

SUPPLEMENT TO “SOCIAL MEDIA AND PROTEST PARTICIPATION:
EVIDENCE FROM RUSSIA”

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APPENDIX: THEORETICAL MODEL

IN THE SUPPLEMENTAL MATERIAL, we expand on how we construct our theoretical framework. Building on the work by Little (2016), we examine how, by providing more precise information about the quality of the government and protest logistics, social media can affect the number of people choosing to turn out to protest or express support for the authoritarian regime. We also explore the way the effect of social media depends on city size and the existence of threshold behavior in the relationship between VK penetration and protests.

SA.1. *Protests in Autocracy*

In this section, we examine the potential ramifications of social media for protest participation. The setup of the model is as follows. There is a continuum of risk-neutral citizens, $i \in [0, 1]$. First, nature draws common priors about the regime quality, ω , and protest tactics, θ . The common priors on ω and θ are distributed as $N(0, 1/\alpha_0)$ and $N(0, 1/\beta_0)$, respectively. The public signals are then drawn as $s_\omega \sim N(\omega, 1/\alpha_s)$ and $s_\theta \sim N(\theta, 1/\beta_s)$. A random cost of protesting, which is separate from the costs of mismatching tactics, is drawn as $c_{pi} \sim N(\mu_{pc}, \sigma_{pc}^2)$. Each citizen then maximizes

$$u_p(p_i, t_i) = p_i[-\bar{\omega} + \lambda_p P - k(t_i - \theta)^2 - c_{pi}],$$

where p_i is the protest decision indicator which equals 1 if i goes out to protest and zero otherwise; t_i is the tactics decision of an individual; $k(t_i - \theta)^2$ represent the costs of mismatching tactics; P is the proportion of citizens who turn out to protest, and $\lambda_p \geq 0$ is a reduced form strategic coordination parameter, which reflects the social image parameter as in Enikolopov, Makarin, Petrova, and Polishchuk (2017) and a number of other potential channels (e.g., safety in numbers). In this version of the model, all citizens update their priors about the regime based on the same information, so that citizens' belief about the regime's popularity, $\bar{\omega}$, does not vary with i . However, the cost of participating in a

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protest, c_{pi} , is drawn at random for each individual, so their decisions to protest against the regime or abstain will still differ.

Note that, in addition to providing more precise information about the regime, ω , social media can also help individuals coordinate on protest tactics, θ , that is, when, where, and how to protest against the regime. These forces reflect the information and the coordination channels, respectively.

Upon observing the public signal, s_ω , citizens update their beliefs about regime quality, ω , as follows:

$$\bar{\omega} = \mathbb{E}[\omega + s_\omega] = \frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s}.$$

Similarly, upon observing signal s_θ , citizens update their beliefs about the tactics of the upcoming protest:

$$\bar{\theta} = \mathbb{E}[\theta + s_\theta] = \frac{s_\theta \beta_s}{\beta_0 + \beta_s}.$$

Since citizens would like to match the true θ as closely as possible, in optimum, they set $t_i = \bar{\theta}$. By definition, the expected level of the discrepancy between $\bar{\theta}$ and θ is equal to the variance of $\bar{\theta}$, that is, formally:

$$\mathbb{E}[k(\bar{\theta} - \theta)^2] = \frac{k}{\beta_0 + \beta_s}.$$

Having updated their beliefs about the regime and the tactics, each citizen then decides whether to participate in a protest or not, given the expected benefits and the expected costs. They go out to protest if

$$-\frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_p \mathbb{E}[P|s_\omega, s_\theta] > \frac{k}{\beta_0 + \beta_s} + c_{pi}. \quad (2)$$

