helped bring about the popular uprisings against authoritarian regimes. However, much of this perception comes from journalistic accounts, not careful research; thus the real impact of these technologies may have been exaggerated (Aday et al., 2010; Farrell, 2012). And just as social media platforms provide enormous possibilities for movement organizers, they also help the government detect and suppress collective action (Diamond & Plattner, 2012; Sanovich, Stukal, Penfold-Brown, & Tucker, 2015). Yet the media continues to cite social media as a critical factor in explaining more recent waves of protests, motivated by varied grievances and occurring in very different political regimes (e.g., Economist, 2019).

Two main empirical challenges must be overcome in order to determine the causal effect of the Internet and social media on political outcomes. First, Internet access correlates with socio-economic characteristics that also influence politics. The second challenge involves reverse causality: increased political mobilization may drive the growth in Internet and social media participation and penetration, not the other way around.

This paper estimates the effect of social media on collective action across a broad sample of countries and regions. Our identification strategy relies on the introduction of Facebook, the world's most common and widely used social media outlet with over 2 billion users worldwide, in different languages. Facebook's platform, launched worldwide in September 2006 in English, was gradually extended to versions in other languages. We exploit its release in a given language as an exogenous source of variation in access to social media among countries, regions, and people speaking that language. Our strategy builds on the idea that the platform's introduction in French, for example, increases Facebook use in French-speaking countries and regions, and among French-speaking people for at least two reasons. First, Internet users interpret and use the platform more efficiently in their main language. Second, even if some people can understand the platform well enough in their second language, they will likely use it more when their peers (friends, politicians, businesses) enjoy greater access with the language barrier gone.

We collect data from a variety of sources, and present results at the national, subnational, and individual levels. At the national and subnational levels, we test whether protests increase after Facebook is launched in a language commonly spoken in a country or region within a country. We also gather information from the Afrobarometer (AB), European Social

Survey (ESS) and World Values Survey (WVS) and run individual-level regressions where protest participation is a function of Facebook availability in the respondent's first language.

These approaches complement each other. The national-level regressions allow us to more directly examine a key concern of our empirical strategy: that the arrival of language-specific platforms responds to an increased demand for social media in protest-prone countries. Three findings suggest that this source of reverse causality is unlikely to be a concern. First, there are no pre-existing differential trends between countries with more or less people speaking languages available on Facebook. Second, collective action in a country does not predict increased efforts to translate the platform into languages spoken in that country. Third, the main results are not driven by any region, country, language, or by countries that are significant in terms of their wealth, size, or level of political turmoil.

The national-level analysis is also useful to explore potential mechanisms by studying the heterogeneous effects of Facebook availability as a function of national socio-economic and political characteristics. Finally, at the national level we can validate that language-specific Facebook platforms increase Facebook access using data on users and search interest in Facebook from Google Trends. Comparable data on Facebook use is incomplete at the sub-national level, and measuring protest locations in smaller geographical regions may introduce more error. Despite these two drawbacks, the subnational analysis helps control for national and regional trends in collective action, which relaxes the identification assumptions.

Individual-level survey data has three main advantages. First, it allows us to examine *who* protests, not merely where protests take place. Second, it enriches the set of outcomes and likely mechanisms of influence that we can study by exploiting variation in individual circumstances. Finally, this data helps us address the concern that our findings in the national and subnational analysis partly reflect that Facebook increases reported protests because it makes them more *visible*, but does not change the number of demonstrations. While several robustness exercises in our national- and subnational-level regressions suggest this is unlikely, the individual-level data reinforce our finding since it relies on direct reports rather than media coverage.[1]

Consistently across these approaches, we find that Facebook access has a positive and robust effect on citizen protests. Different types of protests increase, suggesting it has a very generalized impact that is not confined to a particular form of collective action. Facebook access has a more pronounced effect in countries with underlying conditions that facilitate

[1] We also use the survey data to verify, where possible, that Facebook availability in respondents' languages increases social media use.

using the technology (more Internet access), grievances (economic downturns), few other opportunities to coordinate action against authorities (no freedom of assembly, repression of the opposition), and factors that make the country more conflict prone (natural resource abundance, denser urban populations). The effect is also stronger in countries with either very high or very low levels of accountability.

When examining individual protest participation, individuals with very different characteristics (in terms of age, sex, education and income) react to the introduction of Facebook. We also use individual data to test whether Facebook crowds out other forms of political participation and news consumption, and detect no evidence of such displacement. It has a very precisely measured zero effect on political activities (like voting, engagement and interest in political discussions); party identity and association membership and participation; and radio, TV and newspaper consumption. We instead find an appreciable 10% increase in individuals' perceived freedom to express their thoughts, to join political organizations, to vote and to voice their political opinions.

The magnitudes of the effects are economically meaningful. Our estimations using protest counts imply that a one-standard-deviation increase in the share of people who speak a language available on Facebook (a variable that we term "Facebook Speakers") increases protests by 0.04 to 0.14 standard deviations. To gauge the quantitative importance of these effects, we construct a counterfactual number of protests implied by our estimates if Facebook had never been launched (that is, imposing zero Facebook Speakers throughout). We then estimate the cumulative difference from September 2006 (when Facebook first appeared) to December 2015 (when our sample ends) between protests with and without Facebook. The calculations imply that without Facebook, 14–26% fewer protests would have taken place around the world during the study period. The magnitudes at the individual level indicate that being a Facebook Speaker increases participation by 10% on average.

We also provide direct evidence to alleviate several empirical concerns that might bias our estimates. First, we show parallel trends in aggregate protest counts, individual protest participation, and Facebook access before the arrival of new Facebook platforms. Second, our findings are robust to the exclusion of countries that could influence Facebook's translation into a new language. Third, we find no correlation between collective action events and subsequent translation activity for Facebook platforms. Fourth, omitted variables are not a likely confounder given the fine-grained variation we can use, controlling for country and even regional trends in collective action, as well as for trends parametrized as a function of initial country characteristics. Fifth, we confirm that the results are not merely driven by major

episodes that change the nature of collective action coinciding with Facebook's expansion into new languages (in particular, the Arab Spring or the global financial crisis of 2007–2008). Finally, we provide evidence that reporting biases cannot account for our protest count results, and confirm those results with individual answers that are independent of media reports.

Our paper contributes to several strands of research. We add to the literature exploring the impact of the expansion of the Internet (e.g. increased access to broadband) on various political outcomes such as turnout and voting behavior (Campante, Durante, & Sobbrio, 2017; Larcinese & Miner, 2017), ideological polarization (Gentzkow & Shapiro, 2011; Barberá, 2014; Boxell, Gentzkow, & Shapiro, 2017), economic growth (Czernich, Falck, Kretschmer, & Woessmann, 2011), and policies (Gavazza, Nardotto, & Valletti, 2018). Like several of these papers, we emphasize the importance of devising a credible identification strategy to identify causal effects. However, these studies typically evaluate the *overall* role of Internet access, without identifying which Internet tool determines the results.[2] We contribute by focusing on the impact of social media, one of the critical innovations of the Internet era, on protests – a fundamental outcome that has received considerable attention in recent studies (for a recent survey, see Zhuravskaya, Petrova, and Enikolopov (2019)).

However, many previous studies fail to provide evidence that new media in general, or social media in particular, has a causal effect on protests. A key exception is Enikolopov, Makarin, and Petrova (in press), who exploit exogenous variation in the expansion of VKontakte (VK), Russia's leading social network, to identify the impact of network penetration on political protests. In a later paper Enikolopov, Makarin, Petrova, and Polishchuk (2017) provide evidence consistent with a model in which individuals use protests to signal their type to their peers. Qin, Strömberg, and Wu (2019) use a difference-in-differences methodology to document the effect of network interactions (in particular, retweets by users in one city of blogposts from other cities) on protests and strikes in China. An important question that our study contributes to is whether these findings for the Russian or Chinese contexts, naturally circumscribed to a particular institutional environment and, in the case of Russia, in a specific juncture of citizen discontent following electoral corruption allegations, can be generalized to other areas and settings.

Also related is the work of Manacorda and Tesei (in press) and Christensen and Garfias (2018), who evaluate the impact of cell phone access on protests in Africa and a panel of

[2] An exception is Enikolopov, Petrova, and Sonin (2018), who study the impact of blog posts about state-controlled companies on the companies' stock returns and management turnover.

countries, respectively; both studies find a positive effect.[3] Like social media, cell phones provide access to information and connect individuals (smartphones also connect to the Internet and online social networks), but their impact can also reflect broader influences.

To the best of our knowledge, our study is the first to offer convincing quantitative evidence of the causal effect of social media on protests on a global scale.[4] Our focus on the role of Facebook, the largest social media platform in the world, allows us to examine how generalized these potential effects are *and* the conditions under which they are more likely to occur. Also, since we complement the protest count analysis with individual reports on protest participation, we look directly at who responds more to Facebook, and whether it crowds out other activities or influences other individual behaviors.

Our results complement an extensive literature on online social networks' content and activity to evaluate the role that platforms like Twitter and Facebook play during protest events. Much of this literature focuses on explaining online behavior during protest events (Segerberg & Bennett, 2011; Munger, Bonneau, Jost, Nagler, & Tucker, 2016; González-Bailón, Borge-Holthoefer, Rivero, & Moreno, 2011). Other studies also rely on surveys of participants to show that they learn about the protests and are encouraged to participate by information gathered through these networks, either directly or indirectly via friends. Evidence from Turkey, Ukraine, Occupy Wall Street, Chile, and Tahir Square (e.g., Jost et al., 2018; Tufekci & Wilson, 2012; J. Tucker et al., 2015; Valenzuela, Arriagada, & Scherman, 2012; Valenzuela, 2013) reveals that Twitter and Facebook are used to share information on key logistical issues (ranging from carpools to protest sites to advice on counteracting the effects of tear gas), to disseminate motivational appeals emphasized in social psychological theories of protest participation (shared interests, a sense of injustice or grievance, and social identification), and to publicize visuals from the demonstrations.[5] Steinert-Threlkeld, Mocanu, Vespignani, and Fowler (2015) also show, for 16 countries during the Arab Spring

[3] Pierskalla and Hollenbach (2013) look at the relationship between cell phone coverage and violence in Africa. Müller and Schwarz exploit Facebook and Internet outages (Müller & Schwarz, 2019a) and the rise of Donald Trump together with Twitter usage (Müller & Schwarz, 2019b) to show that social media increases hate crimes in Germany and the US, respectively. Bursztyn, Egorov, Enikolopov, and Petrova (2019) also find that social media influences the rate of hate crimes in Russia.

[4] Guriev, Melnikov, and Zhuravskaya (2019) show that increased access to 3G networks reduced government approval in a sample of 116 countries and, in European democracies, the vote shares of anti-establishment populist parties.

[5] One paper that goes beyond documenting the uses of social networks to evaluate their impact is Larson, Nagler, Ronen, and Tucker (2019), who collect data on Twitter activity during the 2015 Charlie Hebdo protests in Paris, recording both real-world protest attendance and social network structure. They show that the protesters are significantly more connected to one another relative to comparable Twitter users. By shaping these connections, online social network structures influence offline protest participation.

uprising, that coordination via Twitter messages using specific hashtags correlates with increased protests the following day. Acemoglu, Hassan, and Tahoun (2017) find that Twitter activity predicts the Tahrir Square protests, and Qin, Strömberg, and Wu (2017) find that the penetration of China's microblogging platform Sina Weibo is correlated with the incidence of collective action events.

While these are not necessarily causal correlations, they illuminate potential channels of influence that might underlie our results; that is, this research sheds light on *how* social media influences collective action. However, these studies are not designed to determine how much additional protest activity can be attributed to these tools. Indeed, if online social networks had not been available, protestors might have used traditional ways to coordinate and communicate. Global Positioning System (GPS) devices and applications provide a useful analogy. Do people drive more since the appearance of apps like Waze, which track their location and suggest a route? Probably. But many journeys would likely have occurred without the technology. So, while there is little doubt that people use Twitter and Facebook during protests, it is less clear that these technologies increase the number protests, and if so, how important this effect is.

Our goal is more ambitious than prior research that has documented social media use during protests in that we attempt to estimate the net effect of greater Facebook accessibility. This naturally has a cost: to tease out the underlying mechanisms, there are limitations on how much we can do by relying on our specific source of variation and data for a large set of countries. Nevertheless, some of our findings suggest the importance of certain mechanisms and help inform theories of collective action and protest participation, as well as the related debate regarding whether social media has a positive or negative average net effect on collective action. In a famous magazine article, Gladwell (2010) argues that online social networks, which are based on "weak ties," are unlikely to promote – and can displace – costly offline action and commitment to successful protest movements. By contrast, recent research on information diffusion through online social networks highlights the potential *advantages* of the very decentralized and diffuse nature of organization (Bennett & Segerberg, 2012; Barberá et al., 2015), as well as possible complementarities between online and offline activities (Campante et al., 2017; Vaccari et al., 2015).[6] Several recent theories also argue that social media platforms increase the probability of political protests by facilitating collective action (Edmond, 2013; Little, 2016; Barbera & Jackson, 2017; Enikolopov et al., in press; Manacorda & Tesei, in press), both because they increase the spread of information that

[6]The potential strength of weak ties has been long recognized (Granovetter, 1973).

motivates protesters to take action and because they facilitate coordination between them. Our findings suggest that these advantages, on average, overshadow any possible negative impacts. Complementary findings also suggest that information (since we document larger effects in areas with less freedom of the press) and coordination (since the effects are stronger in places where the opposition has few other ways to organize) likely play a role.

Of course, the positive average impact of social media on collective action does not directly translate into positive social outcomes. While evaluating the normative consequences of the increase in collective action is beyond the scope of this paper, we briefly discuss this issue in the final discussion.

The rest of the paper proceeds as follows. Section 2 presents our data and empirical strategy. The results based on protest counts are reported in Section 3 and those using individual reports in Section 4. Section 5 concludes with a final discussion of our results and implications.

2 Data sources and empirical strategy

2.1 Data

To measure protests at the national and subnational levels, we use several variables from the Global Database of Events, Language and Tone (GDELT), which records six types of collective action events on a daily basis using news reports from a variety of sources.[7] The types of protest are: engagement in political dissent, demonstrations or rallies, hunger strikes, strikes or boycotts, obstruction of passages or blockades, and violent protests or riots. Using this dataset, we aggregate the number of total protest events per month in each country or region. Importantly, since Facebook may facilitate information flows or news reporting, we emphasize that a protest refers to a single event record (coded with a globally unique identifier number in the dataset) even if there are multiple reports of the event. Our results are also robust to more demanding de-duplication strategies.

To construct our main independent variable, we coded the dates up until March 2016 when Facebook was released in all 81 distinct languages in which it is available (including beta versions).[8] Launch dates for each Facebook interface were determined through Google

[7] This section describes the main data and variables in our analysis. Appendix Table A-1 describes all our variables.

[8] Facebook reported 91 different platforms, but this includes minor variations such as US vs. UK English

searches for news announcing the release. Dates for relatively uncommon languages were found in specialized blogs. In the 24 cases for which both options failed, we relied on the first crawl from the Internet Archive (https://archive.org/index.php) to identify the initial date when the corresponding webpage (e.g. https://mk-mk.facebook.com/ for Facebook in Macedonian) was created.[9]

Information on the official languages spoken in each country comes from the World Language Mapping System (WLMS, version 16). This source provides the aggregate number of speakers by country and language, as well as polygons within countries where each language is spoken. For the 12 countries (listed in Table A-1) without data, we complete the information using WLMS's original source, Ethnologue. Some polygons in the WLMS intersect, creating areas we refer to as *overlapping zones* where more than one language is spoken. Only 5% of protests fall in these zones, which we exclude from the baseline analysis. Our results are virtually the same if we include these areas and infer language shares using national totals and grid-level population figures from the Socioeconomic Data and Applications Center (SEDAC).

To illustrate the variation we exploit, Figure 1 shows the fraction of people that speak Mandarin, English, Spanish, and German as their first language across the globe. The map illustrates, for instance, that when Facebook was launched in Spanish, most of Latin America, except Brazil, and Spain experienced a large increase in potential access to the platform. However, other countries like the US, UK, and others in Europe also gained some access.

Our sample includes 240 countries and non-sovereign territories for the period January 2000 to December 2015.[10] The subnational-level regressions rely on language polygons within countries as units of analysis (and robustness tests show similar results when using political–administrative divisions).

For the individual-level estimations, we collect data from three surveys reporting protest participation and the language spoken by the respondent – the WVS, ESS, and AB. In this analysis, protest activity is based on direct individual reports rather than media sources.

Facebook does not publicly disclose the number of users at the country-month level. However, we combine a variety of sources, including the platform's own partial reports and

and Spanish from Spain versus Latin America).

[9] Appendix Table A-2 lists all language-specific platforms and the source for coding the dates of entry.

[10] Some non-sovereign territories have independent data for our main dependent and independent variables (Appendix A.2 lists the full set of countries and non-sovereign territories in the sample). We use the term 'countries' for simplicity. Our results are similar when we restrict the analysis to sovereign territories.

figures from secondary sources, to construct an unbalanced country-month panel containing Facebook users' information for a subset of our sample. We use search interest in Facebook as calculated by Google Trends as another measure of Facebook use. We show that, where data is available, "Facebook users" and "Facebook searches" are very strongly and significantly correlated.

"Facebook searches" offer two main advantages relative to "Facebook users". First, the former is available for a larger sample of countries. Second, since some Facebook users subscribe to the platform but are either "fake" or do not actively participate,[11] search interest more accurately captures interest and activity in the social network. The main disadvantage, in theory, is that some Facebook searches may have little to do with activity in the network. For instance, when people search for information on the company's stock price, or are curious about its founder, or are looking for an employment opportunity in the company, etc. However, this is a negligible problem in practice.[12]

2.2 Identification strategy

There are two main empirical challenges when studying the effect of social media on various forms of collective action: omitted variables and reverse causality. The sign of the bias is not easy to determine *a priori*. Social media outlets such as Facebook or Twitter are available globally and thus variation in access is largely driven by Internet access rates, which confounds other country characteristics such as wealth, education or infrastructure. Areas with more social media activity may be more prosperous and democratic and experience less

[11] Facebook reports that only 65% of monthly active users are daily active users (see https://investor.fb.com/investor-news/press-release-details/2016/Facebook-Reports-Fourth-Quarter-and-Full-Year-2015-Results/default.aspx). The platform took down 2.2 billion fake accounts in the first three months of 2019, roughly equivalent to the total number of monthly active users it claims to have (see https://www.vox.com/recode/2019/5/23/18637596/facebook-fake-accounts-transparency-mark-zuckerberg-report and https://investor.fb.com/investor-news/press-release-details/2019/Facebook-Reports-First-Quarter-2019-Results/default.aspx).

[12] Information from Google Trends shows that the top 25 "related queries" concern access to the platform. "Facebook login" is the most common search query, followed by equivalents of facebook login in other languages ("facebook entrar," "iniciar facebook," and "iniciar sesion facebook," which have 35%, 35% and 30% as many queries as "facebook login," respectively), and the following terms that again indicate interest in logging into Facebook or using its tools (all with 5% as many queries as "facebook login"): "facebook español," "facebook login in facebook," "facebook login in," "facebook download," "my facebook," "entrar no facebook," "facebook com," "facebook lite," "facebook en español," "facebook sign in," "www facebook," "free facebook," "mi facebook," "facebook messenger," and "facebook log in." The final seven still relate to Facebook access, and are consulted less than 1% as much as "facebook login": "facebook live," "facebook app," "facebook mobile," "login to facebook," "iniciar sesion en facebook," and "facebook belépés". These numbers are from a Google search query conducted on September 26, 2017.

citizen discontent and fewer demonstrations, or people could be drawn to the Internet and social networks where social capital and collective organizations are stronger, which in turn may correlate with more citizen demonstrations. Also, some countries may restrict access to social media.[13] In this case, a naive comparison of countries with high and low levels of access to social media may confound the (positive or negative) effect of state censorship on collective action with the effect of access to social media. Also, as noted in the introduction, we cannot rule out the possibility that reverse causality causes a positive bias.

We propose using Facebook's release in a given language as an exogenous source of variation in access to social media. We estimate the following two-way fixed-effects regression for protests in a panel of countries using monthly observations:

$$\text{Protests}_{ct} = \beta \times \text{Facebook Speakers}_{ct} + \mathbf{Z}'_{ct}\psi + \gamma_c \times f(t) + \gamma_c + \delta_t + \varepsilon_{ct}, \tag{1}$$

where γ_c are country fixed effects and δ_t time (month) fixed effects that partial out any global trends in collective action. We also allow linear (or quadratic) country-specific time trends $\gamma_c \times f(t)$ to recognize that countries may be on differential protest trends that would have been observed even without the new Facebook interfaces. $\mathbf{Z}'_{ct}$ is a vector of additional controls that always includes initial population interacted with time dummies in order to allow for scale effects. In robustness exercises we include additional baseline variables interacted with time dummies, to permit flexible differential trends based on country features.

Our main independent variable, $\text{Facebook Speakers}_{ct}$, captures the share of each country's population that can access the platform in their first language. To compute it, we interact Facebook_{tl}, which indicates whether a Facebook version in language l exists at time t, with Speakers_{cl}, the share of the population in country c that speaks language l. More formally:

$$\text{Facebook Speakers}_{ct} = \left(\sum_l \text{Facebook}_{tl} \times \text{Speakers}_{cl} \right). \tag{2}$$

This variable equals zero if either Facebook has not been released or if it has only been released in languages l not spoken in country c.[14] Once Facebook appears in a language spoken in country c, Speakers equals the share of the population that speaks this language.

[13] King, Pan, and Roberts (2013, 2014) show that in China, censorship silences information on collective action, but allows criticism of the state – likely in an effort to collect information on government performance.

[14] Notice that the time and country fixed effects absorb direct effects in the interaction defining Speakers.

Moreover, there is an additional "treatment" in country c every time Facebook is released in the first language of at least a fraction of the population.

Speakers_{cl} refers to the share of people in country c that speak l as their first language. There may be individuals who also understand l as a second or third language, but data for second languages is unavailable in the WLMS. We thus focus on variation in access stemming from main language availability in our baseline regressions. Also note that even though multilingual individuals may access the platform before it is released in their first language, they may still use it more when this occurs because they likely have new peers (friends, relatives, companies, politicians) to interact with for whom the language barrier is relevant.

In short, Facebook Speakers measures the share of people that can potentially benefit from increased access to Facebook as the new language platforms are launched. For instance, in Canada this variable is 59.6% when Facebook was first launched (in English), 61.4% when released in Spanish, and 83% when launched in French.

Our identification assumption is that, absent the release of these language-specific platforms, countries with different proportions of speakers of the corresponding languages would have observed similar collective action trends. It is plausible that the timing of these releases is orthogonal to political developments, and in particular collective action episodes, in countries, regions and people who speak the corresponding language. For example, the introduction of Facebook in French probably does not depend on political developments in French-speaking countries as diverse as France and Cote d'Ivoire. Also, our regression framework takes into account any time-invariant country characteristics (absorbed by the country fixed effects), plus country-specific temporal trends. Only trends that would have differentially affected places with comparably more speakers of a given language *and* that are not well captured by this country-specific (linear or quadratic) trend could contaminate our results. As we show below, we perform a number of robustness tests to determine whether our findings reflect the influence of omitted variables (differential trends that would have been observed even without the new Facebook interfaces) or reverse causality (targeting of Facebook interfaces to languages spoken in countries where demand for protests was on the rise).

We also exploit within-country variation in regressions where, unlike the national-level regressions, we can control for a full set of country $\times$ time fixed effects. This relaxes the identification assumption and examines whether Facebook platforms in a given language increase collective action in regions where people can interpret that language compared to

other areas *in the same country* where they cannot. For region j in country c at time (month) t, we estimate:

$$\text{Protests}_{cjt} = \beta \times \text{Facebook Speakers}_{cjt} + \mathbf{Z}'_{cjt}\psi + \gamma_c \times \delta_t + \omega_j + \varepsilon_{cjt}, \tag{3}$$

where ω_j are region fixed effects and $\gamma_c \times \delta_t$ are fixed effects for each country and month. As in equation (1), $\mathbf{Z}_{cjt}$ includes the initial population of region j interacted with month fixed effects and other controls. Similar to equation (2), our main independent variable is defined as:

$$\text{Facebook Speakers}_{cjt} = \left(\sum_l \text{Facebook}_{tl} \times \text{Speakers}_{cjl} \right),$$

where $Speakers_{cjl}$ is the share of people in region j of country c that speaks language l (which is either 0 or 1 except in areas where more than one main language is reported by the WLMS).

Finally, our individual-level regressions take the following form, for individual i in country c responding the survey at time (year) t:

$$\text{Protest}_{cit} = \beta \times \text{Facebook Speaker}_{cit} + \mathbf{Z}'_{cit}\psi + \gamma_c \times \delta_t + \gamma_c \times \ell_i + \varepsilon_{cit} \tag{4}$$

where protest is now a dummy variable that equals 1 if the individual reports participating in protests and Facebook Speaker$_{cit}$ is a dummy variable that equals 1 if Facebook is already available in individual i's main language. Also, in addition to country-specific flexible time trends, we include in this specification language fixed effects (ℓ_i) and their interaction with country fixed effects, to allow for potential differential participation in collective action activities by individuals with specific linguistic backgrounds within a polity. Finally, $\mathbf{Z}_{cit}$ now denotes individual controls.