Note that citizens with $c_{pi} < -s_\omega \alpha_s / (\alpha_0 + \alpha_s) - k / (\beta_0 + \beta_s)$ are going to protest regardless of the protest participation decision of others, while citizens with $c_{pi} > \lambda_p - s_\omega \alpha_s / (\alpha_0 + \alpha_s) - k / (\beta_0 + \beta_s)$ will not participate regardless. In equilibrium, there will be a cut-off value of the individual cost of protesting, \hat{c}_p , in between these two values, such that citizens with a realized cost below the cut-off value will go out to protest, and citizens with a realized cost above the cut-off will abstain. To identify the voting cut-off, \hat{c}_p , we need to calculate the expected proportion of people voting for the government given the public signals, s_ω and s_θ :

$$\mathbb{E}[P|s_\omega, s_\theta] = \Pr[c_{pi} \leq \hat{c}_p(s_\omega) | s_\omega, s_\theta] \quad (3)$$

$$= \Pr\left[\frac{c_{pi} - \mu_{pc}}{\sigma_{pc}} \leq \frac{\hat{c}_p(s_\omega, s_\theta) - \mu_{pc}}{\sigma_{pc}}\right] = \Phi\left[\frac{1}{\sigma_{pc}}(\hat{c}_p(s_\omega, s_\theta) - \mu_{pc})\right]. \quad (4)$$

Hence, the cut-off level, \hat{c}_p , is determined by the following equation:

$$-\frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_p \Phi\left[\frac{1}{\sigma_{pc}}(\hat{c}_p(s_\omega, s_\theta) - \mu_{pc})\right] - \frac{k}{\beta_0 + \beta_s} - \hat{c}_p(s_\omega, s_\theta) = 0. \quad (5)$$

The comparative statics of the cut-off with respect to the public signal of regime strength (s_ω) and social media (i.e., increased precision of public signals, α_s and β_s) are as follows:

$$\frac{\partial \hat{c}_p}{\partial s_\omega} = \frac{-\frac{\alpha_s}{\alpha_0 + \alpha_s}}{1 - \frac{\lambda_p}{\sigma_{pc}} \phi\left(\frac{1}{\sigma_{pc}}(\hat{c}_p - \mu_{pc})\right)}, \quad (6)$$

$$\frac{\partial \hat{c}_p}{\partial \beta_s} = \frac{\frac{k}{(\beta_0 + \beta_s)^2}}{1 - \frac{\lambda_p}{\sigma_{pc}} \phi\left(\frac{1}{\sigma_{pc}}(\hat{c}_p - \mu_{pc})\right)}, \quad (7)$$

$$\frac{\partial \hat{c}_p}{\partial \alpha_s} = \frac{-\frac{s_\omega \alpha_0}{(\alpha_0 + \alpha_s)^2}}{1 - \frac{\lambda_p}{\sigma_{pc}} \phi\left(\frac{1}{\sigma_{pc}}(\hat{c}_p - \mu_{pc})\right)}. \quad (8)$$

We assume that λ_p is sufficiently small so that the denominator of the above fractions is positive. This is necessary for a meaningful equilibrium in which a positive public signal about an autocrat decreases the size of a protest. We conclude that: (i) protest size decreases with a more favorable public signal about the regime (i.e., $\partial \hat{c}_p / \partial s_\omega < 0$), (ii) protest size increases when citizens receive a more precise signal about the protest tactics (i.e., $\partial \hat{c}_p / \partial \beta_s > 0$), and (iii) protest size increases when citizens receive a more precise signal about the regime conditional on the signal being negative (i.e., $\partial \hat{c}_p / \partial \alpha_s > 0$ if $s_\omega < 0$) and decreases with signal precision if the signal provides positive information about the regime (i.e., $\partial \hat{c}_p / \partial \alpha_s < 0$ if $s_\omega > 0$). Thus, we derive our central empirical prediction from this analysis:

PREDICTION 1: *Higher social media penetration (higher α_s and β_s) leads to higher protest participation against the ruling regime if the content of social media (public signal s_ω) is, on average, negative. However, even when the content online is positive, social media could increase protest participation if the gains in coordination (higher β_s) are high enough.*

SA.2. Voting in Autocracy

In the previous section, we have established that, according to the information channel, social media could increase or decrease protest intensity depending on whether it contains positive or negative content about the regime. In this section, we argue that which direction this channel goes in our context can be inferred from the effect of social media penetration on voting in favor of the regime. To guide this analysis, we present the model of social media and voting in an authoritarian regime. Note that, rather than examine the choice between multiple political candidates, we consider a citizen deciding whether to support a ruling party or abstain. We believe that this setup better matches the reality of quasi-authoritarian elections in Russia.