Since standard errors may be underestimated by the temporal and spatial correlations (Bertrand, Duflo, & Mullainathan, 2004), we use two-way clustered standard errors at the country and month (year, in the case of individual data) levels.

To illustrate the variation we use to estimate the impact of Facebook, Panel A of Figure 2 shows (on the left-hand vertical axis) the number of Facebook language-specific platforms that have been launched since the English version was made available in 2006. From 2007

to 2011, Facebook had its largest language expansion, accumulating 62 additional versions. The number of versions remained relatively stable from 2012 to 2014, and 16 new platforms were launched from 2014 to 2015. The right-hand vertical axis measures the average country-level value of Facebook Speakers. Panel B displays the share of Facebook Speakers in our individual-level data, by survey wave. The share of speakers increases as new versions are launched, and it is clear that the languages launched earlier have, on average, a stronger impact on the number of speakers than those launched later. Nevertheless, even later languages create meaningful variation because in some regions within countries, and in some waves and places in the survey data, a significant share of the population speaks those languages.

2.3 Event study, parallel trends and endogenous translation

Before discussing our main results, we present exercises that help illustrate the variation in our dataset and validate our approach. We first illustrate the change in the number of protests once Facebook Speakers increase using an event study approach. We keep observations that experience an increase in Facebook Speakers and a study window of eight 6-month periods around this increase or "event." We then run a regression for the (log of) protests on unit and period (semester) $\times$ country fixed effects (excluding the period just before the hike in the number of Speakers). Figure 3 shows the coefficients on period dummies; negative numbers on the horizontal axis indicate periods before the increase, and positive numbers those following the event. The figure reveals no change in protests before the increase in Speakers caused by a new language-specific platform. Two periods after the event, the change in protests is already positive and statistically significant; the effect increases gradually and levels out at around 0.3 (approximately a 30% change) five periods after the increase.

This magnitude is roughly in line with the full difference-in-differences approach presented below. The lack of any substantial changes in the number of protests before a hike in Facebook Speakers also supports our argument. We present additional exercises to further validate our identification assumption. First, if our assumptions hold, we should not observe differential trends in collective action in countries with and without increased Facebook access in their languages *before* these language-specific platforms are launched. Panel A of Figure 4 confirms that this is indeed the case. This figure extends our baseline regression (1) to include anticipation effects (leads) of our treatment variable (Facebook Speakers$_{c,t+n}$, for n ranging from 1–18 months). While the treatment effect (lead zero) is positive and sig-

nificant, other leads are not significantly different from zero, are typically smaller than the treatment, and follow no discernible pattern. Moreover, the conclusions are similar when we use Facebook search intensity in Google (Facebook Searches) as the dependent variable in Panel B: there is no increase in Facebook interest before Facebook Speakers increase.[15] While we do not have sufficient variation or complete month-of-interview information to perform this exercise monthly with our individual data, Panel C explores the same parallel-trends exercise with yearly leads in the survey data. Again, years before a Facebook platform becomes available in a respondent's language, we see no difference in collective action. Placebo treatments for anticipation effects one, two, three and up to 6 years are consistently not statistically significant and smaller in magnitude than the treatment effect.

These parallel trends in the media-based and survey data before Facebook versions become available support our identification assumption. However, Facebook platforms are not randomly assigned. Facebook translations are partly carried out by Facebook users who voluntarily translate phrases on the website. Others then vote on the preferred translations, and a platform is launched when sufficient phrases have been tested and approved. It could therefore be the case that users from certain "protest-prone" countries are more likely to contribute to the translations, hoping that a local platform will be launched sooner (perhaps to organize protests). If this were the case, it would invalidate our identification assumption.

Our parallel-trends results suggest this is unlikely, since in this case one would expect at least some anticipated action in protests (and certainly in Facebook search interest) before the translations started. Furthermore, we confirm in Appendix Table A-3 that (previous) protest activity does not predict Facebook translations.[16] Finally, in robustness checks reported below, we show that our results are not sensitive to removing countries that might have induced the arrival of Facebook's language-specific platforms. This set of results sup-

[15] In Appendix Figure A-1 we follow a slightly different approach and include, in regression (1), quarter dummies for the periods leading up to the adoption of the first Facebook version in any of the country's languages. The coefficients of these quarterly dummies are marked with negative integers in the x-axis. We also include Facebook Speakers but, to gauge the timing of the effects, interact it with quarterly dummies for each quarter after the first adoption of a Facebook platform in a language spoken in the territory (and plot the coefficients of the positive integers in the horizontal axis). Again, there is no increase in protests (Panel A) or Facebook Searches (Panel B) before local languages are available. Point estimates are statistically insignificant and close to zero. Instead, as soon as a local language becomes available, we see a sizable increase in protests and searches, and though there is naturally noise when estimating this high-frequency effect, even the quarterly effects become individually significant after just a few quarters.

[16] To conduct this exercise, we created Facebook profiles in each of the languages in our sample to access information on top translators by language. We then coded each translator's location and counted the frequency of translations from each country and language. Details on the data construction and a discussion of these results are in Appendix A.3.

ports our identification assumption and the causal interpretation of our findings.

3 Results from protest counts

We first present the results using GDELT's measures of collective action. The dependent variable is the natural logarithm of the number of protests (plus one, to allow for zero values). This transformation reduces the skewness when protests are measured in levels, which is 21.8 at the country level with a standard deviation around 6 times as large as the mean. Descriptive statistics for the main variables in the country-level analysis are in Table 1.[17] We focus on linear estimators because they are consistent under comparably weaker assumptions and more flexibly admit fixed effects and clustering of the standard errors (Cameron & Trivedi, 2015). There are protests in 68% of our country-months; demonstrations are the most frequent types of protest, on average, and hunger strikes the least common.

3.1 The effect of Facebook Speakers on protests and Facebook use

Table 2 reports our baseline estimation of equation (1) for protests at the country-month level. All panels in this table follow the same structure. Column 1 includes linear country-specific trends and column 2 instead uses a quadratic polynomial. Column 3 runs the same specification as in column 2, but restricts attention to the sample of countries for which we have complete data on a set of pre-determined covariates. This facilitates comparison with column 4, which interacts time fixed effects with these controls, allowing for fully flexible temporal patterns in collective action as a function of these characteristics.[18]

The estimates in Panel A show that an increase in Facebook Speakers increases protests and that this effect is very robust and stable across specifications. The coefficient for Facebook Speakers ranges from 0.22 to 0.27 and is significant at more than the 99% level. The stability of the effect across these specifications suggests that Facebook Speakers is respon-

[17] In Table A-10, we also report the main results using the increasingly popular inverse hyperbolic sine (or arcsinh) transformation which retains zero values and approximates the natural logarithm of the variable. Both, the $log(1+y)$ and arcsinh transformation allow to interpret coefficients as semi-elasticities, but this interpretation is only valid when y is large enough. Bellemare and Wichman (in press) suggest directly deriving elasticities analytically for each regression specification and their standard errors (using the delta method) to calculate exact values. In our application, the coefficients we report imply very similar magnitudes to those using the exact formula, and regressions with $\log(1+y)$ or $\text{arcsinh}(y)$ are very similar to each other. Nevertheless, when presenting the main results, we show the implied exact magnitudes as well for reference.

[18] Covariates included are: initial GDP and share of GDP per capita in manufacturing, population, share of population aged 15–24, Internet users and language polarization.

sible for increasing protests, and that other omitted factors are not creating differential trends.

Considering the size of the effect in column 2 (our benchmark specification for what follows since it is the most demanding one with the full available sample), the coefficient of 0.221 implies a nearly 22% increase in protests when Facebook Speakers increases from 0 to 100%. This approximation is almost identical to the implied magnitude with the exact formula (see footnote 17), which is also reported in the lower row of the panel. Such a large increase in Facebook Speakers at the country level is uncommon; a one-standard-deviation increase (0.34) implies roughly a 7.5% increase.

To further illustrate the magnitude of this impact, Panel A in Figure 5 plots the observed total number of protests together with the corresponding quantity implied by our estimates assuming no version of Facebook had ever been launched (that is, imposing zero Facebook Speakers throughout). The figure also plots the cumulative difference since Facebook's launch in September 2006 between protests with and without Facebook (expressed as the percent of total cumulative protests without Facebook up to each time period). The calculations imply that, had it not been for Facebook, there would have been close to 14% fewer protests around the world during our study period.

These estimates presume that Facebook availability in local languages increases collective action via an increase in Facebook use. Precisely establishing this key mediating channel is not simple given the lack of consistent Facebook user data (especially for a large sample of countries and at a high frequency). However, as discussed in the Data section, search interest related to Facebook in Google is a good proxy for Facebook use and is available at the country-month level. Therefore, in Panel B of Table 2 we estimate the same specifications as in Panel A with Facebook Searches as the dependent variable. The results show a clear increase in Google searches for Facebook when Facebook Speakers increase. The coefficient for Facebook Speakers ranges from 0.07 to 0.09 and is precisely estimated, significant at more than the 99% level. These estimations demonstrate the relevance of the proposed mechanism: Facebook availability in a local language strongly increases use of the platform. For further confirmation of this conclusion and validation of the Facebook Searches variable, Panels C and D use the (unbalanced) panel of Facebook users that we compiled using various sources (see Appendix Table A-1).[19] Panel C presents the regressions of Facebook Searches on Facebook Users, confirming that Facebook search interest strongly correlates with the

[19]In these panels with a more limited sample, there is no difference between columns 2 and 3 since we have covariates for all countries with Facebook user data.

number of users. Panel D examines whether Facebook Speakers increases Facebook Users, and again find a robust positive and significant correlation in every specification (even if the magnitude of the coefficient of Facebook Speakers is somewhat more sensitive with this more limited sample than in Panel B).

Appendix Table A-4 presents two-stage least-squares estimates of the effect of Facebook Searches on protests, instrumenting searches with Facebook Speakers (the first stage is column 2 of Panel B in Table 2, with an F-statistic of 15.52). The coefficient on Facebook Searches (2.65 with standard error 1.08) is positive and significant at the 95% confidence level. A one-standard-deviation increase in Facebook use as captured by searches implies close to one-third of a standard deviation increase in protests ($2.65 \times 0.24/1.88 = 0.33$).[20] For comparison, the table also shows the corresponding ordinary least squares (OLS) relationship between protests and Facebook searches, which is also positive and statistically significant, but appreciably smaller (coefficient 0.54, standard error 0.14). This could mean that the sources of negative bias in OLS estimations discussed above are empirically more important than those leading to a positive bias. Probably more important, although Facebook Searches captures Facebook interest and use, it measures with considerable error the amount of time and intensity of interactions by users in the platform. Thus, attenuation bias likely also explains part of the gap between the OLS and IV estimates.

We focus on the "reduced-form" relationship between protests and Facebook Speakers in what follows both for simplicity and, more importantly, because we can run comparable regressions at the subnational and individual levels (where we have no good proxy for Facebook use).

Also, before presenting more substantive findings, we briefly mention one important robustness test. Even though the parallel-trend analysis and the lack of association between

[20] For reference, comparing the magnitudes of our findings with those in Enikolopov et al. (in press) suggests smaller impacts on protests than in their setting, while our speakers variable is at least as relevant for Facebook use as their instrument is for VK use. Since treatment and outcome variables are measured differently, for comparison consider the implied standardized effects or "β-coefficients" (how many standard deviations each dependent variable changes per standard deviation increase in the treatment variable). Our estimate of 0.22 for Facebook Speakers in column 2 of Panel A in Table 2 implies a standardized effect of 0.04 ($(0.22 \times 0.34)/1.88$), which is smaller than the 0.096 standardized effect of Enikolopov et al.'s instrument on (log of one plus) protesters in Russia (coefficient 0.259, column 6, Table 2). Also, our instrumental variable (IV) estimates in Appendix Table A-4 for the effect of Facebook Searches on protests is 0.33, while Enikolopov et al. (in press) find that a one-standard-deviation increase in VK users increases (log of one plus) protesters by 1.2 standard deviations (coefficient 1.787 in column 2 of Table 3). The first-stage relation between their instrument and VK has a standardized effect of 0.08, while a one-standard-deviation increase in Facebook Speakers increases Facebook Searches by 0.11 standard deviations (using column 2 of Panel B in Table 2, $(0.083 \times 0.34)/0.24$).

collective action events and translation activity by Facebook users (reviewed in section 2.3) suggest that reverse causality is unlikely to be driving our results, we further explore the concern that social changes, turmoil, modernization, increased openness, and other trends can drive a society to "demand" Facebook local platforms and simultaneously be more prone to protesting. In Panel A of Table 3, we show the baseline specification for subsamples that exclude territories that could plausibly influence the pace of adopting Facebook in a particular language. We drop countries with the largest number of people (column 1), GDP (column 2), Internet users (column 3) and protests (column 4) for each language, and similarly for the same variables measured in per capita terms in columns 5–7. We also use World Bank governance indicator data to drop those performing worst in the rule of law and control of corruption (columns 8 and 9). Panel B in the table presents the same exercise, restricting the set of languages used to drop countries to those available in the platform (since these drive the variation in Facebook Speakers).[21]

The exercise is motivated by the idea that, for instance, Facebook may be launched in Portuguese to meet Brazil's or Portugal's demands, but it is less likely to respond to the political and social situation in a smaller Portuguese-speaking country (by population, income, and Internet users) like Cape Verde. Also, even small but very conflict-prone countries may drive the introduction of Facebook. Nevertheless, the results are maintained, and if anything strengthened, suggesting that Facebook's release in new languages is not driven by a rise in demand for social networks in large countries or those with increasing protest activity or political turmoil.[22]

In short, the impact we document is a widespread phenomenon, relevant to the world as

[21] Appendix Table A-5 reports similar results when excluding countries with the most Facebook Speakers (and Facebook Speakers per capita) by language, and those with the worst performance using additional governance indicators (voice and accountability, political stability, government effectiveness, and regulatory quality).

[22] Appendix Figure A-2 shows that our results are not sensitive to excluding different clusters of countries, by subregion (Panel A), continent (Panel B), or former colonies of the main colonial powers (Panel C). Panel D addresses the concern that single-country languages are driving our effects. Indeed, if a Facebook platform will benefit just one (or very few) countries, then it is more likely that circumstances in that country or groups of countries drive the arrival of Facebook. On the x-axis, we exclude the set of languages "spoken" (as the main, most-spoken language) in 1, 2, 3, 4 countries and so on. Again, the effect of Facebook Speakers varies only slightly and is always statistically significant. Finally, Panel A in Appendix Figure A-3 reaches the same conclusion when excluding one country at a time and the set of Arab Spring countries. Similarly, Panel B in Figure A-3 shows that the effect survives when dropping one language at a time. Even the largest drop in the effect when removing one language (English) is modest. That English matters most is reasonable not just because the marginal impact of additional language-specific platforms is likely to be smaller than the original appearance of the network, but also because in a large number of countries non-negligible shares of the population speak English as their first language (recall Figure 2).

a whole. It is not likely because a demand-driven increase in Facebook spuriously correlates with (but does not cause) protests.

3.2 Heterogenous effects with national characteristics

Overall, these results provide compelling evidence that Facebook has a causal effect on citizens' protests. Table 4 examines the heterogeneous effects of particular country characteristics to better understand both the mechanisms at play and the additional implications of our findings. We start with a simple reality check in column 1 of Panel A: Facebook's release in a language spoken by a significant share of people in a country should have larger impacts in countries with more Internet users. As with other interactions with variables that Facebook might influence, we measure Internet users before Facebook appeared in order to avoid a "bad control" bias (Angrist & Pischke, 2008). As expected, Facebook Speakers increases protests more in places with more initial Internet users.[23] A one-standard-deviation increase in Internet users increases the baseline effect by around 32%.

Columns 2 and 3 analyze the likely nature of the protests and the relationship with political accountability. A rise in the number of Facebook Speakers increase protests more where there is no freedom of assembly or association (column 2) and where no oppositional activity is permitted (column 3). These findings suggest that Facebook plays a coordinating role where the opposition is otherwise curtailed, which empowers citizens in places with poor political accountability (we return to this in more detail below).

Poor economic conditions might also trigger discontent and reduce the opportunity cost of protesting. Indeed, column 4 shows that the effects are stronger when GDP growth is weak.[24] This finding is in line with the evidence of the effects of mobile phones in Manacorda and Tesei (in press), except we find that Facebook matters in economic downturns *and* "normal" times. In column 5 we search for differential effects during election months, when there is increased attention to political developments. While there are indeed more protests in election than in non-election months, Facebook access does not exacerbate this difference, and the interaction coefficient is negative.[25] One possible reason is that organizational capacities are already

[23] With the exception of categorical variables, other variables interacted with Facebook Speakers in this table are standardized to ease interpretation of the magnitudes. In column 1, initial population is also interacted with Facebook Speakers to account for mechanical effects due to a correlation between population and Internet users (this does not make a difference, however, and population does not play a major role in creating a differential effect).

[24] The results are similar for per capita GDP growth.

[25] We also experimented with months preceding or immediately following elections, and find similar results.

deployed around elections, so Facebook's additional contribution may be slimmer than in "normal" times.

Facebook may matter because it motivates collective mobilizations in countries where protests have traditionally been scarce, or because it increases protest activity in polities with a tradition to mobilize. In column 6 we interact Facebook Speakers with historical protests and find that countries with traditionally more protests react comparably more: a one-standard deviation increase in historical protests nearly duplicates the baseline effect.

Panel B of the table examines some common determinants of collective action and social strife. A vast literature has documented a positive relationship between education and various forms of political participation, including protests (see, e.g. Campante & Chor, 2012, 2014). Column 1 interacts with average initial years of schooling (for those over age 15), and finds that increased Facebook access has a larger effect in more educated countries.

Ethnic, religious and linguistic diversity has been linked both theoretically and empirically to collective action, social capital, and conflict (see, among others, Esteban & Ray, 1994; Alesina, Baqir, & Easterly, 1999; Montalvo & Reynal-Querol, 2005b, 2005a; Esteban & Ray, 2008). In columns 2 and 3, we interact Facebook Speakers with linguistic diversity, examining both fragmentation and polarization given disputes regarding which is the relevant measure of diversity for particular outcomes. We focus on linguistic diversity since we can measure it directly with WLMS for our full sample, and find no evidence that either index exacerbates the impact of Facebook Speakers.

Together with ethnic tensions, natural resources also stand out as a salient potential determinant of conflict (for a review, see M. L. Ross, 2004). In columns 4 to 6, we focus on diamond production per capita and oil reserves (from Humphreys, 2005) and oil and gas rents per capita (from M. Ross, 2008).[26] In this case, we find consistent evidence that Facebook Speakers increase protests more in countries with more resource rents. The magnitude is also important. A one-standard-deviation increase in diamond production, oil reserves, or oil and gas rents per capita increases the baseline effect of Facebook Speakers by 46%, 15%, and 68%, respectively.

Finally, there is a long-standing debate on whether denser urban populations contribute to more social unrest, as mobilization is both easier to coordinate and potentially more effective at bringing about change in urban areas (e.g. Weiner, 1967; Traugott, 1995; DiPasquale

[26] Though the share of natural resource exports is commonly used as a measure of resource abundance, it is a poor measure of relevant rents when there is high local consumption, when extraction costs vary, and if countries have endogenously low non-resource exports (see M. Ross, 2006; Acemoglu, Fergusson, & Johnson, in press).

& Glaeser, 1998; Nash, 2009; Wallace, 2014; Glaeser & Steinberg, 2017; Campante, Do, & Guimaraes, 2019). In column 7 we observe that initial urban population increases the impact of Facebook Speakers (coefficient 0.16, standard error 0.08, significant at the 90% confidence level).

The role of the quality of democratic institutions deserves a deeper look. In Figure 6, we explore differential effects using the more commonly employed indicators of democratic accountability and governance: the Freedom House indices for political rights (Panel A), civil liberties (Panel B), and the combined index (Panel C); the Freedom Press index combining press pluralism, media independence, censorship, legislative framework, transparency, infrastructure, and abuses against journalists (Panel D); Polity IV's democracy index (Panel E); and the World Bank's governance indicators for voice and accountability (Panel F), regulatory quality (Panel G), rule of law (Panel H), and control of corruption (Panel I).[27] The figure plots the effect of Facebook Speakers on protests at different levels of these indicators. Since the Freedom House indices are constructed on a 7-point scale, we interact dummy variables for each level with Facebook Speakers and plot the coefficients. For the Freedom Press index, we use the categories "not free," "partially free," and "free". For the Polity IV and World Bank indices (ranging from -10 to 10 and -5 to 5, respectively), we divide the scales into three equal parts (low, intermediate and high) and plot the coefficients for these interactions.[28]

The figure produces a consistent U pattern, with the sole exception of control of corruption, which exhibits a negative monotonic relationship. That is, Facebook has stronger impacts on places that are either very democratic, free and well governed *or* very autocratic, authoritarian and poorly governed. One rationale for this is that very autocratic regimes have many grievances, so protests respond to Facebook Speakers despite limited opportunities for collective action. In very democratic areas, there is instead plenty of freedom to protest, so protests respond despite presumably fewer grievances.

[27] We exclude the World Bank's political stability and government effectiveness indices since these are mechanically correlated with citizen protests. In particular, government effectiveness considers citizens' satisfaction (or discontent) with several public goods and government services, as well as infrastructure disruption caused by strikes. Political stability also directly considers social unrest, as well as protest and riots.

[28] We use the levels of the indices (rather than dividing the sample by quantiles, for example) because they build on the conceptual framework used in each case to determine whether a country scores low or high in democracy and governance, irrespective of whether few or many countries are very democratic or functional.

3.3 Examining the language barrier

Our finding that having more Facebook Speakers in a given country increases Facebook use confirms that not having the platform in a local language is an important barrier to accessing the technology. But some individuals may overcome this barrier with their second language. In columns 1 and 2 of Table A-6 we first focus on the sample of former colonies and roughly approximate bilingualism with the language of the former colonizer: we run our baseline regression on a dummy variable ("Facebook Colonizer") that equals 1 if Facebook is in the colonizer's language. Column 2 then adds Facebook Speakers to the regression. The impact of Facebook Colonizer is small and not statistically significant, and the coefficient on Facebook Speakers is similar to the baseline even after controlling for colonizer language effects. Column 3 interacts both measures: the negative coefficient suggests a smaller effect of Facebook Speakers where people might access Facebook using a former colonizer's language, but the magnitude is small and the coefficient not significant.

Columns 4 and 5 then use data on second languages from Ethnologue to construct a variable for Facebook Second-Language Speakers, which captures the share of each country's population that can access a Facebook interface in a second language (it is constructed exactly the same as Facebook Speakers in equation (2), except Speakers_{cl} refers to the proportion of people in country c who speak language l as a second language). Confirming that availability in people's first language is the main barrier to access, we find that while positive, the impact of speaking a second language available in Facebook is small, not significant, and does not change the significance or magnitude of the main Facebook Speakers effect. The interaction term is also not relevant. One plausible reason is that people who are fluent in English and other major languages available in Facebook are not "marginal" Internet and social media users, and factors other than the language barrier determine their participation. Moreover, as noted before, even individuals who are fluent in a second language already on Facebook may respond to a local language arriving on Facebook since this enriches their network of interactions (with friends, politicians, businesses, etc. that enter the platform then).

There could also be spillover effects on protests by people speaking languages that are close enough to a language already in a Facebook platform (for instance, the Facebook English platform is more likely to be understood by Welsh-speaking than Spanish-speaking people). If so, our baseline effects could underestimate Facebook's effects since some "non-treated" speakers could use this linguistically akin Facebook version and increase their protest participation.

To explore this hypothesis, we construct a similarity index for each pair of languages using the Automated Similarity Judgment Program. The index compares a list of 40 words and assesses their similarity across pairs of languages (Wichmann, Holman, & Brown, 2016).[29] In Appendix Figure A-4 we redefine Facebook Speakers as not simply those who have a Facebook version in their first language, but in any language that is at least $x\%$ as similar according to the index (measured in the horizontal axis). The vertical axis on the left measures the resulting coefficient for Facebook Speakers, and the vertical axis on the right the number of languages that are considered "treated" under each threshold (which obviously decreases as the similarity threshold increases). As expected, Facebook's impact is slightly larger when similar languages are considered treated, but the change is very small and the effect of Facebook Speakers is very stable regardless of the threshold used. Therefore, these potential spillovers do not appear to significantly bias our baseline estimates.

Another possibility is that if language is a barrier to accessing Facebook, the writing system might also keep some people away from the platform. To explore this idea, in Figure A-5 we break down the total effect of Facebook Speakers based on whether the language in question is also the first in the corresponding writing system. Thus, for instance, English was the first language in Latin, Arabic the first in Arabic, and Russian the first in Cyrillic (Spanish, Panjabi and Serbian came second in each of the writing systems, respectively). Though the coefficients are measured with considerable noise, the pattern is clear: the impact of Facebook Speakers is larger for the first language in the writing system, followed by the second, third and so on.