Building on the previous section, there is a continuum of risk-neutral citizens, $i \in [0, 1]$. The nature draws a common prior belief about the regime quality, ω , which is distributed as $N(0, 1/\alpha_0)$. Note that, as the voting decision does not require coordination, there is no tactical component, θ , in this version of the model. The public signal about ω is drawn,

$s_\omega \sim N(\mu_s, 1/\alpha_s)$. The cost of voting for citizen i is drawn as $c_{vi} \sim N(\mu_{vc}, \sigma_{vc}^2)$. Each citizen then maximizes

$$u_v(v_i) = v_i[\bar{\omega} + \lambda_v V - c_{vi}],$$

where v_i is a voting decision indicator, which equals 1 if i votes for an autocrat and zero otherwise; $\lambda_v \geq 0$ is a taste-for-conformity parameter; and V is the proportion of citizens who voted for the autocrat.

The citizens' updated belief about the regime's quality, ω , upon observing the public signal, s_ω , is

$$\bar{\omega} = \mathbb{E}[\omega + s_\omega] = \frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s}.$$

Having updated their beliefs about the regime, citizens compare the benefits of voting with their individual costs, c_{vi} . As in the case of protests, note that citizens with $c_{vi} < s_\omega \alpha_s / (\alpha_0 + \alpha_s)$ will vote for the ruling party no matter what others do, while citizens with $c_{vi} > s_\omega \alpha_s / (\alpha_0 + \alpha_s) + \lambda_v$ will abstain regardless of the voting decision of others. In equilibrium, there will be a cut-off value of individual cost, \hat{c}_v , between these two values, such that citizens with realized costs of voting below the cut-off value will vote for the incumbent, and all citizens with realized costs above this cut-off will not vote for the ruling party. The cut-off level, \hat{c}_v , is determined by the following equation:⁵⁷

$$\hat{c}_v(s_\omega) = \frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_v \Phi \left[\frac{1}{\sigma_{vc}} (\hat{c}_v(s_\omega) - \mu_{vc}) \right]. \quad (9)$$

The comparative statics of the costs cut-off w.r.t. s_ω and α_s are as follows:

$$\frac{\partial \hat{c}_v}{\partial s_\omega} = \frac{\frac{\alpha_s}{\alpha_0 + \alpha_s}}{1 - \frac{\lambda_v}{\sigma_{vc}} \phi \left(\frac{1}{\sigma_{vc}} (\hat{c}_v - \mu_{vc}) \right)}, \quad (10)$$

$$\frac{\partial \hat{c}_v}{\partial \alpha_s} = \frac{\frac{s_\omega \alpha_0}{(\alpha_0 + \alpha_s)^2}}{1 - \frac{\lambda_v}{\sigma_{vc}} \phi \left(\frac{1}{\sigma_{vc}} (\hat{c}_v - \mu_{vc}) \right)}. \quad (11)$$

As in the case of protests, we assume that the taste-for-conformity parameter, λ_v , is sufficiently small so that the denominator of the above fractions is positive. This is necessary for a meaningful equilibrium in which a positive public signal about an autocrat increases the amount of votes in favor of the regime, that is, $\partial \hat{c}_v / \partial s_\omega > 0$.

An increase in social media penetration can be interpreted as an increase in the precision of the public signal, α_s . Thus, similarly to the case of protests, social media increases support for an autocrat ($\partial \hat{c}_v / \partial \alpha_s > 0$) whenever the public signal is favorable to the regime ($s_\omega > 0$) and decreases support ($\partial \hat{c}_v / \partial \alpha_s < 0$) whenever the public signal is unfavorable ($s_\omega < 0$). Hence, we draw our second empirical prediction:

PREDICTION 2: *Higher social media penetration (i.e., higher α_s) leads to higher (lower) vote share of the ruling party if the content of social media (i.e., public signal s_ω) is, on average, positive (negative).*

⁵⁷Note that in the case of $\lambda_v = 0$, the solution becomes a simple Bayesian updating.