3.4 Subnational variation

Table 5 presents the results for the subnational-level regressions described in equation (3). In column 1 we look at total protests as the dependent variable. The coefficient for Facebook Speakers is, as with the national-level regressions, positive and precisely estimated (0.51 with standard error 0.08). The standardized effect implied by this coefficient is 0.14 ($(0.51 \times 0.18)/0.65$), which is larger than the 0.04 increase we find in the national-level regressions. To further compare the magnitudes, in Panel B of Figure 5 we replicate the counterfactual

[29] We follow Holman (2014), who points out that the best way to compute a similarity index for languages k and i involves three steps. First, computing the *Levenshtein Distance (LD)* for each word between both languages i and k (where LD is the minimum number of characters that must be replaced for one of them to be identical to the other). Second, normalizing LD for the maximum length of the word in both languages *(LDN)*. Finally, the pairwise similarity index is one minus the ratio between the average LDN between words with the same meaning and the average LDN between words with different meanings.

exercise we conducted using the national-level estimates. Again, we plot total observed protests and protests assuming Facebook was never launched (i.e., imposing zero Facebook Speakers throughout), and the resulting cumulative difference since Facebook first appeared. These calculations imply that Facebook accounts for close to 26% additional protests over our sample period (compared to 14% national-level estimates). This suggests national-level regressions may attenuate the effect by averaging regions that are heavily treated with those that are not when Facebook appears in a new local language.

In columns 2 to 7, we examine the impact on different types of protests (political dissent, demonstrations or rallies, hunger strikes, strikes or boycotts, obstruction of passages or blockades and violent protests or riots) (Schrodt, 2012). Facebook Speakers significantly increases all types of protests.[30] Thus, the subnational-level analysis reaffirms the very robust, positive, and generalized effect of Facebook access on protests. Moreover, since we are including fully flexible country-level temporal trends, these specifications relax our identification assumption and rely on more fine-grained variation than country-level regressions.[31]

To explore the possibility that reporting errors may be driving our findings (an issue that we examine in more detail below and probe with the individual-level regressions), we use data from the Armed Conflict Location & Event Data Project (ACLED). This is a public collection of political violence and protest data for Africa since 1997. Like GDELT, this database is daily and georeferenced. But it has been more widely used and, while also media based, its information is complemented with reports from nongovernmental organizations and "hand checked." Panel A in Figure A-6 shows the total number of protests reported in GDELT and ACLED for Africa since Facebook was originally released. While GDELT reports more protests, there is a strong correlation between the measures, with a correlation

[30] In similar regressions at the country level, Facebook Speakers is positive (and significant except for hunger strikes) for all types of protests except violent ones (with a small, negative coefficient), see Appendix Table A-7.

[31] In Appendix Table A-8 we present additional robustness checks. Column 2 shows that our results do not depend on our inferred population totals for polygons with more than one language reported in Ethnologue or "overlapping zones." Dropping these overlapping zones produces negligible changes in our baseline estimates. In columns 3 to 5, we confirm that the choice of the relevant subnational areas is not important for the findings by using administrative divisions and not just language polygons. These divisions are also appealing since they may be a relevant unit of analysis for political collective action. In column 3 we use the intersection of administrative divisions (the first level of administrative division, equivalent to US states) with language polygons as the unit of analysis. In column 4, we exploit this specification by incorporating month $\times$ state fixed effects, thus flexibly controlling even for subnational trends in collective action. In column 5, we use states as the level of analysis. In every specification we find that Facebook Speakers has a positive and significant impact on protests. The magnitude of the impacts, once we recognize the changing scales of our variables, is similar across most specifications (we report the beta coefficients in the lower row of the table).

coefficient of 88.12%.

Also, consistent with our findings so far, column 8 in Table 5 shows that Facebook Speakers increase (coefficient 0.24, standard error 0.14) ACLED protests. For comparison, column 9 uses GDELT just for Africa, and the coefficient is smaller (0.18). In Panel B of Figure A-6, we further compare the implied sizes by again conducting the counterfactual analysis assuming no Facebook Speakers and plotting the cumulative difference with observed protests. While GDELT predicts that Facebook explains just over 1% additional protests in our sample period, ACLED's estimates imply just over a 3% increase. Our finding that the implied effect is larger for ACLED reassures us that GDELT is not overestimating the effects due to reporting errors.

We focus on one important heterogeneous effect in Figure A-7. We interact Facebook Speakers with a full set of year fixed effects to explore whether its influence has decreased or increased over time. The figure plots the resulting coefficients and shows that Facebook has had an increasingly important effect on protests. This is relevant for three main reasons. First, it suggests that Facebook has consistently been important for collective mobilization until recently. Second, it shows that even though marginal languages entering late in the sample represent a small fraction of the world's population, their appearance on Facebook is nonetheless important for collective mobilization in regions where they are spoken. Finally, one concern with our results thus far could be that they were caused by the financial crisis of 2008, which coincides with Facebook's expansion – i.e., our effects might be spurious. Instead, we find that Facebook matters not just during the crisis years but also, and even more, much later on. Our earlier results revealed that protests occur not only during times of economic hardship, which also suggests an effect not confined to the crisis years.

Table 6 sheds some light on the nature of the protests that Facebook access promotes by looking at the different protest targets. Since target data is very incomplete (close to half of the sample has missing values), it is important to check whether missing data correlates with Facebook Speakers. In column 1 we run our baseline regression for an indicator variable on whether the protest target is known. Facebook Speakers have a negligible and not significant impact on reporting protest targets. In column 2, we restrict our sample to the 47.7% of protests with a known target and run our baseline specification, finding a coefficient very similar to our baseline. In columns 3–10 we run regressions where the dependent variable is protests against specific targets (in each column title under the protest target, we report how common each type is, expressed as a share of total protests with known targets).

Protests against the government are the most common category (25.4%), followed by

armed forces (15.2%). Other protests against regime actors, like the legislature (3.4%), are less common. Protests against civilians and the opposition are also relatively rare (6.7 and 4.7%, respectively). Nevertheless, protests against all actors respond to Facebook Speakers. Thus, while results showing increased opposition to the government, the army, or the legislature are consistent with the notion that Facebook is mostly promoting citizen empowerment against the government, the findings related to protests against the political opposition suggest that Facebook can also enhance the government's ability to organize rallies to attack the opposition.[32]

3.5 Additional results and robustness checks

We briefly discuss additional results and robustness checks; the results are presented in the Appendix. Table A-9 looks at other political outcomes aside from protests, in particular measures of conflict, regime change, democracy, and governance. Since most of these outcomes are measured annually, column 1 first verifies that at the yearly level we are still able to detect the positive impact of Facebook Speakers on protests. Also, even though we have fewer observations, the results are robust to allowing either linear (Panel A) or quadratic (Panel B) country-specific trends. We then examine measures of conflict in columns 2 to 4,[33] of regime change in columns 5 and 6,[34] of democracy in columns 7 to 9,[35] and of quality of governance indicators in columns 10 to 14.[36] Except for a decrease in civil conflict, we fail to detect statistically precise effects on other outcomes, likely because most of these variables tend to react more slowly and our strategy is best suited to capturing effects on variables

[32]Protests against business, labor, and the media (which is defined broadly to include journalists, newspapers, television stations, as well as providers of Internet services and other forms of mass information dissemination and therefore akin to businesses or public sector providers) also react to Facebook Speakers, even though they are relatively infrequent (less than 4% of protests with known targets in each case).

[33]Number of violent internal conflicts of any intensity (column 1), number of internal conflicts producing between 25 and 1,000 battle-related deaths in a given year (column 3), number of internal conflicts producing over 1,000 battle-related deaths in a given year (column 4).

[34]Number of successful, attempted, plotted, or alleged coup d'état events (a forceful seizure of executive authority and office that results in a change in the executive leadership and policies of the prior regime, column 5), the number of irregular removals from office, when the executive leader was removed in contravention of explicit rules and established conventions (column 6).

[35]Composite index of institutionalized democracy on a 0 (less democratic) to 10 (more democratic) scale (column 7), composite index of institutionalized autocracy on a 0 (less autocratic) to 10 (more autocratic) scale (column 8), combined freedom rating, average of Political Rights and Civil Liberties indices, on a 1 to 7 scale (column 9).

[36]On a scale of 0 (lowest rank) to 100 (highest rank): voice and accountability (column 10), government effectiveness (column 11), regulatory quality (column 12), rule of law (column 13), and control of corruption (column 14).

that might react quickly to greater Facebook access.

Table A-10 verifies that our results are not driven by outliers (column 1), and explores alternative transformations of the dependent variable (columns 2–6). Our estimates are very similar when we remove outliers (defined as observations with residuals in the upper or lower 2.5% of the distribution for our baseline specifications).[37] Column 2 shows, as expected given the average incidence of protests (see footnote 17), that the inverse hyperbolic sine transformation produces results that are close to our baseline choice of $\log(1 + protests)$. Column 3 examines the results for the extensive margin, running a simple linear probability model for the binary indicator of protests. The coefficient is positive in both the national- and subnational-level specifications (Panels A and B, respectively), though it is only statistically significant in the latter. Instead, examining indicators for an unusually large number of protests (more than the median incidence, in column 4, or than the average, in column 5) reveals a positive and very significant relationship with Facebook Speakers in both panels. Finally, column 6 excludes information on the number of protests each month and finds that Facebook Speakers also increase a different measure of intensity that is less prone to errors in double-counting protests by the media: the number of days in the month in which protests occur.

Table A-11 shows that our results are also robust to estimating nonlinear models, including quantile regressions for impacts at the median (column 1), a negative binomial regression (column 2), a zero-inflated negative binomial regression (column 3), and logit and probit models for the probability of having at least one protest (columns 4 and 5). We also estimated dynamic panel data models (Table A-12) that incorporate lagged protests on the right-hand side of the equation and instrument these with longer lags, as suggested by the generalized method of moments estimator originally proposed by Arellano and Bond (1991). The effect of Facebook Speakers remains robust to acknowledging persistence in the dependent variable.[38] Also, while we prefer the continuous Facebook Speakers measure, which takes advantage of all the variation in potential access to Facebook, the results are also similar if we use simple binary variables indicating whether there is a Facebook version in the most spoken language or in a language spoken by more than 50% (or 20%) of the

[37] Also, if we use Cook's D criteria (Cook, 1977) to detect influential observations, common rules of thumb such as using $D > 0.5$ to identify outliers suggest that our regressions contain no such unusually influential data points.

[38] We also carried out several tests to check stationarity and reject the presence of unit root in the protest process. The null hypothesis in the Levin-Lin-Chu is strongly rejected (the adjusted $t-statistic$ is -90.8727). Since this test assumes that protest persistence is the same for all countries, we checked Dickey-Fuller tests for each country independently and always rejected the null hypothesis at the 95% confidence level

country's inhabitants (Table A-13).

One final concern is the possibility of reporting bias because Facebook makes protests more visible (e.g., by creating spillovers on protest reporting), and therefore that some of the effect is explained because Facebook increases not *actual* protests, but *reported* protests in GDELT (Weidmann, 2016). However, our finding of a generalized effect on very different types of protests also suggests that the observed effects cannot be fully accounted for by reporting spillovers when Facebook gains notoriety. Indeed, some types of protest events are likely to be relatively less visible and newsworthy, and these should be more influenced by increased reporting than others. Since Facebook Speakers increases all types of protests, pure reporting effects are unlikely to explain our findings. Also, GDELT does not use Facebook data, so any such effect would have to be indirect. Finally, ACLED incorporates more checks and produces similar effects as GDELT. But it still could be that smaller protests that went under the radar before the Facebook era are now being detected, or that some protests that the media used to ignore due to a lack of interest or sources are now brought to their attention by Facebook.

Unfortunately, we do not have reliable information on the size of the protests from GDELT. But we can examine whether more media outlets report on a protest when a country has more Facebook Speakers. The logic is that if media outlets with limited resources can now use Facebook as a primary source, this might increase the number of outlets reporting protests. In Panel A of Table A-14 we run our baseline specification using different features of the distribution of the number of outlets reporting protests as the dependent variable. Columns 1 to 4 report, respectively, the mean, median, 25th percentile, and 75th percentile of the number of news sources reporting each protest in each country-month. There is no evidence that Facebook Speakers change the distribution of the number of outlets reporting protests. This suggests that our effects are not simply capturing an increase in reported protests without any real impact on actual collective action episodes.

We also examine a related source of reporting error in Panel B of Table A-14: that the results are influenced by GDELT failing to successfully de-duplicate protests that are reported on more than once. This would affect our estimates if Facebook directly influences this success rate (for instance by increasing the number of reports or the different stories around them because reporters can now more easily write about them). Following Manacorda and Tesei (in press), in Panel B-1 we construct an alternative measure of protests that treats events in the same location (but that are classified as different events in the data) as a single event. Column 1 is the baseline, column 2 aggregates all columns on the same day in a

single location, column 3 takes a larger location grid with a resolution of 5km × 5km, and in column 4 one location represents an entire country. Even in the most conservative regression to avoid double counting, we find similar qualitative results. Panel B-2 combines geographic and temporal aggregation (Schutte, Liu, & Ward, 2018) by counting as one all protests that occur in a week and landmark (column 1), week and 5km × 5km grid (column 2), month and landmark (column 3), and month and 5km × 5km grid (column 4). Again, our results are not sensitive to these changes. While this does not rule out the possibility that the well-known de-duplication challenges associated with the GDELT data (Strezhnev, 2014; Caren, 2014; Wang, Kennedy, Lazer, & Ramakrishnan, 2016) are affecting the reported protest levels,[39] it suggests that our results do not mechanically result from these biases correlating with increased Facebook access.

These checks all reinforce the idea that the Facebook Speakers variable matters because it increases Facebook access, thus enabling collective action, not because it improves protest recording. However, we can further confirm this and explore additional implications by relying on individual reports on protest participation, which are independent of media reports. We turn to this approach in the next section.

4 Results from individual-level protest participation

Our individual-level analysis is based on multiple rounds of the ESS, WVS, and AB. As shown in Table 1, looking at the Facebook Speaker dummy, we find, as expected, that more people in our waves of the ESS (39%) can access a Facebook platform in their first language than in the WVS (19%) or AB (15%) samples.

The incidence of protest participation is much higher in the WVS and AB (49 and 39%, respectively, on average) than in the ESS (7%). This result partly reflects the lower incidence of protests in European countries. However, it is also due to differences in the survey instruments. The ESS asks whether respondents "have participated or not in a lawful public demonstration last 12 months?" and our protest indicator is 1 if the respondent answers yes and 0 otherwise. The response options for the AB and the WVS, however, include hypothetical participation: "No, but would do if had the chance" in the AB and "Might do" in the WVS.[40] In both surveys, we code the protest indicator as 1 if the respondent selects

[39] Our log transformation also helps minimize the impact of level differences.

[40] The questions read as follows. AB: "Please tell me whether you, personally, have [participated in a demonstration or protest march] during the past year. If not, would you do this if you had the chance?" WVS: "I'm going to read out some forms of political action that people can take, and I'd like you to tell

any of the straight *yes* categories ("Yes, once or twice," "Yes, several times," or "Yes, often" in the AB, or "Yes" in the WVS) or the hypothetical involvement options.

Table 7 shows the results from the individual-level regressions as in equation (4). In Panel A we pool all surveys, and regress the indicator variable for individual participation in protests on the Facebook Speaker dummy, with fixed effects controlling flexibly for heterogeneity at the country, time, and survey wave levels. Moreover, we allow each language in each survey to have differential patterns of protests, since some groups may have more grievances and/or social capital than others. In case this varies by country, column 2 adds the full set of country × language and survey fixed effects. This specification is particularly flexible, allowing for differential participation in collective action activities by individuals who share specific linguistic backgrounds within a polity. Moreover, in columns 3 and 4 we also control for household and individual characteristics (age and sex in column 3, which are clearly predetermined) and education and wealth in column 4 (which probably do not react quickly to Facebook access, but which we include separately since an argument could be made that these are "bad" controls). We also study each of the surveys separately, in Panels B–D.

This table again demonstrates a very robust relationship between speaking a language that is already available in Facebook and protest participation. The average effect using the coefficients in Panel A implies that being a Facebook Speaker increases protest participation by a bit over 3 percentage points, from a mean participation of 30%. This represents close to a 10% increase. This masks variation by survey, where the corresponding increases in the most demanding specification are found: roughly 7 percentage points in the WVS with a mean incidence of 0.49 (close to a 14% average increase), 1.5 percentage points in the ESS with a mean incidence of 0.07 (a low absolute change but comparably larger 20% increase given the low base level), and slightly less than 10 percentage points in the AB (the largest absolute and percent increase, nearing 25% from a base average of 39%).

Certainly, not all individuals who report a willingness to participate end up doing so. But it is reasonable to assume that they are more likely to join in than those who report otherwise. Therefore, our coding choice allows us to capture Facebook's full effect on collective action. However, this obviously increases the incidence. Also, while survey-wave fixed effects absorb any level effects that these different designs have on stated protest participation, we warn that the magnitudes of the effects must also be interpreted carefully. In particular, we expect Facebook to have a larger impact in measures that include a willingness to participate

me... whether you have ... attended peaceful demonstrations."

than in those that only account for actual participation, since only some of those who are hypothetically planning to participate actually do it. For these reasons, in Appendix Table A-15 we also break down the effects for the AB and WVS samples on protest intention and effective participation. As expected, we find positive coefficients for both, with larger effects for intention; the magnitudes for participation are closer to those reported in the ESS, and not larger than in previous research. Indeed, the Facebook coefficients for protest participation are close to 3.5 percentage points in the AB sample and 4–6 percentage points in the WVS.[41]

In Table 8 we examine who responds more to Facebook access. This table breaks down the reported average effects by age group, sex, level of education, and income level. The effect of speaking a language available on Facebook is very widespread. It is present and similar for most types of individuals, with some exceptions (p-values for equality of the coefficients on Facebook Speakers by group are reported in each panel). In the ESS and WVS samples, the effect appears to be concentrated among women. Also, perhaps surprisingly since these tools are more likely be used by younger people, the coefficient for people over 55 in the WVS (and to a lesser extent in the ESS, where the 25–40 age group reacts more) is larger than for the other age groups. One conjecture is that given the relatively low incidence of protests for women and for these age groups, the scope for reaction is greater. Also, the language barrier may be more important for older than younger people. In the AB sample, relatively more educated respondents exhibit a larger effect of Facebook accessibility, unlike in the other samples where the effect is comparably constant. This may be because in Africa education is a barrier to technological access more than it is in the other surveys' samples. The effect is also very similar for different income levels, with the exception of the WVS, where we observe larger point estimates in lower levels of income.

Table 9 uses data from as many measures as are available in each survey to address four additional questions. First, does Facebook access, while increasing protests, also decrease other forms of political participation or interest (Panels A1 to A3 for WVS, ESS, and AB, respectively)? Second, does it crowd out other sources of information (Panels B1 to B3)? Third, using a round of AB with this information, does the release of Facebook in a local language increase social media use (Panel C)? And finally, also relying on AB, do individuals express having more freedom of political expression after Facebook becomes available (Panel

[41] The standardized effects in these estimations are roughly 2.5% for the AB sample and 3.2–4.8% for the WVS. Both are similar to the effects we find in the cross-country data and smaller than those reported in Enikolopov et al. (in press).

D)? Since we look at multiple outcomes, we explore the effect on a normalized average (rescaling all variables to be in the $[0, 1]$ interval) of all available measures in each category.

In Panel A, the conclusion is clear: being a Facebook Speaker does not change the composite index for other forms of political participation and interest. Moreover, relative to the average (0.33, 0.25 and 0.49 in WVS, EES and AB, respectively), the Speaker effect is in each case a precisely measured zero (effects are merely -0.037, 0.003, 0.0008, respectively). The effect in some individual components is both statistically significant and the magnitudes not negligible. Most importantly, interest in politics in the WVS and ESS increases, as does working with a political party in the ESS, which is consistent with our findings for protests since these are highly related to political engagement. However, because there is no consistent direction of other effects, and most coefficients are both relatively small and not statistically significant, we cautiously interpret this finding and conclude that there is no compelling evidence that Facebook crowds out other forms of political participation and interest. A similar conclusion emerges when looking at the use of other sources of information in Panel B. The coefficient on Facebook Speaker effect in regressions for relying on Radio, TV, or newspapers as sources of information is not significantly negative in any survey; only a positive impact on TV (ESS) and radio (AB) are significant at conventional levels. As with political participation, in the bottom row we use the average for the set of political participation and information outcomes, and again encounter precisely measured non-effects. These results contradict the fears voiced in the literature and discussed in the introduction that online social networks displace other forms of political engagement or sources of information.

Panel C confirms that being a Facebook Speaker increases access to social media (Facebook or Twitter.[42]) We find, consistent with the cross-country analysis, that having a Facebook version in one's language increases the likelihood of reporting using Facebook or Twitter by 11 percentage points, from a mean incidence of 17.5%. This strong effect further validates our proposed source of variation to study the impact of Facebook. Finally, Panel D explores several questions in the AB sample that enquire about individuals' perceived freedom to express what they think, to join political organizations, to vote, and to voice their political opinions. Each of these variables responds positively to Facebook access. For the average index, the coefficient implies a 5.4-percentage-point increase from a mean of 0.52, or close to a 10% increase in this measure of freedom of expression.[43]

[42]Unfortunately, a separate question for Facebook is not available, and the remaining surveys do not inquire about Facebook use.

[43]Following a similar approach that exploits the available questions per survey and computes averages

5 Conclusion

We study Facebook's effect on collective action on a global scale. We find robust evidence that it increases collective action. The effect appears when exploiting different levels of variation, including when we focus simply on within-country changes in Facebook access areas with different languages, as well as when we rely on media-based or individual reports of protest participation. We also show the types of countries and people who are more likely to respond to increased Facebook access with mobilization. While we find considerable heterogeneity as a function of country features, our estimates suggest that most types of people respond to Facebook access by increasing protest participation.

Finally, we fail to find important negative impacts on other forms of political participation or news consumption, contradicting fears that Facebook has displaced offline activity or other sources with more news content. Instead, we find that people report feeling a greater freedom of political expression. The impact on protests, together with the lack of signs of crowding out other activities, is important beyond improving our understanding of the determinants of collective action. It is also relevant given the increasing evidence that protests matter for key political outcomes (e.g., Collins & Margo, 2007; Madestam, Shoag, Veuger, & Yanagizawa-Drott, 2013; Acemoglu et al., 2017; El-Mallakh, Maurel, & Speciale, 2016; El-Mallakh, 2017).

Of course, the finding that Facebook causes protests raises many interesting questions, including whether these protests have discernible additional aggregate effects, for example on elections, policy, and regime change or regime repression. We explored the effects of Facebook Speakers on country-level political outcomes, including conflict, regime change, democracy, and governance. Except for some evidence on decreased civil conflict, the resulting estimates are more imprecise; our strategy appears to be better suited to capturing the short-run impact on political outcomes that vary at a higher frequency. Examining the broader political implications of Facebook access is a key area for future research.

It is also relevant to gauge the welfare consequences of our findings. We have documented that Facebook has an average positive effect on collective action, but the final resulting impact on social welfare depends on the broader implications of these effects on society. A

within similar categories, in Appendix Table A-16 we explore the effects on trust in institutions and satisfaction with the government (Panels A), satisfaction with the degree of democracy in the country (Panels B), and measures for support for democracy (Panels C). Except for an increase in trust in institutions in the WVS sample, we observe no discernible clear changes in these outcomes for Facebook Speakers. That Facebook access changes protests but has limited effects on political views is consistent with coordination playing a potentially more important role than information in explaining the effects on collective action.

long tradition going back to at least Olson (1965) emphasizes the importance of collective action to bring about "good" social outcomes. Along these lines, theories and evidence on democratization give protests a key role (Acemoglu & Robinson, 2006; Aidt & Franck, 2015; Aidt & Leon, 2016).

Some of our results, like the stronger impacts on undemocratic areas and places with limited press freedom, the effects on anti-government protests, as well as the absence of any visible reduction in other forms of political activity and the increased freedom of political expression reported by individuals, align with this tradition by suggesting that Facebook is empowering people and unsettling traditional elites in contexts of weak accountability (Farrell, 2012). These results could counteract fears that the Internet, and social media in particular, could facilitate control and propaganda by authoritarian regimes, empower a small set of elites (Hindman, 2009), facilitate control of citizen collective action (Morozov, 2012, 2014; King et al., 2013), spread misinformation (Silverman, 2016; Silverman & Singer-Vine, 2016; Allcott & Gentzkow, 2017; Munger, Egan, Nagler, Ronen, & Tucker, 2017; Allcott, Gentzkow, & Yu, 2019), or facilitate foreign influence (Martin & Shapiro, 2019). However, it would be overstating to conclude that social media is unambiguously a "liberation" technology. As with any general-purpose technology, it has many other applications, so the broader (and changing) implications as different players adapt are still up for debate (J. A. Tucker, Theocharis, Roberts, & Barberá, 2017). Our findings suggest that protests against the opposition also increase, and that some additional mobilizations are violent – results that may have negative welfare consequences.