SA.3. City Size and Coordination Channel

In Section SA.1, we established that social media may affect protest participation along two different channels—by increasing the precision of the public signal about the quality of the regime (information channel) and by increasing the precision of the tactics signal (coordination channel). In Section SA.2, we argued that the information channel can be studied by looking at the impact of social media on voting in favor of the regime. In this section, we further attempt to separate the two channels. We provide an extension of the theoretical framework that yields an additional prediction: the extent to which the effect of social media depends on city size is different for these two channels.

Consider N cities of different size. Assume that the larger the city size, the more difficult it is logistically to coordinate protest activities due to the need of coordinating a larger group of people. In terms of our theoretical framework, that means that the prior signal about the protest tactics is noisier in larger cities, $\beta_0^1 > \beta_0^2 > \dots > \beta_0^N$ where cities are ordered monotonically in city size, from the smallest city ($i = 1$) to the largest one ($i = N$).⁵⁸ Importantly, only public signals from people from the same city are relevant for coordination, whereas for information about regime quality there is no difference between signals from the same and other cities. Thus, due to the transmission of information about regime quality across cities, which is not present for protest tactics, the baseline dispersion of the prior signal about regime quality is assumed to be the same across cities, $\alpha_0^1 = \dots = \alpha_0^N = \alpha_0$.⁵⁹ Since there are no other interactions between individuals in different cities, for each city, calculations in Section SA.1 do apply.

Equation (7) implies that, if λ is small enough, the impact of social media on protest participation via coordination exhibits diminishing returns, $\partial^2 \hat{c}_p / \partial \beta_0^i \partial \beta_s < 0, \forall i \in [1, N]$.⁶⁰ An immediate corollary of this result is that social media should be more important in places where coordination is harder to achieve in the absence of public signals, that is, in cities with lower β_0^i . Although the effect of social media on protest participation via information may also exhibit diminishing returns, we would not expect it to increase in magnitude with city size, since there is little reason to believe that the ex ante public signal regarding popularity of the federal regime is noisier in larger cities. This analysis leads to an additional prediction that the impact of social media should be greater in larger cities due to a stronger marginal effect of social media on coordination; in contrast, the impact of social media on voting should not increase with city size, as it relies primarily on the information channel.

PREDICTION 3: *The impact of social media on protest participation is larger in areas where coordination is hard to achieve in the absence of public signals (low initial β_0). In particular, the effect of social media on protest participation increases with city size. In contrast, the impact of social media on voting in favor of the regime does not increase with city size.*

⁵⁸Intuitively, this prediction can be micro-founded in the following extension of the baseline model. Suppose that there are offline word-of-mouth sources of information and online social media. The number of signals that citizens receive offline via friends and family who live in the same city, F , is independent of the city size, N . However, online, citizens can quickly communicate with an extended circle of friends and acquaintances, who can come either from the same or other cities. Suppose that the number of signals citizens receive online from other people from the same city $E(N)$ is increasing with city size, that is, $\partial E(N) / \partial N > 0$. In this setting, the baseline precision of the public signal about the protest tactics would be more precise in smaller cities and, as a result, the importance of social media for coordination should increase with city size.

⁵⁹For the public signal about the popularity of the regime, however, the precision of the signal does not depend on the size of the city (but does depend on the size of the whole social network).

⁶⁰See the derivation of this result, as well as the precise condition on lambda, in Section A.1 of the Supplemental Material.

SA.4. Social Media Penetration and the Critical Mass

In this section, we explore another extension of the model, predicting that social media should start to matter for protest participation only after its penetration reaches a certain threshold.

Suppose all citizens fall into two categories—those who adopted social media and those who did not. The share of social media adopters is m . In this section, similarly to the reasoning in Section SA.3, we assume that the precision of the public signal about the regime is the same for all citizens, including non-adopters. However, only adopters enjoy higher precision of the tactics signal, that is, $\beta_s^a > \beta_s^n$, where a denotes a social media adopter while n indicates that a citizen did not adopt social media. We take the adoption decision as exogenous throughout this section.