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Table 1: Summary Statistics

	Descriptive Statistics					
	Observations	**Mean**	**Median**	**SD**	**Min**	**Max**
Panel A. Main variables country analysis, 2000.1–2015.12 (240 countries)						
Protests	46,080	63.36	5.00	364.06	0.00	16,951.00
log(1+Protests)	46,080	2.04	1.79	1.88	0.00	9.74
Facebook Speakers	46,080	0.18	0.00	0.34	0.00	1.00
Facebook Searches	45,120	0.19	0.01	0.24	0.00	0.69
Facebook Users	10,359	1.30	0.00	4.18	0.00	18.87
Panel B. Controls, Pre-2004						
Population (millions)	240	24.63	3.75	107.27	0.00	1,258.37
GDP (USD billions)	214	226.11	12.32	963.40	0.03	11,966.75
Internet users (millions)	214	3.15	0.11	13.65	0.00	169.01
Linguistic polarization	214	0.47	0.50	0.27	0.00	1.00
Population aged between 15 and 24 (millions)	214	0.18	0.19	0.07	0.00	0.82
GDP in manufacturing (% GDP)	214	0.23	0.12	1.54	0.00	22.60
Panel C: Main variables subnational analysis (4,777 jurisdictions)						
Protests	917,184	2.06	0.00	40.95	0.00	8,851.00
log(1+Protests)	917,184	0.16	0.00	0.65	0.00	9.09
Facebook Speakers	917,184	0.04	0.00	0.18	0.00	1.00
log(1+Political Protests)	917,184	0.03	0.00	0.26	0.00	6.65
log(1+Demonstrations)	917,184	0.14	0.00	0.58	0.00	8.80
log(1+Hunger Strikes)	917,184	0.01	0.00	0.16	0.00	6.54
log(1+Strikes or boycotts)	917,184	0.03	0.00	0.22	0.00	5.86
log(1+Blocks)	917,184	0.01	0.00	0.14	0.00	6.65
log(1+Violent Protests)	917,184	0.04	0.00	0.27	0.00	7.01
Only Africa...						
log(1+Protests), GDELT	131,904	0.24	0.00	0.71	0.00	8.55
log(1+Protests), ACLED	131,904	0.06	0.00	0.31	0.00	5.26
Facebook Speakers	131,904	0.00	0.00	0.06	0.00	1.00
Panel D. Main variables individual analysis						
Protest (All surveys)	708,936	0.30	0.00	0.46	0.00	1.00
Facebook Speaker (All surveys)	708,936	0.27	0.00	0.44	0.00	1.00
Protest (World Value Survey)	239,114	0.49	0.00	0.50	0.00	1.00
Facebook Speaker (World Value Survey)	239,114	0.19	0.00	0.40	0.00	1.00
Protest (European Social Survey)	340,562	0.07	0.00	0.25	0.00	1.00
Facebook Speaker (European Social Survey)	340,562	0.41	0.00	0.49	0.00	1.00
Protest (Afrobarometer)	129,260	0.39	0.00	0.49	0.00	1.00
Facebook Speaker (Afrobarometer)	129,260	0.15	0.00	0.35	0.00	1.00

Notes: The units of observation are as follows: Panel A, country-month; Panel B, country; Panel C, a region within a country and month; Panel D, an individual in a survey wave. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month, and Facebook Speaker is an indicator variable for whether the respondent's main language is available in Facebook. Facebook Searches is the Google Trends index for intensity of searches for the word "Facebook" in each country-month. Facebook Users are expressed in logarithms (we take the log of one plus users to allow for zero values). For all variable definitions and sources, see Appendix Table A-1.

Table 2: Protests and Facebook
The Effect of Facebook Speakers

	(1)	(2)	(3)	(4)
Panel A. The effect of Facebook Speakers on protests				
Dependent variable is $log(1 + protests)$				
Facebook Speakers	0.2649	0.2213	0.2350	0.2699
	(0.0764)	(0.0788)	(0.0839)	(0.0868)
Semi-elasticity (exact formula)	0.2690	0.2248	0.2386	0.2741
	(0.0776)	(0.0800)	(0.0852)	(0.0881)
Panel B. The effect of Facebook Speakers on Google searches				
Dependent variable is Facebook Searches				
Facebook Speakers	0.0931	0.0834	0.0787	0.0655
	(0.0185)	(0.0212)	(0.0225)	(0.0229)
Observations (Panels A-B)	44,928	44,928	40,896	40,896
Countries (Panels A-B)	234	234	213	213
Panel C. Correlation of Google searches and Facebook users				
Dependent variable is Facebook Searches				
Facebook Users	0.0563	0.0603	0.0603	0.0552
	(0.0060)	(0.0089)	(0.0089)	(0.0088)
Panel D. Validating Facebook Speakers with users data				
Dependent variable is Facebook Users				
Facebook Speakers	1.3326	1.0552	1.0552	0.6736
	(0.3455)	(0.2898)	(0.2898)	(0.2510)
Observations (Panels C-D)	10,357	10,357	10,357	10,357
Countries (Panels C-D)	115	115	115	115
Country fixed effects×linear trend	✓	✓	✓	✓
Country fixed effects×quadratic trend		✓	✓	✓
Controls×month fixed effects				✓

Notes: Monthly data from January 2000 to December 2015. All regressions include country and month fixed effects as well as initial population interacted with time fixed effects. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Facebook Searches is an index of search interest for the term "Facebook" from Google Trends. Facebook Users, available for a subset of country-months, is the number of registered Facebook users (expressed in logs, taking a log of one plus users to allow for zero values). Controls, measured in the pre-treatment period, include initial GDP and share of GDP per capita in manufacturing, population, share of population between 15 and 24 years old, Internet users, and language polarization. Semi-elasticity (exact formula) is the percent increase in the dependent variable caused by a change from 0% to 100% in Facebook Speakers. We compute this elasticity analytically and use the delta method for its standard error. Two-way clustering of standard errors is at the month and country levels.

Table 3: Protests and Facebook Speakers
Reverse Causality: Excluding Major Countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable is $log(1 + protests)$									
	Excludes, per language...								
	...largest country by:							*...worst country by:*	
	Population	GDP	Internet	Protests	GDP per capita	Internet per capita	Protests per capita	Rule of law	Control of corruption
Panel A. Excluding any language									
Facebook Speakers	0.2683	0.2800	0.2742	0.3149	0.3518	0.3974	0.3783	0.3704	0.3854
	(0.1110)	(0.1117)	(0.1070)	(0.1189)	(0.1130)	(0.1119)	(0.1197)	(0.1117)	(0.1070)
Observations	11,520	11,520	12,864	11,328	11,712	14,016	11,328	14,208	14,976
Countries	60	60	67	59	61	73	59	74	78
Panel B. Excluding only languages available in Facebook platforms									
Facebook Speakers	0.3642	0.3644	0.3517	0.3734	0.3610	0.3424	0.4029	0.3369	0.3520
	(0.1074)	(0.1075)	(0.1032)	(0.1056)	(0.1021)	(0.0994)	(0.0984)	(0.1003)	(0.1016)
Observations	34,944	34,752	34,752	34,944	35,328	35,136	35,520	35,520	35,328
Countries	182	181	181	182	184	183	185	185	184

Notes: Monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Two-way clustering of standard errors is at the month and country levels.

Table 4: Protests and Facebook Speakers
Heterogenous Effects with Country Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable is $log(1 + protests)$							
	Panel A. Facebook Speakers × ...						
	Internet users	No freedom of association	Repressed opposition	GDP growth	Month of elections	Historical protests	
Facebook Speakers	0.2118	0.1919	0.1764	0.1666	0.2239	0.1707	
	(0.0812)	(0.0900)	(0.0913)	(0.0848)	(0.0777)	(0.0778)	
Facebook Speakers × ...	0.0696	0.2581	0.2735	-0.0827	-0.1308	0.1702	
	(0.0243)	(0.0945)	(0.1164)	(0.0424)	(0.0788)	(0.0630)	
GDP growth				-0.0722			
				(0.0177)			
Month of elections					0.2245		
					(0.0435)		
Observations	42,048	37,056	32,064	38,424	46,080	46,080	
Countries	219	193	167	209	240	240	
	Panel B. Facebook Speakers × ...						
	Years of scholling	Linguistic fragmentation	Linguistic polarization	Diamond production	Oil reserves	Oils and gas rents	Share urban population
Facebook Speakers	0.1119	0.1645	0.2032	0.2353	0.2282	0.1857	0.1566
	(0.0927)	(0.0944)	(0.0793)	(0.0894)	(0.0914)	(0.0872)	(0.0855)
Facebook Speakers × ...	0.1532	-0.0957	-0.0632	0.1103	0.0352	0.1258	0.1662
	(0.0757)	(0.0836)	(0.0597)	(0.0293)	(0.0181)	(0.0571)	(0.0884)
Observations	36,672	46,080	46,080	28,992	28,992	32,832	41,472
Countries	191	240	240	151	151	171	216

Notes: Country-level regressions with monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Column 1 in Panel A includes the interaction of Facebook Speakers with population as an additional control. Repressed Opposition and Month of Elections are dummies. All other variables used in the interactions are standardized. Two-way clustering of standard errors is at the month and country levels.

Table 5: Protests and Facebook Speakers
Subnational Variation and Additional Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Dependent variable is $ln(1 + protests)$	Main	Political engagement	Demons-trations	Hunger strikes	Strikes or boycotts	Blockades	Violent protests	ACLED (Africa)	GDELT (Africa)
Facebook Speakers	0.5106	0.2574	0.5131	0.1198	0.2255	0.1118	0.2150	0.2412	0.1830
	(0.0846)	(0.0478)	(0.0828)	(0.0294)	(0.0433)	(0.0296)	(0.0430)	(0.1374)	(0.0969)
Observations	1,430,400	1,430,400	1,430,400	1,430,400	1,430,400	1,430,400	1,430,400	467,520	467,520
Polygons	7,450	7,450	7,450	7,450	7,450	7,450	7,450	2,435	2,435

Notes: Each observation is a language polygon (region) within a country, with data from January 2000 to December 2015. All regressions include fixed effects for each country and month, region fixed effects, and initial regional population interacted with month fixed effects. Facebook Speakers is the share of the population in each region within a country speaking (as a first language) a language already available in Facebook. Two-way clustering of standard errors is at the month and country levels.

Table 6: Protests and Facebook Speakers
Protest Targets

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Protest share with known target	*Dependent variable is a log of one plus the number of protests against each target...* *In parentheses under each title: share of total protests (col. 2) share of total protests with known target (cols. 3-10)*									
		Known target (47.7%)	Armed forces (15.2%)	Legislature (3.4%)	Government (25.4%)	Political opposition (6.7%)	Education (4.5%)	Media (3.6%)	Civilians (4.7%)	Business (3.6%)	Labor (2.4%)
Facebook Speakers	0.0088	0.3311	0.1552	0.0875	0.1983	0.1068	0.0990	0.0762	0.0943	0.0870	0.0744
	(0.0117)	(0.0528)	(0.0282)	(0.0202)	(0.0365)	(0.0222)	(0.0249)	(0.0158)	(0.0227)	(0.0193)	(0.0185)
Observations	64,062	904,704	904,704	904,704	904,704	904,704	904,704	904,704	904,704	904,704	904,704
Polygons	2,280	4,712	4,712	4,712	4,712	4,712	4,712	4,712	4,712	4,712	4,712
Beta-coefficient	[0.004]	[0.116]	[0.111]	[0.123]	[0.115]	[0.111]	[0.125]	[0.101]	[0.111]	[0.121]	[0.120]

Notes: Each observation is a language polygon (region) within a country, with data from January 2000 to December 2015. All regressions include fixed effects for each country and month, region fixed effects, and initial regional population interacted with month fixed effects. Facebook Speakers is the share of the population in each region within a country speaking (as a first language) a language already available in Facebook. Beta coefficient is the standardized effect, or implied effect on the dependent variable, in standard-deviation units, of a one-standard-deviation increase in Facebook Speakers. Protests are classified by target (when known) as follows. Armed forces: police forces, officers, criminal investigative units, protective agencies and troops, soldiers, all state/military personnel/equipment. Legislative: parliaments, assemblies, lawmakers, references to specific legislative entities or subentities such as committees. Government: the executive, governing parties, coalitions partners, executive divisions. Political opposition: opposition parties, individuals, anti-government activists. Education: educators, schools, students, or organizations dealing with education. Media: journalists, newspapers, television stations, providers of Internet services and other forms of mass information dissemination. Civilians: civilian individuals or groups sometimes used as a catch-all for individuals or groups for whom no other role or category is appropriate. Business: businessmen, companies, and enterprises. Labor: individuals in (or elements of) organized labor, organizations concerned with labor issues. Two-way clustering of standard errors is at the month and country levels.

Table 7: Individual-level Protest Participation
The Effect of Facebook Speakers

	(1)	(2)	(3)	(4)
Dependent variable is indicator variable for protest participation				
Panel A. All surveys				
Facebook Speaker	0.0314	0.0331	0.0314	0.0332
	(0.0084)	(0.0085)	(0.0086)	(0.0097)
Observations	708,849	708,464	707,468	706,500
Countries	123	123	123	123
Country × Year × Survey fixed effects	✓	✓	✓	✓
Language × Survey fixed effects	✓			
Country × Language fixed effects × Survey		✓	✓	✓
Age group + Male			✓	✓
Education + Wealth				✓
Panel B. World Values Survey				
Facebook Speaker	0.0534	0.0580	0.0545	0.0743
	(0.0191)	(0.0210)	(0.0193)	(0.0219)
Observations	239,084	239,004	239,004	239,004
Countries	90	90	90	90
Panel C. European Social Survey				
Facebook Speaker	0.0150	0.0162	0.0156	0.0158
	(0.0052)	(0.0050)	(0.0054)	(0.0059)
Observations	340,509	340,218	340,218	340,218
Countries	36	36	36	36
Panel D. Afrobarometer				
Facebook Speaker	0.0988	0.0962	0.0955	0.0945
	(0.0108)	(0.0150)	(0.0148)	(0.0173)
Observations	129,256	129,242	128,246	127,278
Countries	36	36	36	36
Panels B–D:				
Country × Year fixed effects	✓	✓	✓	✓
Language fixed effects	✓			
Country × Language fixed effects		✓	✓	✓
Age group +Male			✓	✓
Education +Wealth				✓

Notes: Individual data from several rounds of each survey. See list of rounds in Figure 2. In Panel B, Protest equals 1 if respondent answers "Have done" or "Might do" to the question "I'm going to read out some forms of political action that people can take, and I'd like you to tell me ... whether you have ... attend peaceful demonstrations." In Panel C, Protest equals 1 if respondent answers "Yes" to the question "Have you ... taken part in lawful public demonstration last 12 months?" In Panel D, Protest equals 1 if respondent answers "No, but would do if had the chance," "Yes, once or twice," "Yes, several times," or "Yes, often" to the question, "Please tell me whether you, personally, have done any of these things during the past year. If not, would you do this if you had the chance: Participated in a demonstration or protest march." In Panel A these definitions are used to define Protest when pooling all surveys. Facebook Speaker is a dummy that equals 1 if Facebook has been released in the respondent's first language. Two-way clustering of standard errors is at the year and country levels.

Table 8: Individual-level Protest Participation
The Effect of Facebook Speakers by Age, Sex, Education, and Income

	(1)	(2)	(3)	(4)	(5)	(6)
	World Values Survey		*European Social Survey*		*Afrobarometer*	
Dependent variable is Protest						
Group	**Mean non-speakers**	**Speakers effect**	**Mean non-speakers**	**Speakers effect**	**Mean non-speakers**	**Speakers effect**
Panel A: By Age group						
Age $\in [18, 25]$	0.5195	0.0565	0.1035	0.0063	0.4218	0.1072
	(0.0025)	(0.0277)	(0.0018)	(0.0073)	(0.0030)	(0.0153)
Age $\in (25, 40]$	0.5102	0.0377	0.0746	0.0244	0.3967	0.1035
	(0.0019)	(0.0198)	(0.0012)	(0.0068)	(0.0023)	(0.0129)
Age $\in (41, 55]$	0.5033	0.0443	0.0770	0.0165	0.3711	0.0832
	(0.0023)	(0.0179)	(0.0012)	(0.0068)	(0.0032)	(0.0184)
Age > 55	0.4029	0.1037	0.0452	0.0289	0.2996	0.0854
	(0.0026)	(0.0190)	(0.0008)	(0.0073)	(0.0039)	(0.0419)
P-value: No difference		0.000		0.002		0.357
Panel B: By Sex						
Female	0.4405	0.0731	0.0610	0.0254	0.3649	0.0826
	(0.0016)	(0.0165)	(0.0007)	(0.0062)	(0.0020)	(0.0220)
Male	0.5415	0.0371	0.0783	0.0160	0.4053	0.1073
	(0.0016)	(0.0255)	(0.0009)	(0.0067)	(0.0021)	(0.0093)
P-value: No difference		0.046		0.008		0.148
Panel C: By Education						
Primary	0.3900	0.0825	0.0493	0.0207	0.3792	0.0790
	(0.0019)	(0.0216)	(0.0007)	(0.0070)	(0.0017)	(0.0283)
Secondary	0.5212	0.0730	0.0706	0.0181	0.3999	0.1063
	(0.0016)	(0.0215)	(0.0012)	(0.0041)	(0.0030)	(0.0072)
Tertiary	0.6314	0.0522	0.1059	0.0159	0.4126	0.1441
	(0.0029)	(0.0195)	(0.0013)	(0.0067)	(0.0083)	(0.0191)
P-value: No difference		0.002		0.770		0.065
Panel D: By Wealth						
Lowest	0.4486	0.1093	0.0508	0.0213	0.3987	0.1034
	(0.0019)	(0.0212)	(0.0010)	(0.0077)	(0.0025)	(0.0288)
Middle	0.5066	0.0662	0.0728	0.0216	0.3859	0.1062
	(0.0017)	(0.0267)	(0.0010)	(0.0085)	(0.0025)	(0.0153)
High	0.5594	0.0369	0.0875	0.0216	0.3699	0.0910
	(0.0033)	(0.0287)	(0.0014)	(0.0075)	(0.0025)	(0.0119)
P-value: No difference		0.000		0.996		0.041

Notes: Individual data from several rounds of each survey. Odd-numbered columns report, for each subgroup, the average protest incidence (and its standard error) for non-Facebook Speakers. Even-numbered columns report the coefficients of the interaction between Facebook Speaker and each subgroup in regressions with country × year fixed effects, country × language fixed effects, subgroup fixed effects, and age and sex fixed effects. The full set of subgroup indicators is interacted with the Facebook Speaker dummy. Protest is defined as in the note under Table 7. Facebook Speaker is a dummy that equals 1 if Facebook has been released in the respondent's first language. Two-way clustering of standard errors is at the year and country levels.

Table 9: Political Participation, Information, Freedom of Expression
The Effect of Facebook Speakers

	(1)	(2)		(3)	(4)
Variable	**Mean non-speakers**	**Speakers effect**	**Variable**	**Mean non-speakers**	**Speakers effect**
A1. Other forms of participation (WVS)			Signs a petition	0.8641	0.0323
Votes in election	0.7660	-0.0135		(0.0010)	(0.0317)
	(0.0015)	(0.0154)	Party identity	0.6153	-0.0133
Interested in politics	0.1220	0.0261		(0.0015)	(0.0223)
	(0.0008)	(0.0114)	*Average A3*	0.4858	0.0008
Member of association	0.3174	-0.1036		(0.0006)	(0.0139)
	(0.0013)	(0.0506)			
Sings a petition	0.5680	-0.0459	**B1. Use of traditional media to get news (WVS)**		
	(0.0011)	(0.0529)	Radio	0.6409	-0.0751
Party identity	0.0574	0.0098		(0.0017)	(0.0615)
	(0.0006)	(0.0153)	TV	0.6969	-0.0163
Average A1	0.3314	-0.0366		(0.0016)	(0.0254)
	(0.0006)	(0.0287)	Newspapers	0.5516	-0.0424
				(0.0017)	(0.0676)
A2. Other forms of participation (ESS)			*Average B1*	0.6301	-0.0428
Votes in election	0.7815	-0.0099		(0.0013)	(0.0505)
	(0.0010)	(0.0059)			
Interested in politics	0.1113	0.0164	**B2. Use of traditional media to get news (ESS)**		
	(0.0007)	(0.0063)	TV	0.2284	0.0144
Member of association	0.1848	-0.0001		(0.0010)	(0.0075)
	(0.0009)	(0.0057)			
Signs a petition	0.2323	0.0065	**B3. Use of traditional media to get news (AB)**		
	(0.0009)	(0.0091)	Radio	0.7380	0.0376
Party identity	0.5037	0.0076		(0.0013)	(0.0183)
	(0.0011)	(0.0146)	TV	0.4307	0.0091
Contacts politician	0.1459	0.0060		(0.0015)	(0.0075)
	(0.0008)	(0.0110)	Newspapers	0.1988	0.0019
Works in political party	0.0436	0.0105		(0.0012)	(0.0230)
	(0.0005)	(0.0030)	*Average B3*	0.4565	0.0167
Wears campaign badge	0.0712	0.0071		(0.0010)	(0.0131)
	(0.0006)	(0.0046)			
Average A2	0.2520	0.0032	**C. Use of social media to get news (AB)**		
	(0.0004)	(0.0045)	Facebook or Twitter†	0.1748	0.1079
				(0.0018)	(0.0060)
A3. Other forms of participation (AB)					
Votes in election	0.7121	0.0028	**D. Freedom of expression (AB)**		
	(0.0013)	(0.0123)	Free to say what you think	0.5256	0.0383
Interest in politics	0.2950	-0.0398		(0.0015)	(0.0179)
	(0.0013)	(0.0298)	Free to join political org.	0.6435	0.0288
Discusses politics	0.2091	-0.0253		(0.0014)	(0.0081)
	(0.0012)	(0.0194)	Free to vote	0.7420	0.0483
Political leader	0.0544	0.0010		(0.0013)	(0.0176)
	(0.0007)	(0.0055)	Free to say political opinion	0.1569	0.0899
Member of association	0.2441	-0.0065		(0.0011)	(0.0232)
	(0.0013)	(0.0000)	*Average D*	0.5161	0.0539
Attends meeting	0.8987	0.0489		(0.0010)	(0.0098)
	(0.0009)	(0.0409)			

Notes: Individual data from several rounds of each survey. WVS is World Values Survey, ESS is European Social Survey, and AB is Afrobarometer. Odd-numbered columns report the average for each outcome listed in the rows (and its standard error) for non-Facebook Speakers. Even-numbered columns report the coefficient for Facebook Speaker in regressions with country× year fixed effects, country × language fixed effects, and age and sex fixed effects. Detailed definitions for each outcome are in Appendix Table A-1. Facebook Speaker is a dummy that equals 1 if Facebook has been released in the respondent's first language. Two-way clustering of standard errors is at the year and country levels.

Figure 1: Distribution of Some Languages around the World

Speakers: 846 million. Facebook Launch: June 19, 2008
Mandarin

Speakers: 328 million. Facebook Launch: September 26, 2006
English

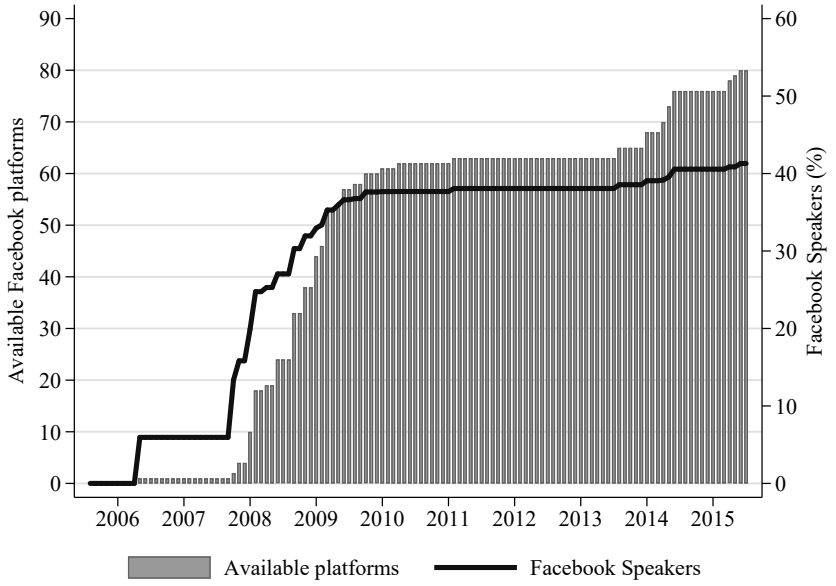
Speakers: 329 million. Facebook Launch: February 2, 2008
Spanish

Speakers: 90 million. Facebook Launch: March 3, 2008
German

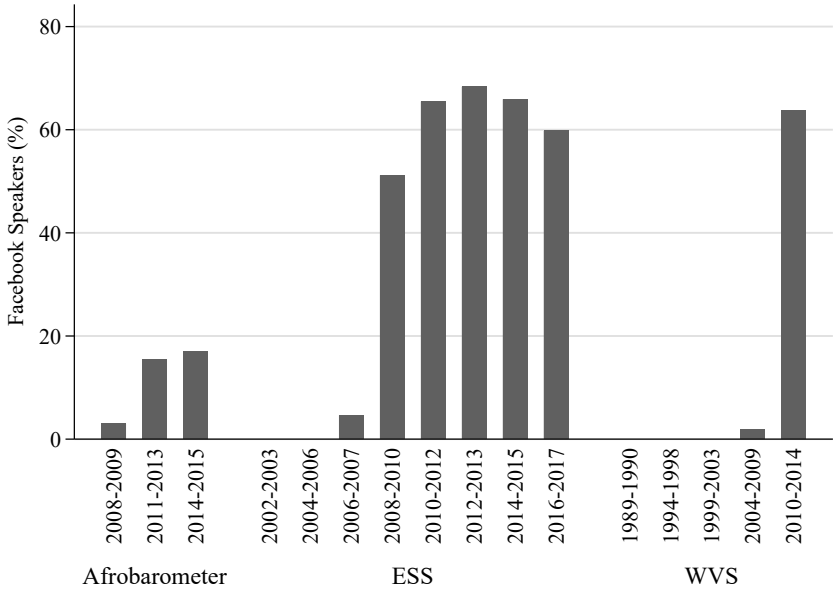
Notes: Share of country population speaking each language as their first language. Total speakers of the corresponding language and launch dates for the Facebook platforms indicated in each panel. Source: World Language Mapping System (WLMS, version 16).

Figure 2: Facebook Language-Specific Versions and Facebook Speakers

Panel A. Number of Facebook versions (left axis) and Facebook Speakers (right axis)

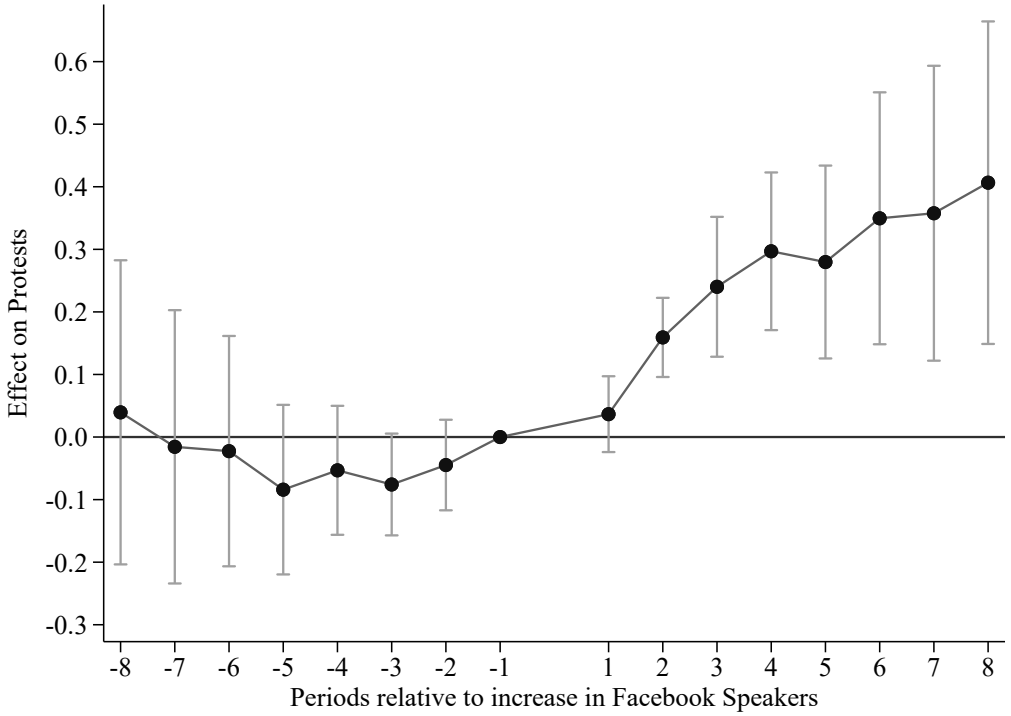


Panel B. Facebook Speakers in the survey data, by survey and wave



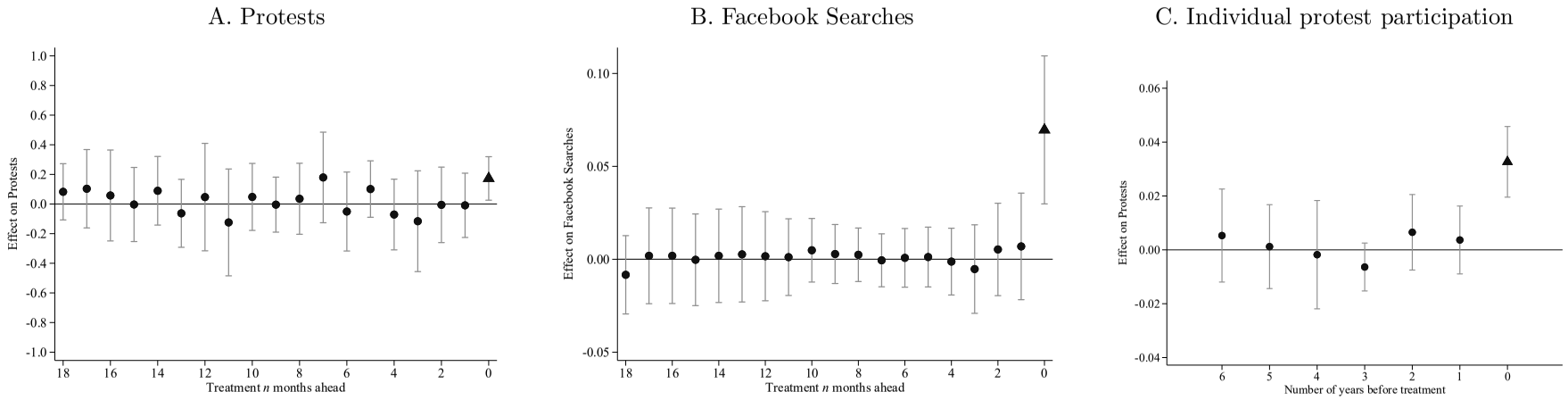
Notes: Facebook versions are language-specific platforms. Facebook Speakers is the average share of the population in each country (Panel A) or in each survey wave (Panel B) whose first language is available in a Facebook language-specific platform. ESS is European Social Survey and WVS is World Values Survey.

Figure 3: Event Study Estimates of the Impact of Facebook Speakers



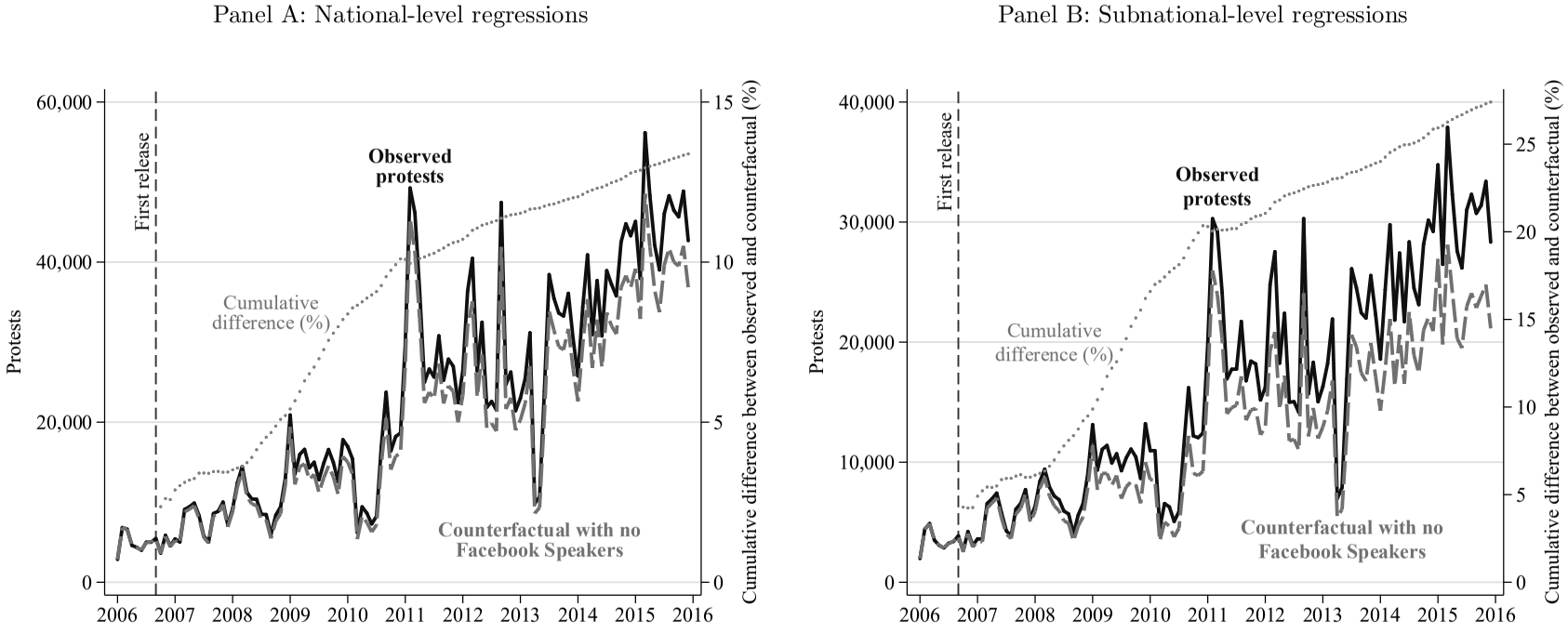
Notes: The vertical axis plots coefficients on 6-month intervals dummies from a regression for (the log of) protests that also includes unit (regions within a country) and time × country fixed effects. Negative numbers on the horizontal axis indicate periods before a discrete increase in Facebook Speakers, and positive numbers those following this event. The period just preceding the increase in Speakers is the omitted category. Confidence intervals at the 95% level with clustering at the country level are also shown.

Figure 4: Parallel Trends in Protests Before Facebook Exploring Anticipated Effects of Facebook Speakers



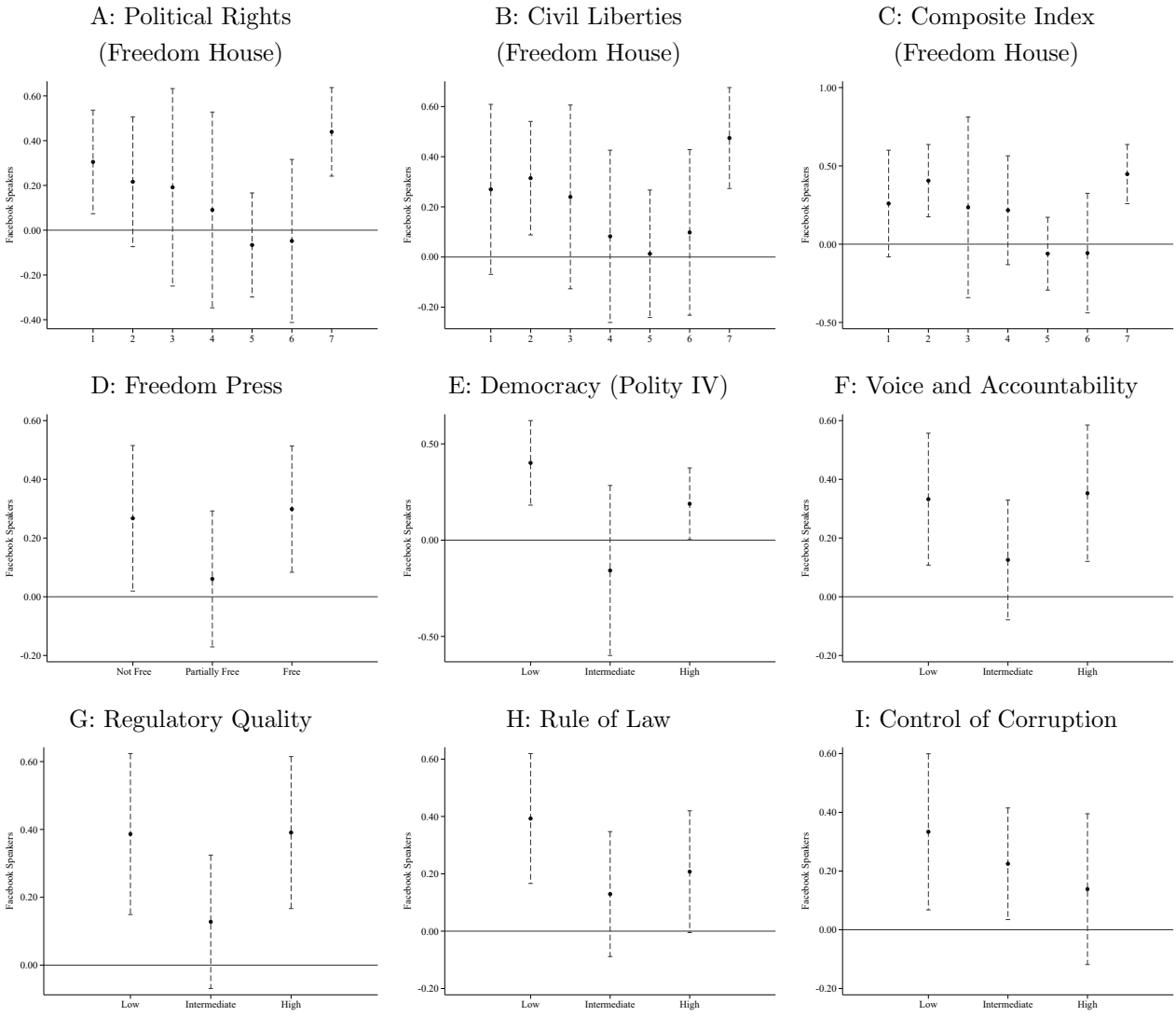
Notes: Panels A and B extend regression equation (1) to include anticipation effects (leads) of Facebook Speakers$_{ct+n}$, for n ranging from 1–18 months, and Panel C extends equation 4 to include leads of Facebook Speaker$_{cit+n}$ for n ranging from 1–6 years. Each panel plots the coefficients and 95% confidence bands for each lead (as marked in the x-axis, and where lead zero is the treatment effect of Facebook Speaker(s)).

Figure 5: Implied Cumulative Effects of Facebook Speakers on Protests



Notes: The solid line in each panel plots the total observed protests in each month, from 2006 to 2015. The dashed line is the corresponding number of protests that would have been observed without Facebook (if Facebook Speakers are held constant at zero throughout the period) as implied by our baseline national (Panel A) or subnational (Panel B) estimates. Finally, the dotted line is the cumulative difference since September 2006 (when Facebook first appeared) between protests with and without Facebook (expressed as a percent of total cumulative protests without Facebook up to each time period).

Figure 6: Facebook Speakers Impact by Features of the Political Regime



Notes: This figure is based on regression (1), extended to include the interaction of Facebook Speakers with indicator variables built using the measures of democracy and governance indicated in each panel. We plot the effect (and 95% confidence bands) of Facebook Speakers on protests at different levels of the indicators. Since the Freedom House indices are constructed on a 7-point scale, we interact Facebook Speakers with dummy variables for each level and plot the coefficients. For Freedom Press we use the three categories "not free," "partially free," and "free." With the Polity IV and World Bank indices (ranging from -10 to 10 and from -2.5 to 2.5, respectively), we divide the scales into three equal parts (low, intermediate, and high) and plot the coefficients for these interactions.

A Appendix

A.1 Variables and Sources

Table A-1: Variable Definition and Sources

Variable	Description
	Panel A. National and subnational data
Main variables	
Protests	Source: GDELT and ACLED. Total protests by geographic unit and month. The baseline geographic unit is country and WLMS polygons at the national and subnational levels respectively. The main source is GDELT where protests are classified following the *Conflict and Mediation Event Observations* (CAMEO) classification (see Schrodt, 2012), in six different types of collective action episodes (examples from CAMEO in parenthesis): engagements in political dissent (the Homeland Union Conservatives began collecting signatures in part of a drive to convince the Lithuanian Parliament to amend the constitution so that same-sex marriages are banned), demonstrations or rallies (angry activists from the defeated Fatah Party have staged rallies in the Gaza Strip against the party's leader Mahmoud Abbas, saying he must resign), hunger strikes (up to 1,000 ethnic Turks began a hunger strike on Monday to protest against Sweden's decision to send them back to Bulgaria, where they say they face imprisonment, homelessness and persecution), strikes or boycotts (Palestinians of the Israeli-occupied West Bank shunned work on Monday to protest at settlement of Soviet Jewish immigrants on Arab land), obstruction of passages or blockades (hundreds of thousands of people blocked streets in Hong Kong in defiance of Chinese authorities to demand democratic reforms) and violent protests or riots (Palestinian prisoners rioted Monday at this jail in Northern Israel, setting fire to their mattresses and smashing furniture, police sources said). In the subnational analysis all events were filtered to have a geoprecision (*actiongeo_type*) of 3 and 4, ensuring that only events with exact locations are included in the analysis. Additional results report protests from ACLED (available for Africa). In this case, we also filter the dataset to "Riots/Protests" identified to the most accurate level of precision (*actiongeo_type*= 1).

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Facebook Speakers	Source: World Language Mapping System (WLMS) and own coding from web searches and Internet Archive (https://archive.org/). Proportion of people who, in each country-month, speak (as their first language) a language available in Facebook. We use WLMS to identify languages spoken in countries or regions, and use our own coding of launch dates for language-specific Facebook platforms from internet queries of news, official announcements, specialized blogs and (if no other source is available) the earliest date with a web crawl at the Internet Archive's Way Back Machine tool. See Table A-2 for launch dates and source for date of entry of each platform. For 12 countries (British Indian Ocean Territory, Faroe Islands, Hong Kong, Isle of Man, Kosovo, Macau, Paracel Islands, Saitn Martin, Seychelles, South Sudan, Svalbard, Western Sahara), the information in WLMS is in-existent or extremely incomplete. In such cases we rely directly in Ethnologue.
Other variables (in alphabetical order)	
Arab spring countries	Source: Own coding. Equals one if country is Algeria, Egypt, Gaza Strip, Iran, Iraq, Jordan, Kuwait, Mauritania, Morocco, Lebanon, Libya, Oman, Saudi Arabia, Sudan, Syria, Tunisia, West Bank, Western Sahara or Yemen.
Colony/Colonizer	Source: ICOW Colonial History Data version 1.1. It represents the Primary Colonial Ruler defined as "the colonial or imperial power that was most responsible for shaping the development of the entity (or entities) that became this modern state."
Control of Corruption	Source: The Worldwide Governance Indicators (WGI). It captures "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5." We use the country average from 1996 to 2004. More details at https://datacatalog.worldbank.org/control-corruption-estimate-0.
Democracy (Polity IV)	Source: Systemic Peace. Polity score which ranges from -10 to +10, where with -10 to -6 corresponding to autocracies, -5 to 5 corresponding to anocracies, and 6 to 10 to democracies. Based on an evaluation of elections for competitiveness and openness, the nature of political participation in general, and the extent of checks on executive authority. We use the country average from 1996 to 2004.
Diamond production	Source: Humphreys (2005). Diamond Production (Carats per person), average 1961-2000.
Election month	Source: Constituency-Level Elections Archive (CLEA). Equals one for observations where constituency-level elections were carried out in each country.

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Facebook Most Spoken, 50% and 20%	Source: Own coding from WLMS and Facebook language-specific platforms launch dates. Equals one if, in a country-month, a Facebook version had been released in: the most spoken language in the country (Facebook Most Spoken), a language spoken by more than 50% of the population (Facebook 50%) or one spoken by more than 20% of the population (Facebook 20%). See Table A-2 for launch dates and source for date of entry of each platform.
Facebook Searches	Source: Google Trends.We use the log of (one plus) the total number of google searches of the word "Facebook" for country c during month m (as percentage of the highest number of searches in a month for the country c). Google reports this information weekly. We take the average over the month for each country. These series start in January, 2004. We assume that before 2004, the index equals zero.
Facebook Second Language Speakers	Source: Ethnologue. Ethnologue reports for each country and language the number of people who speak a language as their second (L2 Users). We construct the share of each country's population that can access a Facebook interface in a second language as in equation 2 (in this case, Speakers_{cl} refers to the proportion of people in country c who speak a language l as a second language.)
Facebook Users	Number of Facebook users. Source: We combine figures from three sources: Frost and Strauss (2016), https://www.internetworldstats.com/), https://www.nickburcher.com/ and information that Maria Petrova kindly shared with us for 47 countries from 2008 to 2012. We build an unbalanced panel for 115 countries.
Freedom House	Source: Freedom House. Index measuring the degree of democratic freedoms. Based on two indices, each assessing the state of Civil Liberties and Political Rights on a scale from 1 (most free) to 7 (least free). In Figure 6, the index is the value in 2000.
GDP	Source: World Bank. GDP in USD billion dollars (constant dollars of 2005). Average between 2000-2005. Where unavailable, we complemented the information for some countries by consulting national statistics offices.
GDP growth	Source: World Bank. Annual gross domestic product per capita growth rate.
GDP in manuf. (% GDP)	Source: United Nations. GDP in manufacturing as percentage of total GDP, average 1990-2005.
Internet users	Source: International Telecommunication Union. Millions of internet users in 2002.
Linguistic fragmentation	Source: Own coding using WLMP/Ethnologue. Fragmentation in country c is defined as $F_c = 1 - \sum_{i=1}^{N} \pi_{ic}^2$, where π_{ij} is the share of speakers of i language in country c before Facebook was launched.
Linguistic polarization	Source: Own coding using using WLMP/Ethnologue. Polarization for country c is defined as $P_c = 1 - \sum_{i=1}^{N} \pi_{ic} \left(\frac{1/2 - \pi_{ic}}{1/2} \right)^2$, where π_{ic} is the share of speakers of the i language in country c before Facebook was launched.

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

No freedom of association	Source: CIRI Human Rights Data Project. Equals one if freedoms of assembly and association in the period 2000-2005 was reported as "severely restricted or denied completely to all citizens".
Oil reserves	Source: Humphreys (2005). Oil reserves (thousand barrels per person), average 1961-2000.
Oil and gas rents	Source: M. Ross (2008). Oil and gas rents per capita (per capita rents from oil and gas in constant 2000 dollars), average 1990-2000.
People aged between 15 and 24	Source: United Nations. Millions of inhabitants aged between 15 and 25 for 2000.
Population	Source: United Nations, World Bank and WMLS. Number of inhabitants by country and year. When used as control in the national regressions, population is the average 1995-1999. In the subnational regressions, we use the population of the polygon.
Press Freedom	Source: Freedom House. Index based on four elements "(A) Laws and regulations that influence media content, (B) political pressures and controls on media content, (C) economic influences over media content and (D) repressive actions (killing of journalists, physical violence against journalists or facilities, censorship, self-censorship, harassment, expulsions, etc.)". Results in classification as Free (0-30), Partly Free (31-60) or Not Free (61-100). We use this index for 2000.
Regulatory Quality	Source: The Worldwide Governance Indicators (WGI) project. It captures "perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5." We use the country average from 1996 to 2004. More details at `https://datacatalog.worldbank.org/regulatory-quality-estimate-0`
Repressed opposition	Source: Systemic Peace. Equals one if no significant oppositional activity is permitted outside the ranks of the regime and ruling party. Totalitarian party systems, authoritarian military dictatorships, and despotic monarchies are typically coded here. Coded from *parcomp* in polity IV. Average 2000-2004.
Rule of Law	Source: The Worldwide Governance Indicators (WGI) project. It captures "perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5." We use the country average from 1996 to 2004. More details at `https://datacatalog.worldbank.org/rule-law-estimate-0`
Urban population share	Source: World Bank. Urban population as percentage of total population. Average 1990-2005.

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Voice and Accountability	Source: The Worldwide Governance Indicators (WGI) project . It captures "perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5." We use the country average from 1996 to 2004. More details at `https://datacatalog.worldbank.org/voice-and-accountability-estimate-0`
Years of schooling	Source: United Nations. Average schooling in inhabitants aged 15 and over in 1995.

Panels B-D. Individual-level data from surveys (source is the corresponding survey)

Panel B. World Values Survey

Main variables	
Protest	Equals one if the respondent answers "Have done" or "Might do" (zero if "Would never do") to the question, "I'm going to read out some forms of political action that people can take, and I'd like you to tell me ... whether you have done any of these things, whether you might do it or would never under any circumstances do it ... Attending peaceful demonstrations". In Table A-15, we also explore alternative definitions. *Effective protest* equals one if the respondent answers "Have done", and zero if "Would never do". *Intention to protest* equals one if the respondent answers "Might do" and zero if "Would never do".
Facebook Speaker	Equals one if Facebook is available in the respondent's home language, coded from the question "What language do you normally speak at home?"
Other variables (in alphabetical order)	
Age group	Respondent's age in years in the following groups: ≤ 25, $(25, 40]$, $(41, 55]$ and ≥ 55.

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Education	We classify education in three levels: tertiary completed (*Tertiary*), secondary completed (*Secondary*) or less than secondary completed (*Primary*). Based on the question "What is the highest educational level that you have attained?" we classify this variable as (1) *Primary* if "No formal education", "Inadequately completed primary school", "Completed (compulsory) elementary education" or "Incomplete secondary school"; (2) *Secondary* if "Complete secondary school: technical/vocational type", "Incomplete secondary: university-preparatory type", "Complete secondary: university-preparatory type" or "Some university without degree"; or (3) *Tertiary* if "University with degree/Higher education".
In favor of a democratic system	Equals one if the respondent answers "Very good" or "Fairly good" (zero if "Fairly bad" or "Very bad") to the question "I'm going to describe various types of political systems and ask what you think about each as a way of governing this country. For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country?... Having a democratic political system".
Interested in politics	Equals one if the respondent answers "Very interested" (zero if "Not at all interested", "Not very interested" or "Somewhat interested") to the question "How interested would you say you are in politics?"
Member of association	Equals one if the respondent answers "Active member" (zero if always "Inactive member" or "Don't belong") to any of the questions "Now I am going to read off a list of voluntary organizations. For each organization, could you tell me whether you are an active member, an inactive member or not a member of that type of organization?" (1) "sport or recreation", (2) "art, music, educational", (3) "labour unions", (4) "political party", (5) "environmental organization", (6) "professional organization", (7) "charitable/humanitarian organization" or (8) "any other organization".
Newspapers	Equals one if the respondent answers "Daily" or "Weekly" (zero if "Monthly", "Less than monthly" or "Never") to the question question "People learn what is going on in this country and the world from various sources. For each of the following sources, please indicate whether you use it to obtain information daily, weekly, monthly, less than monthly or never: Daily newspaper".
Party identity	Equals one if the respondent answers "Active member" (zero if "Inactive member" or "Don't belong") to the question "Now I am going to read off a list of voluntary organizations. For each organization, could you tell me whether you are an active member, an inactive member or not a member of that type of organization? ...political party"
Radio	Equals one if the respondent answers "Daily" or "Weekly" (zero if "Monthly", "Less than monthly" or "Never") to the question "People learn what is going on in this country and the world from various sources. For each of the following sources, please indicate whether you use it to obtain information daily, weekly, monthly, less than monthly or never: Radio news".