Following the calculations in Section SA.1, one can show that adopters and non-adopters would have different participation thresholds, \hat{c}_p^a and \hat{c}_p^n , defined by the following pair of equations:

$$-\frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_p P = \frac{k}{\beta_0 + \beta_s^a} + \hat{c}_p^a, \quad (12)$$

$$-\frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_p P = \frac{k}{\beta_0 + \beta_s^n} + \hat{c}_p^n. \quad (13)$$

Note that the total share of protesters now consists of two different types of participants—adopters and non-adopters:

$$P = m \Pr[c_i \leq \hat{c}_p^a | \bar{s}_\omega, \bar{s}_\theta^a] + (1 - m) \Pr[c_{pi} \leq \hat{c}_p^n | \bar{s}_\omega, \bar{s}_\theta^n].$$

To understand how protest participation changes with m and whether, other things held constant, higher social media adoption could trigger a protest after reaching a certain critical mass, we study the comparative statics of the cost thresholds, \hat{c}_p^a and \hat{c}_p^n , and protest participation, P , with respect to social media penetration, m . Subtracting equation (13) from equation (12), one gets

$$\hat{c}_p^a - \hat{c}_p^n = \frac{k(\beta_s^a - \beta_s^n)}{(\beta_0 + \beta_s^a)(\beta_0 + \beta_s^n)} = K > 0.$$

Note that $\hat{c}_p^a > \hat{c}_p^n$, meaning that the fraction of adopters who participate in protests is higher than the fraction of non-adopters who do, due to the higher precision of their information regarding tactics. Expressing \hat{c}_p^a in terms of K and \hat{c}_p^n and plugging in the result in (13), one gets

$$-\frac{s_\omega \alpha_s}{\alpha_0 + \alpha_s} + \lambda_p \left[m \Phi\left(\frac{1}{\sigma_c}(\hat{c}_p^n + K - \mu_c)\right) + (1 - m) \Phi\left(\frac{1}{\sigma_c}(\hat{c}_p^n - \mu_c)\right) \right] = \frac{k}{\beta_0 + \beta_s^n} + \hat{c}_p^n. \quad (14)$$

For the ease of exposition, denote $\bar{c}_p^n = (\hat{c}_p^n + K - \mu_{pc})/\sigma_{pc}$ and $\underline{c}_p^n = (\hat{c}_p^n - \mu_{pc})/\sigma_{pc}$. Applying the implicit function theorem to equation (14), we derive the first derivative of the non-adopters participation, \hat{c}_p^n , with respect to social media penetration, m :

$$\frac{\partial \hat{c}_p^n}{\partial m} = \frac{\lambda_p [\Phi(\bar{c}_p^n) - \Phi(\underline{c}_p^n)]}{1 - \frac{\lambda_p}{\sigma_{pc}} [m \phi(\bar{c}_p^n) + (1 - m) \phi(\underline{c}_p^n)]} > 0. \quad (15)$$

Since $\hat{c}_p^a = K + \hat{c}_p^n$, where K is a constant, this result also implies that $\partial \hat{c}_p^a / \partial m > 0$. Hence, as the take-up of social media in the population grows, both adopters and, interestingly, non-adopters go out to protest with a higher probability. As a result, the total share of protesters, P , is also monotonically increasing with m :

$$\frac{\partial P}{\partial m} = (\Phi(\bar{c}_p^n) - \Phi(\underline{c}_p^n)) \frac{\partial \hat{c}_p^n}{\partial m} \frac{1}{\sigma_{pc}} (m\phi(\bar{c}_p^n) + (1 - m)\phi(\underline{c}_p^n)) > 0.$$

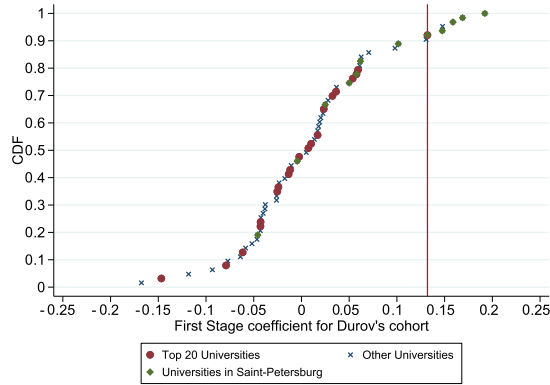
Assume now that, after citizens made their participation decisions, a protest gets organized only if the total share of citizens who would like to participate exceeds some threshold P^* .⁶¹ Since the share of people willing to participate is monotonically increasing in m , there is a unique threshold of social media penetration m^* such that, other parameters held equal, protests are organized in cities above this threshold and are not in cities below it.⁶² Hence, we conclude with the following empirical prediction:

PREDICTION 4: *Higher rates of social media adoption (higher m) lead to higher protest participation (higher P). Moreover, if protests take place after a certain critical mass of potential participants is accumulated, we expect protests to occur only after social media penetration reaches a certain threshold, m^* .*

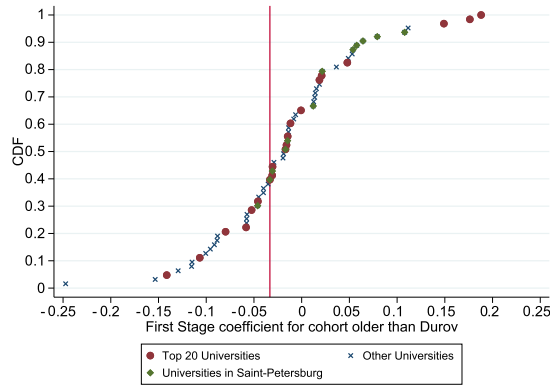
⁶¹Such threshold behavior naturally arises if political protests are modeled in a more elaborate global game setting (e.g., as in Edmond, 2013).

⁶²Note that, in this model, the location of the threshold for VK penetration depends not only on the critical mass needed for a successful protest (P^*), but also on the relative importance of strategic and logistical coordination (λ_p and k , respectively), relative importance of social media signal for belief update ($\beta_s^a - \beta_s^n$), and the within-city deviation of costs distribution (σ_{pc}).

A: Distribution of students in Durov's cohort (+- 2 years from Durov).



B: Distribution of students in younger cohort



C: Distribution of students in older cohort

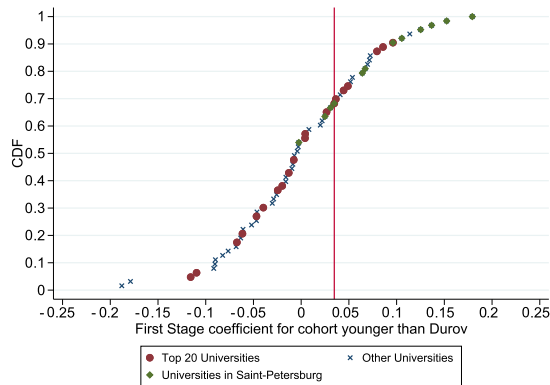


FIGURE SA.1.—First stage coefficients for 65 universities in Russia. *Notes:* These figures draw comparisons between the first stage coefficients displayed on Figure 1 and the coefficients from the same specification, but estimated with the log of the number of students from other 62 top Russian universities, as opposed to SPbSU. Red vertical lines indicate the SPbSU coefficients from Figure 1. Red dots represent the first stage coefficients for the top-20 universities, such as MSU, SPbSPU, etc. Green dots represent the first stage coefficients for the top-63 Russian universities that are located in St. Petersburg. Blue crosses represent the first stage coefficients for the other 63 universities.