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Rejects...	(1) *experts making decisions*, (2) *military rule* and (3) *one-man rule* equal one if the respondent answers "Fairly bad" or "Very bad" (zero if "Very good" or "Fairly good") to the question "I'm going to describe various types of political systems and ask what you think about each as a way of governing this country. For each one, would you say it is a very good, fairly good, fairly bad or very bad way of governing this country?..." (1) "...Having experts, not government, make decisions according to what they think is best for the country", (2) "...Having the army rule" and (3) "...Having a strong leader who does not have to bother with parliament and elections", respectively.
Satisfied democracy	Individuals are asked to rate in a card from 0 to 10 the question "And how democratically is this country being governed today? Again using a scale from 1 to 10, where 1 means that it is "not at all democratic" and 10 means that it is "completely democratic," what position would you choose?". Variable is normalized to the [0,1] interval.
Signs petition	Equals one if the respondent answers "Have done" or "Might do" (zero if "Would never do") to the question, "I'm going to read out some forms of political action that people can take, and I'd like you to tell me ... whether you have done any of these things, whether you might do it or would never under any circumstances do it ... Sign a petition"
Trust in...	(1) *civil service*, (2) *courts*, (3) *military*, (4) *government*, (5) *parliament* and (6) *police* equal one if the respondent answers "A great deal" or "Quite a lot" (zero if 'Not very much" or "None at all") to the question "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them: is it a great deal of confidence, quite a lot of confidence, not very much confidence or none at all..." (1) "...The Civil service", (2) "...The courts", (3) "...The armed forces", (4) "...The government (in your nation's capital)", (5) "...Parliament" and (6) "...The police" respectively.
TV	Equals one if the respondent answers "Daily" or "Weekly" (zero if "Monthly", "Less than monthly" or "Never") to the question question "People learn what is going on in this country and the world from various sources. For each of the following sources, please indicate whether you use it to obtain information daily, weekly, monthly, less than monthly or never: TV news.
Votes in election	Equals one if the respondent answers "Always" or "Usually" (zero if "Never") to any of the following to question "When elections take place, do you vote always, usually or never?" in (1)"Local level" or (2) "National level".
Wealth	We categorize households by wealth using the question "On this card is an income scale on which 1 indicates the lowest income group and 10 the highest income group in your country. We would like to know in what group your household is." We classify households in three subgroups: 1-3, 4-7 and 8-10.

Panel C. European Social Survey

Main variables

Continued on next page

Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Protest	Equals one if the respondent answers "Yes" (zero if "No") to the question, "There are different ways of trying to improve things in [country] or help prevent things from going wrong. During the last 12 months, have you ... taken part in lawful public demonstration last 12 months?".
Facebook Speaker	Equals one if Facebook is available in the respondent's home language, coded from the question "What language or languages do you speak most often at home?" Respondents can choose up to two languages (47% of the respondents report two languages). An individual is a *Facebook Speaker* at time t if Facebook had been launched at t in any of the (up to two) first languages reported.
Other variables (in alphabetical order)	
Age group	We categorize the respondent's age in years in the following groups: ≤ 25, $(25, 40]$, $(41, 55]$ and ≥ 55.
Contacts politician	Equals one if the respondent answers "Yes" (zero if "No") to the question "There are different ways of trying to improve things in [country] or help prevent things from going wrong. During the last 12 months, have you ... contacted a politician, government or local government official?"
Education	We classify education in three levels: tertiary completed (*Tertiary*), secondary completed (*Secondary*) or less than secondary completed (*Primary*). When the *International Standard Classification of Education (ISCED)* variable (eisced) is available (mostly since wave 5), we classify this variable as (1) *Primary* if "None", "ISCED I (less than lower secondary)", "ISCED II, lower secondary" or "ES-ISCED IIIb"; (2) *Secondary* if "ES-ISCED IIIa (upper tier upper secondary)" or (3) *Tertiary* if "ISCED IV (advanced vocational)", "ISCED V1 (lower tertiary education)" or "ISCED V2 (higher tertiary education)". When ISCED is not available, we rely on the question "What is the highest level of education you have achieved?" (edulvla) and classify education as (1) *Primary* if "Less than lower secondary education"or "Lower secondary education completed"; (2) *Secondary* if "Upper secondary education completed" or (3) *Tertiary* if "Tertiary education completed".
Interested in politics	Equals one if the respondent answers "Very interested" (zero if "Not at all interested", "Hardly interested" or "Quite interested") to the question "How interested would you say you are in politics are you?"
Member of association	Equals one if the respondent answers "Yes, currently" (zero if "Yes, previously" or "No") to the question "Are you or have you ever been a member of a trade union or similar organisation? if yes, is that currently or previously?"

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Party identity	Equals one if the respondent answers "Yes" (zero if "No") to "Is there a particular political party you feel closer to than all the other parties?"
Satisfied government	Individuals are asked to rate from 0 to 10 when responding the question "Now thinking about the [country] government, how satisfied are you with the way it is doing its job? Still use the card". We normalize to the [0,1] interval using $\frac{x-x_{min}}{x_{max}-x_{min}}$.
Satisfied democracy	Individuals are asked to rate from 0 to 10 when responding the question "And on the whole, how satisfied are you with the way democracy works in [country]? Still use this card". We normalize to the [0,1] interval using $\frac{x-x_{min}}{x_{max}-x_{min}}$.
Signs a petition	Equals one if the respondent answers "Yes" (zero if "No") to the question "There are different ways of trying to improve things in [country] or help prevent16 things from going wrong. During the last 12 months, have you ... Signed a petition?"
Trust in...	(1) *courts*, (2) *parliament*, (3) *police*, (4) *political parties* and (5) *politicians*. Based on the question "Using this card, please tell me on a score of 0-10 how much you personally trust each of the institutions I read out. 0 means you do not trust an institution at all, and 10 means you have complete trust:" (1) "...the legal system?", (2) "...[country]'s parliament?", (3) "...the police?", (4) "...political parties?" and (5) "...politicians?" respectively. Each variable is normalized to the [0,1] interval using $\frac{x-x_{min}}{x_{max}-x_{min}}$.
TV	Equals one if the respondent answers "More than 1 hour, up to 1.5 hours", "More than 1.5 hours, up to 2 hours", "More than 2 hours, up to 2.5 hours", "More than 2.5 hours, up to 3 hours" or "More than 3 hours" (zero if "No time at all", "Less than 1/2 hour" "1/2 to 1 hour") to the question "And again on an average weekday, how much of your time watching television is spent watching news or programs about politics and current affairs?"
Votes in election	Equals one if the respondent answers "Yes" (zero if "No") to the question "Some people don't vote nowadays for one reason or another. Did you vote in the last [country] national election in [month/year]?"
Wealth	We categorize households by wealth using the total net income classification in the survey. In waves 1-3, individuals are asked "Using this card, if you add up the income from all sources, which letter describes your household's total net income? If you don't know the exact figure, please give an estimate." In waves 4-8, individuals are asked "Using this card, please tell me which letter describes your household's total income, after tax and compulsory deductions, from all sources? If you don't know the exact figure, please give an estimate." In the former case the card goes from 1 to 12 and we group households in three subgroups: 1-4, 5-8 and 9-12. In the later case the card goes from 1 to 10 and we classify households in three subgroups: 1-3, 4-7 and 8-10.

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)	
Works in political party	Equals one if the respondent answers "Yes" (zero if "No") to the question "There are different ways of trying to improve things in [country] or help prevent things from going wrong. During the last 12 months, have you ... worked in a political party or action group?"
Worn campaign badge	Equals one if the respondent answers "Yes" (zero if "No") to the question "There are different ways of trying to improve things in [country] or help prevent things from going wrong. During the last 12 months, have you ... worn or displayed a campaign badge/sticker?"
Panel D. Afrobarometer	
Main variables	
Protest	Equals one if the respondent answers "Yes, once or twice", "Yes, several times", "Yes, often" or "No, but would do if had the chance" (zero if "No, would never do this") to the question, "Here is a list of actions that people sometimes take as citizens. For each of these, please tell me whether you, personally, have done any of these things during the past year. If not, would you do this if you had the chance: Attended a demonstration or protest march?". In Table A-15, we explore alternative definitions. *Effective protest* equals one if the respondent answers "Yes, once or twice", "Yes, several times" or "Yes, often", and equals zero if "No, would never do this". *Intention to protest* equals one if the respondent answers "No, but would do if had the chance", and equals zero if "No, would never do this".
Facebook Speaker	Equals one if Facebook is available in the respondent's home language, coded from the question "Which language is your home language?"
Other variables (in alphabetical order)	
Age group	We categorize the respondent's age in years in the following groups: ≤ 25, $(25, 40]$, $(41, 55]$ and ≥ 55.
Attends meeting	Equals one if the respondent answers "Yes, once or twice", "Yes, several times", "Yes, often" or "No, but would do if had the chance" (zero if "No, would never do this") to the question "Here is a list of actions that people sometimes take as citizens. For each of these, please tell me whether you, personally, have done any of these things during the past year. If not, would you do this if you had the chance: Attended a community meeting?"

Continued on next page

Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Checks court	Equals one if the respondent answers "Agree with Statement 2", "Agree very strongly with Statement 2" (zero if "Agree very strongly with Statement 1" or "Agree with Statement 1" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: Since the President was elected to lead the country, he/she should not be bound by laws or court decisions that he thinks are wrong. Statement 2: The President must always obey the laws and the courts, even if he/she thinks they are wrong".
Checks media	Equals one if the respondent answers "Agree very strongly with Statement 1" or "Agree with Statement 1" (zero if "Agree with Statement 2", "Agree very strongly with Statement 2" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: The news media should constantly investigate and report on corruption and the mistakes made by the government. Statement 2: Too much reporting on negative events, like corruption, only harms the country".
Checks parliament	Equals one if the respondent answers "Agree very strongly with Statement 1" or "Agree with Statement 1" (zero if "Agree with Statement 2", "Agree very strongly with Statement 2" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: Parliament should ensure that the President explains to it on a regular basis how his/her government spends taxpayers' money. Statement 2: The President should be able to devote his/her full attention to developing the country rather than wasting time justifying his actions".
Checks opposition	Equals one if the respondent answers "Agree very strongly with Statement 1" or "Agree with Statement 1" (zero if "Agree with Statement 2", "Agree very strongly with Statement 2" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: Opposition parties should regularly examine and criticize government policies and actions. Statement 2: Opposition parties should concentrate on cooperating with government and helping it develop the country".
Choosing leaders in elections	Equals one if the respondent answers "Agree very strongly with Statement 1" or "Agree with Statement" (zero if "Agree with Statement 2", "Agree very strongly with Statement 2" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: We should choose our leaders in this country through regular, open and honest elections. Statement 2: Since elections sometimes produce bad results, we should adopt other methods for choosing this country's leaders."
Discusses politics	Equals one if the respondent answers "Frequently" (zero if "Never" or "Occasionally") to the question "When you get together with your friends or family, would you say you discuss political matters?"

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Education	We classify education in three levels: tertiary completed (*Tertiary*), secondary completed (*Secondary*) or less than secondary completed (*Primary*). Using the question "What is the highest level of education you have completed?" we classify this variable as (1) *Primary* if "No formal schooling", "Informal schooling only (including Koranic schooling)", "Some primary schooling", "Primary school completed" or "Some secondary school/ high school"; (2) *Secondary* if "Secondary school completed/high school completed", "Post-secondary qualifications, other than university e.g. a diploma or degree from polytechnic or college" or "Some university"; or (3) *Tertiary* if "University completed" or "Post-graduate".
Facebook or Twitter	Equals one if the respondent answers "A few times a week" or "Every day" (zero if "Less than once a month", "A few times a month" or "Never") to the question "How often do you get news from the following sources: Social media such as Facebook or Twitter?" Only available in round 6.
Free to say what you think	Equals one if the respondent answers "Completely free" (zero if "Not at all free", "Not very free" or "Somewhat free") to the question "In this country, how free are you: To say what you think?"
Free to join political org.	Equals one if the respondent answers "Completely free" (zero if "Not at all free", "Not very free" or "Somewhat free") to the question "In this country, how free are you: To join any political organization you want?"
Free to vote	Equals one if the respondent answers "Completely free" (zero if "Not at all free", "Not very free" or "Somewhat free") to the question "In this country, how free are you: To choose who to vote for without feeling pressured?"
Free to say political opinion	Equals one if the respondent answers "Never" (zero if "Rarely", "Often" or "Always") to the question "In this country, how often: do people have to be careful of what they say about politics?"
Interested in politics	Equals one if the respondent answers "Very interested" (zero if "Not at all interested", "Not very interested" or "Somewhat interested") to the question "How interested would you say you are in public affairs?"
Member of association	Equals one if the respondent answers "Active member" or "Political leader" (zero if "Inactive member" or "Not a member") to the question: "Let's turn to your role in the community. Now I am going to read out a list of groups that people join or attend. For each one, could you tell me whether you are an official leader, an active member, an inactive member, or not a member: Some other (different from a religious group) voluntary association or community group?"
Newspapers	Equals one if the respondent answers "A few times a week" or "Every day" (zero if the respondent answers "Less than once a month", "A few times a month" or "Never") to the question "How often do you get news from the following sources: Newspapers?"

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Parliament law making	Equals one if the respondent answers "Agree very strongly with Statement 1" or "Agree with Statement 1" (zero if "Agree with Statement 2", "Agree very strongly with Statement 2" or "Agree with neither") to the question "Which of the following statements is closest to your view? Choose Statement 1 or Statement 2. Statement 1: Members of Parliament represent the people; therefore they should make laws for this country, even if the President does not agree. Statement 2: Since the President represents all of us, he/she should pass laws without worrying about what Parliament thinks".
Party identity	Equals one if response is "Yes" (zero if "No") to the question "Do you feel close to any particular political party?".
Performance of...	(1) *assembly*, (2) *local councilor* and (3) *president* equal one if the respondent answers "Approve" or "Strongly approve" (zero if 'Strongly disapprove" or "Disapprove") to the question "Do you approve or disapprove of the way the following people have performed their jobs over the past twelve months, or havent you heard enough about them to say:..." (1) "...Your Member of Parliament", (2) "...Your Elected Assembly man/woman" and (3) "...The President", respectively.
Political leader	Equals one if the respondent answers "Official leader" (zero if "Not a Member", "Inactive member" or "Active member") to the question "Let's turn to your role in the community. Now I am going to read out a list of groups that people join or attend. For each one, could you tell me whether you are an official leader, an active member, an inactive member, or not a member: Some other voluntary association or community group?"
Radio	Equals one if the respondent answers "A few times a week" or "Every day" (zero if "Less than once a month", "A few times a month" or "Never") to the question "How often do you get news from the following sources: Radio?"
Rejects...	(1) *military rule*, (2) *one-man rule* and (3) *one-party rule* equal one if the respondent answers "Strongly disapprove" or "Disapprove" (zero if "Neither approve nor disapprove", "Approve" or "Strongly approve") to the question "There are many ways to govern a country. Would you disapprove or approve of the following alternatives:..." (1) "...The army comes in to govern the country?", (2) "...Elections and Parliament/National Assembly are abolished so that the President/Prime Minister can decide everything?" and (3) "...Only one political party is allowed to stand for election and hold office?", respectively.
Satisfied democracy	Equals one if the respondent answers "Fairly satisfied" or "Very satisfied" (zero if "My country is not a democracy", "Not at all satisfied" or "Not very satisfied") to the question "Overall, how satisfied are you with the way democracy works in [Ghana/Kenya/etc.]? Are you:"
Signs a petition	Equals one if the respondent answers "Yes, once or twice", "Yes, several times", "Yes, often" or "No, but would do if had the chance" (zero if "No, would never do this") to the question "Here is a list of actions that people sometimes take as citizens. For each of these, please tell me whether you, personally, have done any of these things during the past year. If not, would you do this if you had the chance: Got together with others to raise an issue?"

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Table A-1 – Variable Definition and Sources (Continues from Previous Page)

Support for democracy	Equals one if the respondent answers "Statement 1" (zero if "Statement 2" or "Statement 3") to the question "Which of these three statements is closest to your own opinion? Statement 1: Democracy is preferable to any other kind of government. Statement 2: In some circumstances, a non-democratic government can be preferable. Statement 3: For someone like me, it doesn't matter what kind of government we have."
Trust in...	(1) *courts*, (2) *electoral commission*, (3) *opposition* (4) *parliament*, (5) *police*, (6) *president* and (7) *ruling party* equal one if the respondent answers "Somewhat" or "A lot" (zero if 'Not at all" or "Just a little") to the question "How much do you trust each of the following, or haven't you heard enough about them to say:..." (1) "...Courts of law", (2) "...The Electoral Commission of [Ghana, Kenya, etc.]", (3) "Opposition Political Parties", (4) "...Parliament", (5) "...The Police", (6) "...The President" and (7) "...The Ruling Party", respectively.
TV	Equals one if the respondent answers "A few times a week" or "Every day" (zero if "Less than once a month", "A few times a month" or "Never") to the question "How often do you get news from the following sources: Television?"
Votes in election	Equals one if the respondent answers "You voted in the elections" (zero if "You were not registered or you were too young to vote", "You decided not to vote", "You could not find the polling station", "You were prevented from voting", "You did not have time to vote" "Did not vote for some other reason" or "You could not find your name in the voter's register") to the question "With regard to the most recent, national elections, which statement is true for you?"
Wealth	We categorize households by wealth in three groups. First, we compute the first principal component of the following three questions (for each wave): "Over the past year, how often, if ever, have you or anyone in your family gone without:" (1) "Enough food to eat?" (2) "Enough clean water for home use?" and (3) "Medicines or medical treatment?" (classified as "0=Never", "1=Just once or twice", "2=Several/Many times" and "3=Always"). Next, using this component, we divide the households into terciles.

Table A-2: Languages available in Facebook by January 2016 and source for date of entry

Platform	Source	Platform	Source
Afrikaans	Internet Archive, New Sudan Vision	Kazakh	Facebook Translation Team
Albanian	Wikipedia, Internet Archive	Khmer	Open Equal Free, Chamnan Muon
Arabic	The Daily Telegraph, The Guardian	Kinyarwanda	PC Tech Magazine
Armenian	Internet Archive, Panarmenian	Korean	Blog Nick Burcher, Internet Archive
Assamese	Facebook Translation Team	Kurdish	Facebook Translation Team
Azerbaijani	Adweek, Wikipedia	Latvian	Internet Archive
Basque	Internet Archive	Lithuanian	Internet Archive
Belarusian	Internet Archive	Macedonian	Internet Archive
Bengali	Medianama, Anshprat Wordpress	Malay	Internet Archive
Bosnian	Internet Archive	Malayalam	Medianama, Anshprat Wordpress
Breton	Facebook Translation Team	Marathi	Facebook Translation Team
Bulgarian	Internet Archive	Mongolian	Facebook Translation Team
Burmese	Facebook Translation Team	Nepali	Adweek
Catalan	Blog Nick Burcher, Internet Archive	Norwegian	Adweek, Wikipedia
Cebuano	Internet Archive	Oriya	Facebook Translation Team
Chinese	The Daily Telegraph, The Guardian	Pashto	Internet Archive, Pashtunforums
Croatian	Internet Archive	Persian	Facebook Translation Team
Czech	Blog Nick Burcher, Internet Archive	Polish	Adweek
Danish	Blog Nick Burcher, Internet Archive	Portuguese	Google Discovery, Blog Nick Burcher
Dutch	Blog Nick Burcher, Internet Archive	Punjabi	Medianama, Anshprat Wordpress
English	Wikipedia, Internet Archive	Romanian	Wikipedia, Internet Archive
Estonian	Internet Archive	Russian	Blog Nick Burcher, Internet Archive
Filipino	Internet Archive	Serbian	Internet Archive, Ukratko Turanjanin
Finnish	Blog Nick Burcher, Internet Archive	Sinhala	Facebook Translation Team
France	The Age, Blog Nick Burcher	Slovak	Internet Archive
Frisian	Internet Archive, Facebook Translation Team	Slovenian	Wikipedia, Internet Archive
Galician	Wikipedia, Internet Archive	Sorani Kurdish	Facebook Translation Team
Georgian	Adweek	Spanish	El Pais
German	TechCrunch, Adweek	Swahili	Bet News, New Sudan Vision
Greek	Internet Archive, Facebook Translation Team	Swedish	Blog Nick Burcher, Internet Archive
Guarani	Ultima hora	Tajik	Facebook Translation Team
Gujarati	Facebook Translation Team	Tamil	Medianama, Anshprat Wordpress
Hebrew	The Daily Telegraph, The Guardian	Telugu	Medianama, Anshprat Wordpress
Hindi	ReadWrite	Thai	Wikipedia, Internet Archive
Hungarian	Wikipedia, Internet Archive	Turkish	Haberturk
Icelandic	Internet Archive	Ukrainian	Internet Archive
Indonesian	Internet Archive	Urdu	Askmohsin
Italian	Blog Nick Burcher, Internet Archive	Uzbek	Facebook Translation Team
Japanese	Adweek	Vietnamese	Internet Archive, Radio Free Asia
Javanese	Facebook Translation Team	Welsh	Internet Archive, WalesOnline
Kannada	Facebook Translation Team		

A.2 Countries and non-sovereign territories

Countries included in the baseline regression are Afghanistan, Albania, Algeria, Andorra, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo (Republic), Congo D.R. (Zaire), Costa Rica, Cote Divoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Laos, Latvia, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Micronesia, Moldova, Monaco, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, North Korea, Norway, Oman, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and The Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, South Korea, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Timor Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

Non sovereign territories included in the baseline regression are American Samoa, Anguilla, Aruba, Bermuda, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Christmas Island, Cook Islands, Falkland Islands, Faroe Islands, French Guiana, French Polynesia, Gaza Strip, Gibraltar, Greenland, Guadeloupe, Guam, Guernsey, Holy See, Hong Kong, Isle Of Man, Jersey, Kosovo, Macau, Martinique, Mayotte, Montserrat, Netherlands Antilles, New Caledonia, Niue, Norfolk Island, Northern Mariana Islands, Paracel Islands, Puerto Rico, Reunion, Saint Helena, Saint Martin, Saint Pierre and Miquelon, Svalbard, Taiwan, Tokelau, Turks and Caicos Islands, US Virgin Islands, Wallis and Futuna, West Bank, Western Sahara.

A.3 Collective action and Facebook translations

Facebook publishes, for each language, a ranking of the top 100 users by number of published phrases and makes it available to users of that language. We use this feature to measure the frequency of translations by country and language.

We created several user accounts for the 81 different languages in our sample. For the top 100 translators in each platform (8,100 users) we identify the name, profile link, ranking position, and number of published phrases. We next identify each user's country of residence. In 75% of the cases, this is directly identifiable in the user profile, either because the country of residence is listed (35%) or because we can match the city or district to the country (30%) using the *Geonames* dataset. In an additional 30% of the cases, we manually review the user's profiles and posts to infer the country from complementary information (e.g., the user attends a university or works in a firm that can be located). We are unable to match the country for only 5% of the users.

We use this information to examine whether pre-existing trends in collective action predict translations in Table A-3. In Panel A, the unit of observation is a country and the dependent variable is the total number of phrases translated by users in each country (columns 1 to 3) or the total number of translators in the country (columns 4 to 6), regardless of the language. This test may be weak, however, because it combines all language translations within a country. Thus, in Panel B, the unit of observation is a country and the dependent variable is the total number of phrases translated by users in each country in the main (most-spoken) language (columns 1 to 3) or the total number of translators of that language in the country (columns 4 to 6). We then measure pre-existing trends in collective action in various ways. Bearing in mind that Facebook was launched in September 2006, columns 1 and 4 use growth in the number of protests from August 2005 to August 2006 as the independent variable. Columns 2 and 5 instead compare protests in the 12-month period before Facebook's launch with the preceding 12 months. Finally, for a longer-term trend, columns 3 and 6 compare protests in the 12-month period before Facebook's launch with the corresponding 12 months five years before. Whether we are looking at published phrases or the number of translators, and whether we examine short-run or longer-term pre-trends in protests, it is clear that collective action trends before Facebook appears do not predict increased translation efforts. Coefficients are typically not significant (the sole exception is in Panel B and column 4, with a negative sign) are statistically insignificant. Moreover, in the lower row of each panel we report the beta coefficients to gauge the magnitude of the correlations, and these are generally smaller than 5%, with few exceptions.

Finally, since by restricting to each country's main language we may be ignoring some other important languages and social groups that are mobilized for collective action, in Panel C the unit of observation is a country-language (for languages spoken by more than 10% of the population) and the dependent variable is the total number of phrases translated by users in each country in each language (columns 1 to 3) or the total number of translators in each country and language (columns 4 to 6). For protests, we conduct an analogous exercise as in Panels A and B, but the pre-trends relate to the launch date of each particular language. In this exercise we find even more precisely measured zero coefficients for previous patterns of protests.

In short, we find no evidence that collective action events speed up translations to promote the Facebook language-specific platform that is relevant for mobilizing groups.

A.4 Additional Tables and Figures

Table A-3: Predicting Translations

	(1)	(2)	(3)	(4)	(5)	(6)
	Published phrases			Translators		
Panel A. Dependent variable is published phrases or number of translators						
Growth in the number of protests during (final period/base period)...						
Ago. 2006/Ago. 2005	1.6088			0.0023		
	(5.9951)			(0.0069)		
Sep. 2005-Ago. 2006/Sep. 2004-Ago. 2005		61.6411			0.0882	
		(41.8101)			(0.0683)	
Sep. 2005-Ago. 2006/Sep. 2002-Ago. 2003			4.0651			0.0297
			(43.3372)			(0.0353)
Observations	214	214	214	214	214	214
Beta-coefficient	[0.010]	[0.104]	[0.006]	[0.013]	[0.147]	[0.041]
Panel B. Dependent variable is number of published phrases or translators in country's most-spoken language						
Growth in the number of protests during (final period/base period)...						
Ago. 2006/Ago. 2005	-2.7628			-0.0037		
	(2.8999)			(0.0021)		
Sep. 2005-Ago. 2006/Sep. 2004-Ago. 2005		19.2704			0.0222	
		(22.8144)			(0.0202)	
Sep. 2005-Ago. 2006/Sep. 2002-Ago. 2003			2.1975			0.0149
			(33.5039)			(0.0272)
Observations	214	214	214	214	214	214
Beta-coefficient	[-0.028]	[0.055]	[0.005]	[-0.050]	[0.085]	[0.048]
Panel C. Dependent variable is number of published phrases or translators in each language and country						
Protests growth during...						
Month before launch	-0.7386			-0.0001		
	(1.7535)			(0.0015)		
12 months before launch		-1.0105			-0.0008	
		(1.2813)			(0.0011)	
Four years before launch			0.5538			-0.0004
			(1.3911)			(0.0017)
Observations	1,529	1,529	1,529	1,529	1,529	1,529
Countries	225	225	225	225	225	225
Beta-coefficient	[-0.012]	[-0.009]	[0.010]	[-0.002]	[-0.009]	[-0.010]

Notes: In Panel A, the unit of observation is a country and the dependent variable is the total number of phrases translated by users in each country (columns 1 to 3) or the total number of translators in the country (columns 4 to 6), regardless of the language. In Panel B, the unit of observation is a country and the dependent variable is the total number of phrases translated by users in each country in the country's main (most-spoken) language (columns 1 to 3) or the total number of translators of that language in the country (columns 4 to 6). In Panel C, the unit of observation is a country-language (for languages spoken by more than 10% of the population) and the dependent variable is the total number of phrases translated by users in each country in each language (columns 1 to 3) or the total number of translators in each country and language (columns 4 to 6). Panel C includes country fixed effects. The right-hand-side variable of interest is the increase in protests during the time period indicated in each row. The beta coefficient is the standardized effect, or implied effect on the dependent variable, in standard-deviation units, of a one-standard-deviation increase in the protest measure. Robust standard errors in Panels A and B and clustered at the country level in Panel C.

Table A-4: The Effect of Facebook Searches on Protests Instrumental Variable Estimates

	(1)	(2)
Dependent variable is $log(1 + protests)$		
Estimator:	OLS	IV
Facebook Searches	0.5346	2.6541
	(0.1370)	(1.0810)
First-stage F-statistic		15.52
Observations	44,928	44,928
Countries	234	234

Notes: Monthly data from January 2000 to December 2015. Regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Facebook Searches is an index of search interest for the term "Facebook" from Google Trends. Column 1 is an OLS regression and column 2 an instrumental variable regression with the first stage given by column 2 of Panel B in Table 2. Two-way clustering of standard errors at the month and country levels.

Table A-5: Protests and Facebook Speakers
Reverse Causality: Excluding Major Countries, Additional Categories

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable is $log(1 + protests)$						
	...largest country by:		*Excludes, per language... ...worst country by:*			
	Speakers	Speakers per capita	Voice and Accountability	Political Stability	Government Effectiveness	Regulatory Quality
A. Excluding any language						
Facebook Speakers	0.2248	0.4017	0.3234	0.2952	0.3509	0.3933
	(0.1074)	(0.1298)	(0.1080)	(0.1115)	(0.1057)	(0.1134)
Observations	9,984	9,408	13,824	14,400	14,976	14,400
Countries	52	49	72	75	78	75
B. Excluding only languages available in Facebook platforms						
Facebook Speakers	0.3750	0.4167	0.3433	0.3153	0.3582	0.3544
	(0.1145)	(0.1228)	(0.1003)	(0.1030)	(0.0994)	(0.1019)
Observations	33,984	33,600	35,136	35,136	35,712	35,712
Countries	177	175	183	183	186	186

Notes: Monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Two-way clustering of standard errors is at the month and country levels.

Table A-6: Protests and Facebook Speakers
Exploring the Role of Bilingualism

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable is $log(1 + protests)$						
Facebook Colonizer	0.0511	-0.0072	-0.0056			
	(0.0483)	(0.0528)	(0.0534)			
Facebook Speakers		0.2603	0.3507		0.2208	0.2154
		(0.0943)	(0.1110)		(0.0777)	(0.0783)
Facebook Speakers × Faceboook Colonizer			-0.0947			
			(0.0960)			
Facebook Second-Language Speakers				0.0125	0.0068	-0.0064
				(0.0786)	(0.0786)	(0.0806)
Facebook Second-Language Speakers × Faceboook Colonizer						0.0195
						(0.0561)
Observations	39,168	39,168	39,168	46,080	46,080	46,080
Countries	204	204	204	240	240	240

Notes: Monthly data from January 2000 to December 2015. Country and month fixed effects, initial population × month fixed effects and country-specific quadratic trends included. Sample of former colonies in columns 1–3. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Facebook Colonizer equals 1 if the main language of the colonizer is available in Facebook, and 0 otherwise. Facebook Second-Language Speakers is the proportion of people speaking (as a second language) a language available in Facebook in each country and month. Two-way clustering of standard errors is at the month and country levels.

Table A-7: Types of Protests and Facebook Speakers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
A. Dependent variable: $ln(1 + Protests)$							
	Main	Political protests	Demons-trations	Hunger strikes	Strikes or boycotts	Blocks	Violent protests
Facebook Speakers	0.2210	0.0900	0.2541	0.0095	0.1320	0.0589	-0.0071
	(0.0777)	(0.0574)	(0.0782)	(0.0341)	(0.0504)	(0.0331)	(0.0537)
Observations	46,080	46,080	46,080	46,080	46,080	46,080	46,080
Countries	240	240	240	240	240	240	240

Notes: Monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Two-way clustering of standard errors is at the month and country levels.

Table A-8: Protests and Facebook Speakers
Subnational Variation Robustness

	(1)	(2)	(3)	(4)	(5)
Dependent variable is $log(1 + protests)$					
Unit of analysis:	*Baseline*	*Language Polygons*	*Language Polygons*	*State-Lang*	*State-Lang*
Facebook Speakers	0.5106	0.5523	0.3606	0.1054	0.0851
	(0.0846)	(0.0959)	(0.0503)	(0.0377)	(0.0346)
Observations	1,441,728	1,282,944	1,483,776	3,751,680	3,751,680
Polygons	7,509	6,682	7,728	19,540	19,540
Beta-coefficient	[0.110]	[0.115]	[0.091]	[0.074]	[0.060]
Month × State fixed effect					✓
Overlapping zones	*Yes*	*No*	*Yes*	*Yes*	*Yes*

Notes: Unit of observation indicated in each column title, with data from January 2000 to December 2015. All regressions include fixed effects for each country and month, region fixed effects and initial population interacted with month fixed effects. Facebook Speakers is the share of the population in each region within a country speaking (as a first language) a language already available in Facebook. The beta coefficient is the implied effect on the dependent variable, in standard-deviation units, of a one-standard-deviation increase in Facebook Speakers. Overlapping zones refer to polygons in Ethnologue where more than one language is spoken by the population. Two-way clustering of standard errors is at the month and country levels.

Table A-9: Other political outcomes and Facebook Speakers
Conflict, regime change, democracy and governance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Dependent variable is...													
	ln(1+protests)	No. of violent internal conflicts			Coup	Irreg. remov.	Polity indices		FH.	World Governance Indicators				
	yearly level	Any	Minor	War	D'État	from office	Democ.	Autoc.	Democ.	Voice/Account.	Gov. Effect.	Reg. Qual.	R. Law	Ctrl. Corrupt.
Panel A: Including country-specific linear trends														
Facebook Speakers	0.2454	-0.1294	-0.0936	-0.0358	-0.0068	-0.0171	0.0761	-0.0411	-0.0464	-0.0315	-0.0093	0.0155	0.0337	-0.0042
	(0.1134)	(0.053)	(0.049)	(0.016)	(0.025)	(0.014)	(0.159)	(0.136)	(0.066)	(0.028)	(0.027)	(0.030)	(0.027)	(0.031)
Panel B: Including country-specific quadratic trends														
Facebook Speakers	0.2076	-0.1176	-0.0969	-0.0206	-0.0159	-0.0141	0.189	-0.0355	-0.0743	-0.0184	-0.0108	0.0208	0.0232	-0.0227
	(0.1132)	(0.063)	(0.057)	(0.020)	(0.025)	(0.015)	(0.174)	(0.137)	(0.063)	(0.026)	(0.027)	(0.031)	(0.027)	(0.028)
Observations	3,840	2,784	2,784	2,784	3,136	2,768	2,559	2,559	3,177	3,125	3,093	3,092	3,142	3,103
Countries	240	174	174	174	196	173	166	166	200	214	212	212	214	212

Notes: Yearly data from 2000 to 2015. All regressions include country and year fixed effects as well as initial population interacted with time fixed effects. Facebook Speakers is the average proportion of people speaking (as a first language) a language available in Facebook in each country and year. Clustering of standard errors is at the country level. Dependent variables are: log of 1 plus protests (column 1), number of violent internal conflicts of any intensity (column 2), number of internal conflicts producing 25–1,000 battle-related deaths in a given year (column 3), number of internal conflicts producing over 1,000 battle-related deaths in a given year (column 4), number of successful, attempted, plotted or alleged coup d'état events (a forceful seizure of executive authority and office that results in a change in the executive leadership and policies of the prior regime, column 5), number of irregular removals from office, when the executive leader was removed in contravention of explicit rules and established conventions (column 6), composite index of institutionalized democracy on a 0 (less democratic) to 10 (more democratic) scale (column 7), composite index of institutionalized autocracy on a 0 (less autocratic) to 10 (more autocratic) scale (column 8), combined freedom rating, average of Political Rights and Civil Liberties indices, on a 1 to 7 scale (column 9), and the following World Bank governance indicators on a scale of 0 (lowest rank) to 100 (highest rank): voice and accountability (column 10), government effectiveness (column 11), regulatory quality (column 12), rule of law (column 13), and control of corruption (column 14). Sources: GDELT (column 1), UCDP/PRIO Armed Conflict Dataset version 19.1 (columns 2 to 4), Coup D'État Events Dataset, 1946–2018, Center for Systemic Peace (column 5), Archigos Dataset on Leaders version 4.1 (column 6), Polity IV Project, Political Regime Characteristics and Transitions (columns 7 and 8), Freedom House (column 9), World Bank (columns 10 to 14).

Table A-10: Protests and Facebook Speakers
Robustness to Outliers and Dependent Variable Transformation

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable is...	log (1+ protests), without outliers	arcsinh (protests)	Protests>0	Protests>median	Protests>mean	days in month
A. National						
Facebook Speakers	0.2789	0.2452	0.0191	0.0449	0.0536	1.5366
	(0.0618)	(0.0861)	(0.0179)	(0.0248)	(0.0251)	(0.4727)
Observations	44,006	46,080	46,080	46,080	46,080	46,080
Countries	240	240	240	240	240	240
B. Subnational						
Facebook Speakers	0.2745	0.5652	0.0411	0.0411	0.0676	3.0135
	(0.0289)	(0.0942)	(0.0156)	(0.0156)	(0.0175)	(0.4910)
Observations	1,365,141	1,430,400	1,430,400	1,430,400	1,430,400	1,430,400
Polygons	7,110	7,450	7,450	7,450	7,450	7,450

Notes: Monthly data from January 2000 to December 2015. In Panel A the unit of observation is a country, and in Panel B a language polygon (region) within a country. In Panel A, all regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. In Panel B, all regressions include fixed effects for each country and month, region fixed effects and initial population interacted with month fixed effects. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook. Outliers, removed in column 1, are observations with residuals in the upper or lower 2.5% of the distribution in the corresponding baseline regression. arcsinh (protests) is the inverse hyperbolic sine transformation on the number of protests. Two-way clustering of standard errors is at the month and country levels.

Table A-11: Protests and Facebook Speakers
Non-linear Estimators

	(1)	(2)	(3)	(4)	(5)
	Dependent variable is...				
	Number of protests			*Probability*($Protests > 0$)	
Estimation	Quantile median	Negative binomial	Zero-inflated	Logit	Probit
Facebook Speakers	12.1162	0.4451	0.2637	0.2071	0.1074
	(1.5070)	(0.0730)	(0.1051)	(0.0490)	(0.03045)
Observations	46,080	46,080	46,080	46,080	46,080
Countries	240	240	240	240	240

Notes: Monthly data from January 2000 to December 2015. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. *Quantile regression* (at the median) includes country and month fixed effects and reports standard errors clustered at the country level. *Negative binomial regression* reports the fixed-effects estimator and includes quadratic time trends. *Zero-inflated negative binomial regression* includes country fixed effects and a quadratic time trend and reports standard errors clustered at the country level. *Logit regression* reports the fixed-effects estimator; *Probit regression* reports the random-effects estimator. *Negative binomial regression*, *Logit regression*, and *Probit regression* include quadratic trends and report bootstrapped standard errors (500 repetitions) as suggested by Cameron and Trivedi (2009). Marginal effects are reported for the *Logit* and *Probit* regressions.

Table A-12: Protests and Facebook Speakers
Dynamic Panel Data Estimations (Arellano-Bond)

	(1)	(2)	(3)	(4)	(5)
Dependent variable is $log(1 + protests)$					
Estimation...	Baseline	Arellano & Bond			
Facebook Speakers	0.2212	0.2598	0.2651	0.1888	0.2011
	(0.0777)	(2.72)	(3.12)	(2.34)	(2.27)
Lag 1		0.2392	0.2361	0.2505	0.2396
		(25.76)	(26.60)	(26.75)	(22.55)
Lag 2			0.0535	0.0576	0.0485
			(8.72)	(9.33)	(6.38)
Lag 3				0.0286	0.0202
				(4.52)	(2.70)
Lag 4				0.0264	0.0181
				(4.58)	(2.46)
Lag 5				0.0068	-0.0015
				(1.12)	(0.20)
Observations	46,080	45,600	45,360	44,640	43,440
Countries	240	240	240	240	240
pvalue AR(2)		0.00	0.00	0.49	0.78
P-value lags 6-10					0.17

Notes: Monthly data from January 2000 to December 2015. All regressions include country fixed, month fixed effects, country-specific quadratic trends, and initial population interacted with time fixed effects. In the Arellano-Bond estimation, we restrict the maximum lags for use as instruments to ten. Two-way clustering of standard errors is at the month and country levels in column 1 and Arellano-Bond robust standard errors in columns 2–5. P-value AR(2) is the p-value for a test of serial correlation in the residuals of the log protests series. In column 5, ten lags of log protests are included (but not reported) as controls. P-value lags 6–10 is the p-value of a test for the joint significance of these lags.

Table A-13: Protests and Facebook Speakers
Robustness to Speakers Definition

	(1) **Definition A** (Baseline)	(2) **Definition B** (Most spoken)	(3) **Definition C** (50%)	(4) **Definition D** (20%)
Dependent variable is $log(1 + protests)$				
Facebook Speakers*	0.2281	0.1438	0.1903	0.1701
	(0.0631)	(0.0515)	(0.0540)	(0.0516)
Observations	46,080	46,080	46,080	46,080
Countries	240	240	240	240

Notes: Monthly data from January 2000 to December 2015. *In **Definition A** Facebook Speakers is defined as in the baseline: the share of people in each country-month whose main language is already available in a Facebook platform. For the next columns, Facebook Speakers indicates whether, in a given country-month, a Facebook version had been released in: the most-spoken language (**Definition B**), a language spoken by more than 50% of the population (**Definition C**), or by more than 20% of population (**Definition D**). All regressions include country fixed effects, month fixed effects, country-specific quadratic trends, and initial population interacted with time fixed effects. Two-way clustering of standard errors is at the month and country levels.

Table A-14: Facebook Speakers and Reporting Biases

	(1)	(2)	(3)	(4)
	Panel A. Number of media outlets reporting protests			
	Dependent variable is statistic in column for number of outlets reporting			
	Mean	Median	Percentile 25	Percentile 75
Facebook Speakers	0.0044	-0.0079	0.0004	-0.0179
	(0.0351)	(0.0112)	(0.0064)	(0.0331)
Observations	32,121	32,121	32,121	32,121
Countries	237	237	237	237
	Panel B: Treating events in the same location or period as single events			
	Dependent variable is log of one plus protests, aggregation by...			
Panel B-1 (location)	None (Baseline)	Day-landmark	Day-Grid	Day-Country
Facebook Speakers	0.2210	0.2195	0.2191	0.1726
	(0.0777)	(0.0622)	(0.0621)	(0.0505)
Panel B-2 (period)	Week-Landmark	Week-Grid	Month-Landmark	Month-Grid
Facebook Speakers	0.2067	0.2069	0.1859	0.1870
	(0.0520)	(0.0517)	(0.0441)	(0.0437)
Observations	46,080	46,080	46,080	46,080
Countries	240	240	240	240

Notes: Monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects and country-specific quadratic trends. Facebook Speakers is the proportion of people speaking (as a first language) a language available in Facebook in each country and month. Panel A runs the baseline specification using different features of the distribution of the number of outlets reporting protests as the dependent variable, with the statistic used indicated in each column. In Panel B-1, instead of counting the total reported occurrences of protests by country-month as in the baseline (column 1), we construct alternative measures of protests, treating protests that occur in the same location, but are classified in GDELT as different protests, as a single event. In column 2, the location is the specific geographic coordinates provided in GDELT. In column 3 we use grids with a resolution of 5km × 5km, and in column 4 one location represents an entire country. Panel B-2 combines geographic and temporal aggregation by counting as one all protests that occur in a week and landmark (column 1), week and 5km × 5km grid (column 2), month and landmark (column 3), month and 5km × 5km grid (column 4). Two-way clustering of standard errors is at the month and country levels.

Table A-15: Individual-level Protest Participation and Facebook Robustness to Discriminating Participation and Intention to Participate

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable is							
	Effective protest				*Intention to protest*			
Panel A. World Values Survey								
Facebook Speaker	0.0475	0.0420	0.0443	0.0632	0.0453	0.0565	0.0438	0.0585
	(0.0167)	(0.0192)	(0.0169)	(0.0184)	(0.0210)	(0.0222)	(0.0195)	(0.0221)
Observations	159,572	159,494	159,572	159,572	204,212	204,135	204,212	204,212
Countries	90	90	90	90	90	90	90	90
Panel B. Afrobarometer								
Facebook Speaker	0.0352	0.0340	0.0368	0.0376	0.1211	0.1181	0.1202	0.1200
	(0.0369)	(0.0369)	(0.0367)	(0.0339)	(0.0415)	(0.0448)	(0.0417)	(0.0421)
Observations	92,432	92,418	91,695	90,985	116,848	116,833	115,929	115,094
Countries	36	36	36	36	36	36	36	36
Country × Year fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Language fixed effects	✓				✓			
Country × Language fixed effects		✓	✓	✓		✓	✓	✓
Age+Sex			✓	✓			✓	✓
Education+Wealth				✓				✓

Notes: Individual data from several rounds of each survey. See list of rounds in Figure 2. *Effective protest* is equals 1 if a respondent has participated in a demonstration and 0 if they have never participated (those who "would have" participated if they had the chance are excluded). *Intention to protest* equals 1 if the respondent "would have" participated if they had the chance and 0 if they have never participated (those who report participation are excluded). See Appendix Table A.1 for more details. Facebook Speaker is a dummy that equals 1 if Facebook has been released in the respondent's first language. Age and sex fixed effects included. Two-way clustering of standard errors is at the year and country levels.

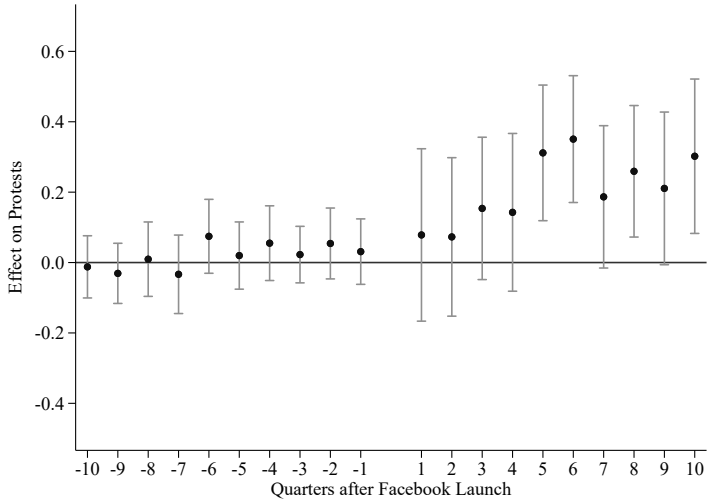
Table A-16: Trust and Satisfaction with the Government and with Democracy
The Effect of Facebook Speakers

Variable	Mean non speakers	Speakers effect
A1. Trust/Satisfaction with government (WVS)		
Trust parliament	0.4150	0.1583
	(0.0012)	(0.0595)
Trust courts	0.3728	0.0307
	(0.0012)	(0.0229)
Trust police	0.5333	0.0598
	(0.0012)	(0.0348)
Trust government	0.4666	0.1167
	(0.0012)	(0.0628)
Trust military	0.6329	0.0894
	(0.0011)	(0.0170)
Trust civil service	0.4708	0.0751
	(0.0012)	(0.0255)
Average A1	0.4847	0.0917
	(0.0008)	(0.0264)
A2. Trust/Satisfaction with government (ESS)		
Trust parliament	0.4528	0.0042
	(0.0006)	(0.0060)
Trust police	0.5979	-0.0034
	(0.0006)	(0.0025)
Trust courts	0.5204	0.0079
	(0.0006)	(0.0041)
Trust politicians	0.3640	0.0013
	(0.0005)	(0.0053)
Trust political parties	0.3576	-0.0014
	(0.0006)	(0.0068)
Satisfied government	0.4295	0.0006
	(0.0006)	(0.0071)
Average A2	0.4590	0.0005
	(0.0004)	(0.0046)
A3. Trust/Satisfaction with government (AB)		
Trust parliament	0.5557	0.0062
	(0.0015)	(0.0220)
Trust courts	0.6033	0.0084
	(0.0015)	(0.0296)
Trust police	0.5220	-0.0113
	(0.0015)	(0.0224)
Trust electoral commission	0.5504	-0.0074
	(0.0015)	(0.0291)
Trust president	0.6167	0.0373
	(0.0015)	(0.0255)
Trust ruling party	0.5236	-0.0192
	(0.0015)	(0.0216)
Trust opposition	0.3980	-0.0050
	(0.0015)	(0.0447)
Performance President	0.6612	-0.0237
	(0.0014)	(0.0216)
Performance Aseembly	0.5192	-0.0419
	(0.0016)	(0.0164)
Performance local councilor	0.5519	-0.0028
	(0.0016)	(0.0000)
Average A3	0.5535	-0.0070
	(0.0009)	(0.0117)
B1. Satisfied degree of democracy in country (WVS)		
Satisfied democracy	0.6054	0.0169
	(0.0010)	(0.0261)
B2. Satisfied degree of democracy in country (ESS)		
Satisfied democracy	0.5318	0.0098
	(0.0006)	(0.0068)
B3. Satisfied degree of democracy in country (AB)		
Satisfied democracy	0.5155	-0.0102
	(0.0015)	(0.0369)
C1. Support for democracy (WVS)		
Rejects one-man rule	0.6031	0.0241
	(0.0012)	(0.0677)
Rejects experts making decisions	0.3991	-0.0062
	(0.0012)	(0.0591)
Rejects military rule	0.7608	0.0278
	(0.0010)	(0.0450)
In favor of a democratic system	0.8985	0.0182
	(0.0007)	(0.0136)
Average C1	0.6683	0.0222
	(0.0006)	(0.0346)
C2. Support for democracy (AB)		
Rejects one-party rule	0.7837	-0.0492
	(0.0012)	(0.0156)
Rejects military rule	0.7872	-0.0378
	(0.0012)	(0.0410)
Rejects one-man rule	0.8529	-0.0275
	(0.0011)	(0.0240)
Support for democracy	0.7641	0.0136
	(0.0013)	(0.0348)
Choosing leaders in elections	0.8251	0.0093
	(0.0011)	(0.0148)
Checks parliament	0.6565	0.0901
	(0.0014)	(0.0706)
Checks opposition	0.3241	0.0075
	(0.0014)	(0.0214)
Checks media	0.7229	0.0089
	(0.0013)	(0.0225)
Parliament law making	0.7047	0.0613
	(0.0014)	(0.0300)
Checks court	0.7057	-0.0192
	(0.0014)	(0.0552)
Average C3	0.7098	0.0055
	(0.0006)	(0.0280)

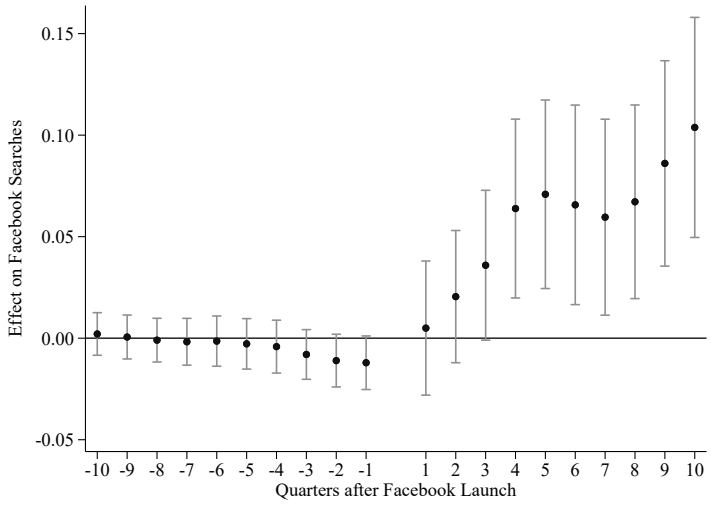
Notes: Individual data from several rounds of each survey. WVS is World Values Survey, ESS is European Social Survey, and AB is Afrobarometer. Odd-numbered columns report the average for each outcome listed in the rows (and its standard error) for non-Facebook Speakers. Even-numbered columns report the coefficient for Facebook Speaker in regressions with country× year fixed effects, country × language fixed effects, and age and sex fixed effects. Detailed definitions of each outcome are in Appendix Table A-1. Facebook Speaker is a dummy that equals 1 if Facebook has been released in the respondent's first language. Two-way clustering of standard errors is at the year and country levels.