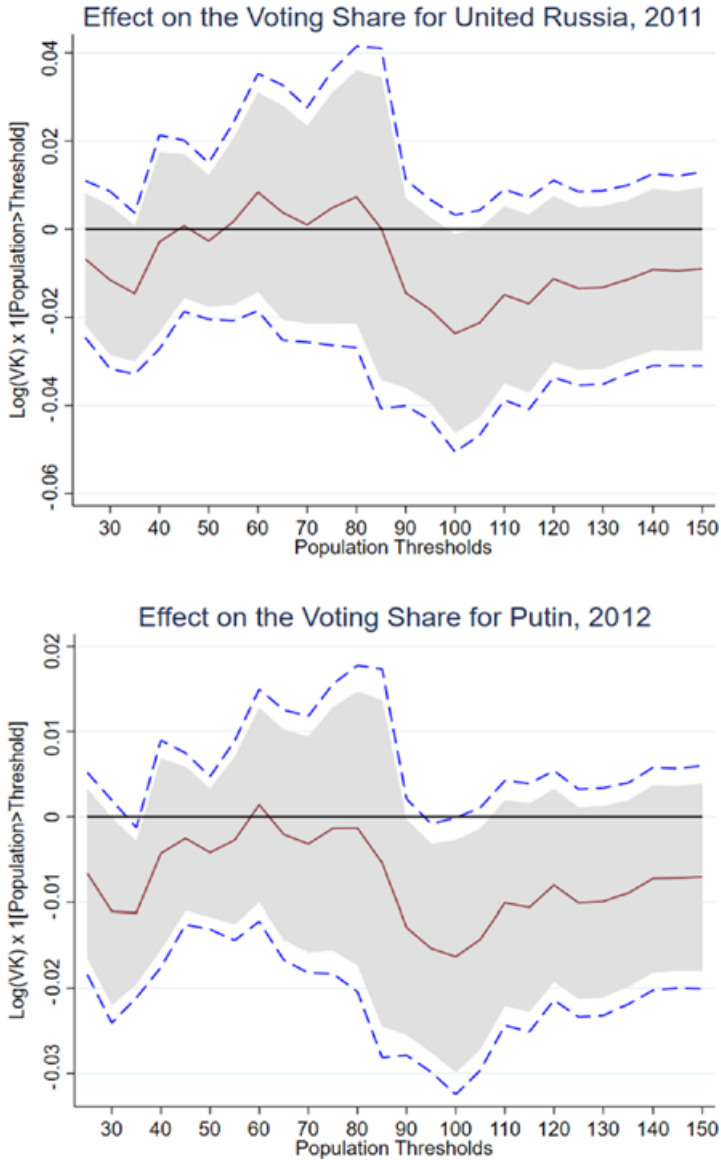


FIGURE SA.2.—Magnitude of the effect of social media on voting outcomes as a function of population threshold. *Notes:* The graphs display the additional effect of VK penetration on the vote share for United Russia in 2011 and vote share for Putin in 2012 in larger cities. Specifically, in the baseline IV specification, both the instrument and the endogenous variable are interacted with the indicator for whether the city population exceeds a certain threshold, in addition to including the instrument and the endogenous variable on their own. The figures show the resulting coefficients on the interaction between VK penetration and the population indicator, varying the population threshold on the x-axis (in thousands). Gray areas show the 10% confidence intervals. Dashed lines display the 95% confidence intervals.