Figure A-1: Parallel Trends in Protests Before Facebook
Alternative Approach to Exploring Anticipated Effects of Facebook Speakers

A. Protests

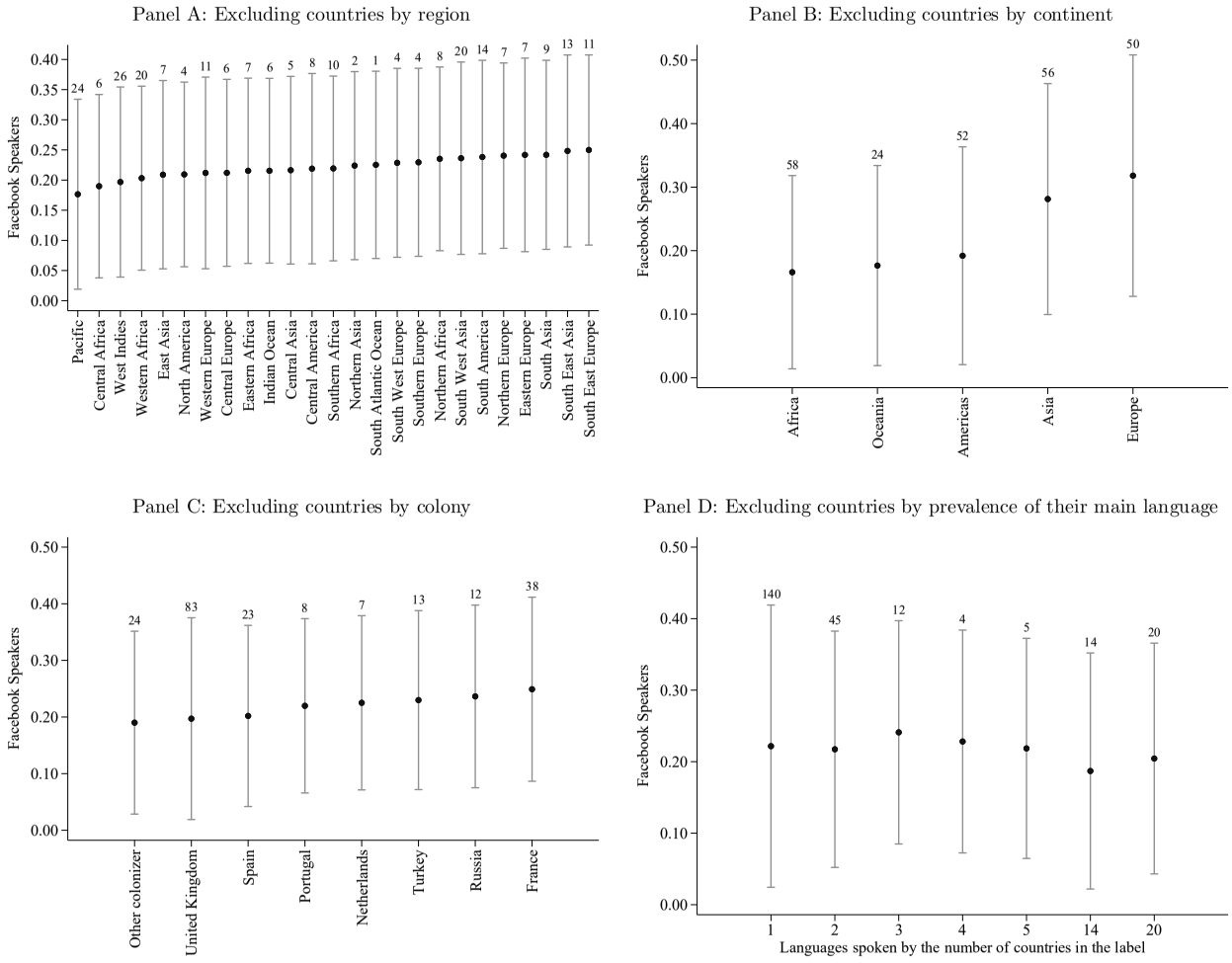


B. Facebook Searches



Notes: Each panel presents estimates from a modified version of the baseline regression in equation (1) with Protests (Panel A) or Facebook Searches (Panel B) as the dependent variable. In addition to country and time fixed effects, quadratic country-specific trends, and initial population × time fixed effects, we include and plot the coefficients for: (a) quarter dummies for the periods leading up to the availability of Facebook in the country's main language (marked with negative integers in the horizontal axis) and (b) quarter dummies after this first adoption interacted with Facebook Speakers (positive integers in the horizontal axis). Coefficients are reported with 95% confidence bands, allowing for two-way clustered standard errors at the country and month levels.

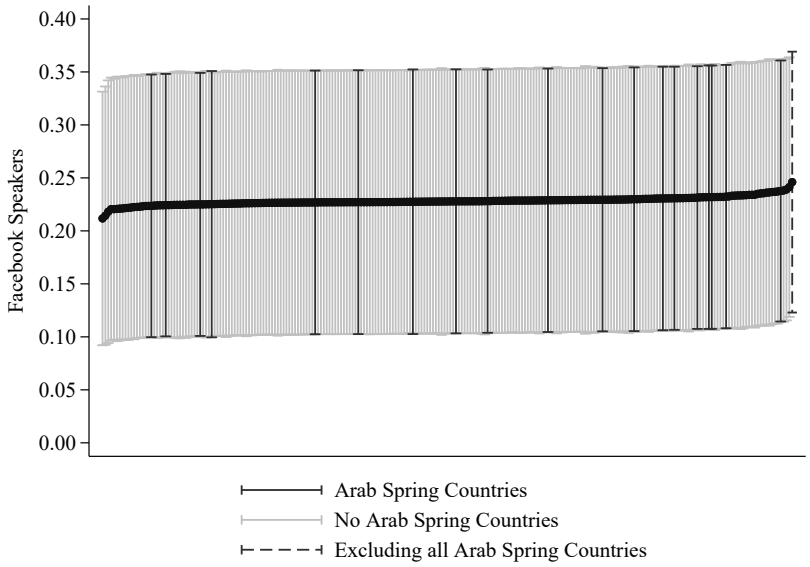
Figure A-2: The Effect of Facebook Speakers on Protests
Robustness to Excluding Country Clusters



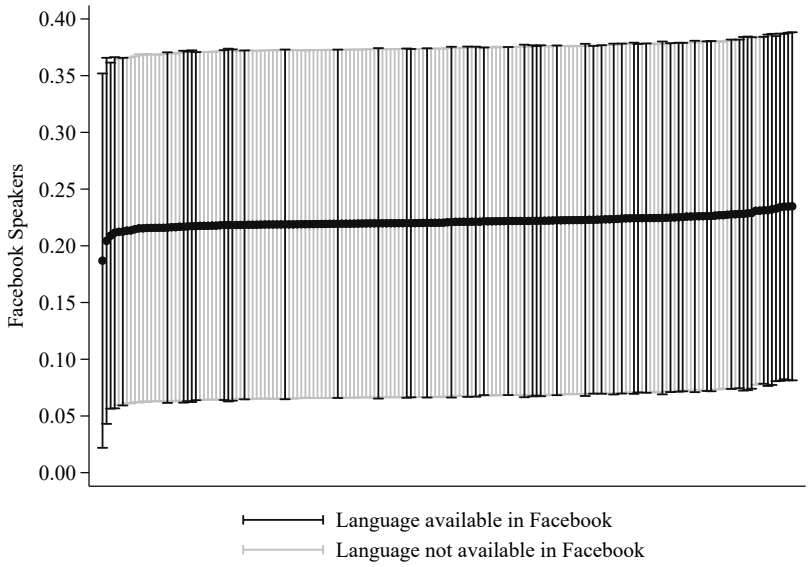
Notes: The figure reports the coefficients for Facebook Speakers (and 95% confidence intervals) in a regression for log of (one plus) protests at the country level with monthly data from January 2000 to December 2015, including country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. Different groups of countries are excluded in each case, with the number of excluded countries indicated over each bar. Excluded groups are: regions (Panel A), continents (Panel B), and colonies by former colonizer (Panel C). Panel D excludes countries according to how widespread each language is worldwide: the first bar excludes all countries for which the main/most popular language is only spoken in that country, the second removes all countries whose main language is the most popular language in two countries, and so on.

Figure A-3: The Effect of Facebook Speakers on Protests Robustness to Excluding Countries and Languages

Panel A: Excluding each country

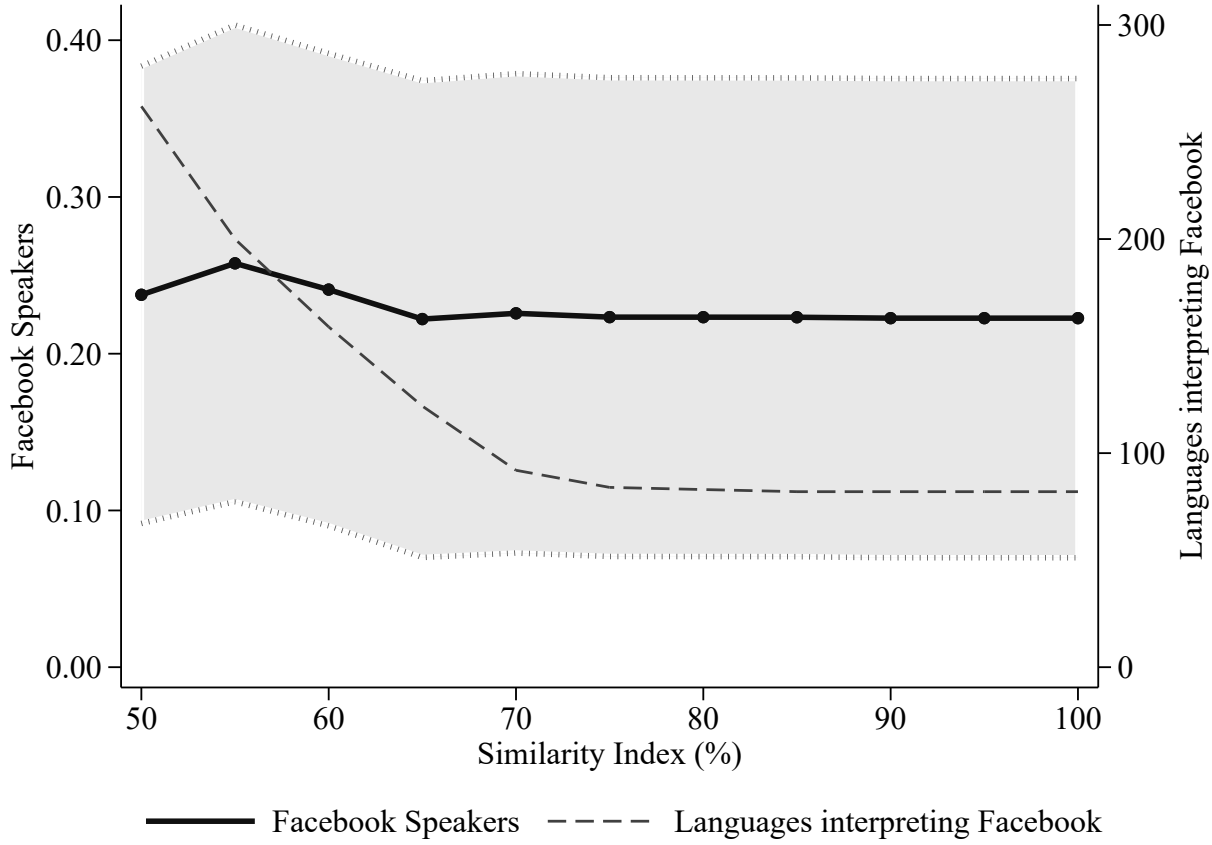


Panel B: Excluding each language available in Facebook



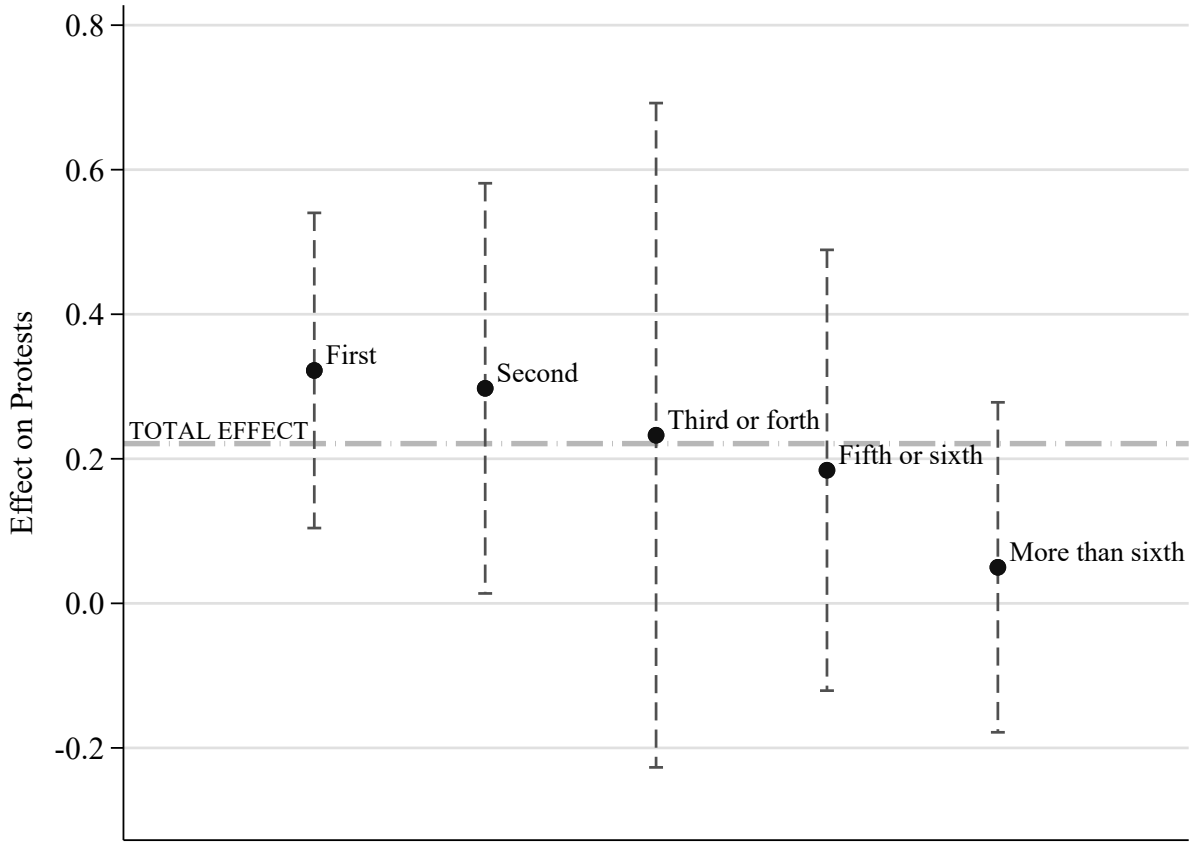
Notes: Country-level regression with monthly data from January 2000 to December 2015. All regressions include country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. Panel A plots the coefficient and confidence intervals for Facebook Speakers when excluding each country (or groups of countries, as noted in the label). Panel B instead excludes, for all languages in the dataset, all countries where the language is the most spoken language.

Figure A-4: The Effect of Facebook Speakers on Protests Addressing Spillovers Between Similar Languages



Note: Estimates from regression in equation (1) with country and time fixed effects, quadratic country-specific trends, and initial population × time fixed effects. The figure plots the coefficient of Facebook Speakers, modified to assume that when a language version is launched, people who speak similar languages (with a similarity index at least as large as indicated in the horizontal axis) can understand this version. 95% confidence bands are shaded. Two-way clustering of standard errors is at the month and country levels.

Figure A-5: Protests and Facebook Speakers
Differential Effects by Order of Appearance of Corresponding Writing System



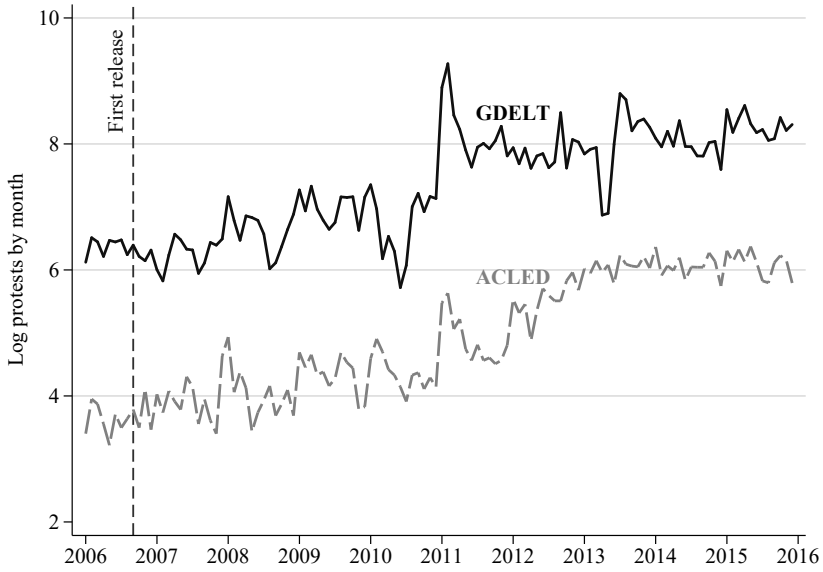
Notes: The figure breaks down the effect of Facebook Speakers according to the order in which the platforms were launched in each writing system. Let R_l be such order/rank. For example, $R_l = 2$ for platforms/languages such as Spanish, Panjabi or Serbian that were launched second in their corresponding writing system (Latin, Arabic and Cyrillic, respectively). They were launched after English, Arabic and Russian for which $R_l = 1$. Then Facebook Speakers at writing system order "r" can be calculated as:

$$\text{Facebook Speakers}^r_{c,t} = \left(\sum_l \text{Facebook}_{t,l} \times \text{Speakers}_{c,l} \times \mathbb{1}\{R_l = r\} \right)$$

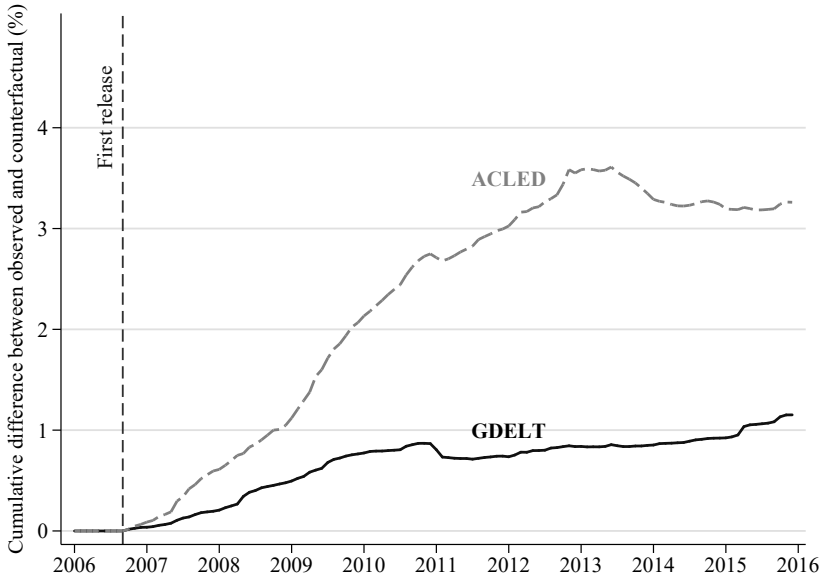
The figure reports the coefficient of five subgroups r (1 to 5 and greater than or equal to 6) in a regression for log of (one plus) protests at the country level with monthly data from January 2000 to December 2015, including country fixed effects, month fixed effects, initial population interacted with time fixed effects, and country-specific quadratic trends. Since $\text{Facebook Speakers}_{c,t} = \sum_r \text{Facebook Speakers}^r_{c,t}$, the total effect of Speakers is a weighted average of the subgroups.

Figure A-6: GDELT vs ACLED: Differences in Protests and Cumulative Effects of Facebook Speakers

Panel A: Evolution of the number of protests in Africa

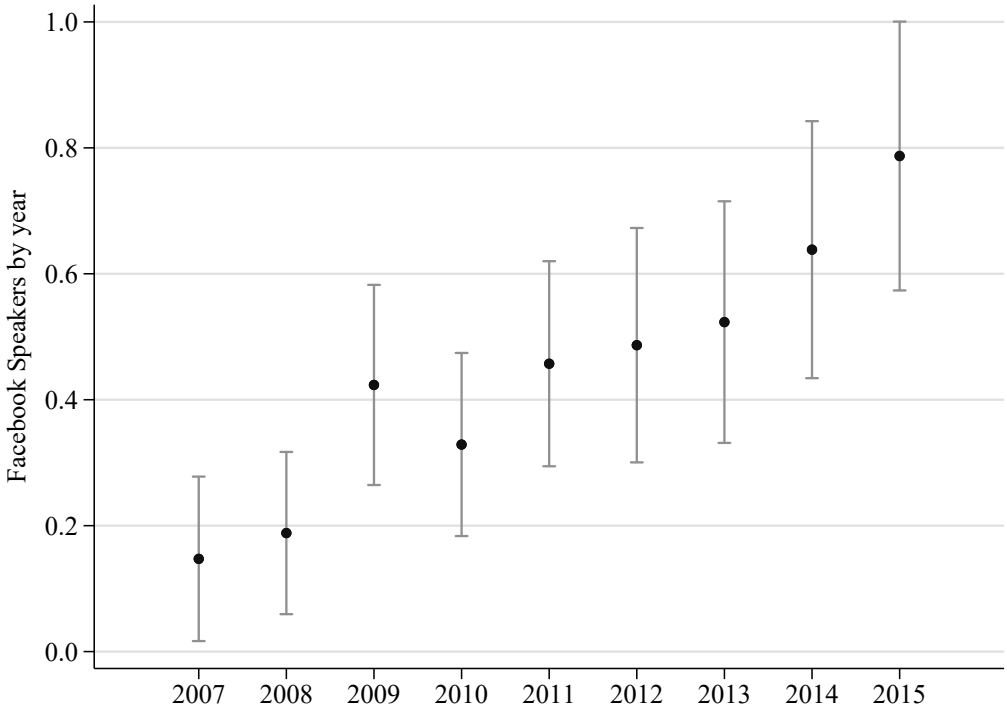


Panel B: Cumulative effect of Facebook Speakers in Africa, GDELT versus ACLED



Notes: To construct the counterfactual in Panel B, we estimate the number of protests that would have been observed without Facebook (if Facebook Speakers are held constant at zero throughout the period) as implied by our baseline subnational estimates using each protest database (restricted to Africa where both sources are available). We then depict the cumulative difference since September 2006 (when Facebook first appeared) between protests with and without Facebook (expressed as a percent of total cumulative protests without Facebook up to each time period).

Figure A-7: The Effect of Facebook Speakers on Protests
Heterogenous Effects by Year



Notes: Coefficients, and 95% confidence bands, for the interaction of Facebook Speakers with year dummies in the baseline subnational regression for log(1+ protests) as described in equation 3.