TABLE SA.I
 STUDENT COHORTS AND PROTEST PARTICIPATION IN 2011—REDUCED FORM ESTIMATION^a

	Incidence of Protests, Dummy, Dec 2011				Log (Number of Protesters), Dec 2011			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (SPbSU students), same 5-year cohort as VK founder	0.062 [0.020]	0.062 [0.020]	0.064 [0.020]	0.066 [0.020]	0.253 [0.114]	0.256 [0.113]	0.264 [0.115]	0.276 [0.115]
Log (SPbSU students), one cohort younger than VK founder	0.012 [0.020]	0.011 [0.020]	0.009 [0.020]	0.013 [0.020]	0.152 [0.105]	0.147 [0.104]	0.134 [0.105]	0.159 [0.106]
Log (SPbSU students), one cohort older than VK founder	-0.017 [0.020]	-0.016 [0.020]	-0.018 [0.020]	-0.014 [0.020]	-0.075 [0.113]	-0.072 [0.113]	-0.082 [0.112]	-0.068 [0.114]
Regional center	-0.015 [0.099]	-0.011 [0.097]	-0.007 [0.096]	-0.013 [0.098]	0.287 [0.488]	0.304 [0.480]	0.333 [0.480]	0.291 [0.490]
Distance to Saint Petersburg, km	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]	0.000 [0.000]	-0.000 [0.000]	0.000 [0.000]
Distance to Moscow, km	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]	-0.000 [0.000]
Rayon center (county seat)	-0.001 [0.009]	0.001 [0.009]	-0.007 [0.010]	-0.010 [0.011]	0.003 [0.044]	0.007 [0.046]	-0.031 [0.048]	-0.045 [0.054]
Log (average wage), city-level, 2011	0.021 [0.034]	0.041 [0.037]	0.009 [0.036]	-0.013 [0.034]	0.100 [0.176]	0.171 [0.186]	0.009 [0.193]	-0.066 [0.182]
Presence of a university in a city, 2011	0.196 [0.098]	0.194 [0.098]	0.193 [0.097]	0.198 [0.098]	0.870 [0.423]	0.869 [0.424]	0.852 [0.420]	0.892 [0.430]
Internet penetration, region-level, 2011	-0.013 [0.045]	0.007 [0.046]	-0.003 [0.054]	-0.011 [0.049]	0.138 [0.243]	0.204 [0.237]	0.172 [0.276]	0.132 [0.256]
Log (number of Odnoklassniki users), 2014	0.032 [0.017]	0.024 [0.019]	0.039 [0.020]	0.031 [0.019]	0.104 [0.109]	0.078 [0.119]	0.147 [0.120]	0.124 [0.117]
Ethnic fractionalization, 2010	-0.089 [0.059]	-0.084 [0.061]	-0.079 [0.063]	-0.088 [0.062]	-0.580 [0.321]	-0.549 [0.331]	-0.511 [0.342]	-0.583 [0.346]
Observations	625	625	625	625	625	625	625	625
R-squared	0.776	0.780	0.781	0.781	0.823	0.826	0.828	0.826
Mean of the dependent variable	0.134	0.134	0.134	0.134	0.773	0.773	0.773	0.773
SD of the dependent variable	0.341	0.341	0.341	0.341	2.024	2.024	2.024	2.024
Population controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Age cohort controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electoral controls, 1995		Yes				Yes		
Electoral controls, 1999			Yes				Yes	
Electoral controls, 2003				Yes				Yes
p-value for equality of coefficients for three cohorts	0.078	0.071	0.058	0.068	0.271	0.277	0.250	0.246
p-value for equality of coefficients of Durov's and younger cohort	0.089	0.072	0.064	0.076	0.528	0.488	0.416	0.474
p-value for equality of coefficients of Durov's and older cohort	0.031	0.032	0.025	0.028	0.115	0.114	0.099	0.100

^aRobust standard errors in brackets are adjusted by clusters within regions. Unit of observation is a city. Logarithm of any variable is calculated with 1 added inside. "Yes" is added to indicate inclusion of a group of controls. Flexible controls for population (5th polynomial) are included in all specifications. Age cohort controls include the number of people aged 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50 and older years, in each city according to 2010 Russian Census. Education controls include the share of population with higher education overall according to 2002 Russian Census and separately in each of the age cohorts according to 2010 Russian Census, to account for both the levels and the change in education. Electoral controls include vote for Yabloko party, Communist Party (KPRF), LDPR party, the ruling party (Our Home is Russia in 1995, Unity in 1999, United Russia in 2003), and electoral turnout for a corresponding year.

TABLE SA.II
VK PENETRATION AND PRE-VK PROTESTS^a

Panel A. Incidence of earlier protests								
	Incidence of Protests, 1987–1992				Incidence of Pro-Democracy Protests, 1987–1992			
Log (number of VK users), June 2011	0.009 [0.281]	0.006 [0.287]	−0.012 [0.267]	0.023 [0.281]	−0.011 [0.194]	−0.011 [0.193]	−0.022 [0.189]	0.012 [0.197]
<i>p</i> -value for equality of coefficients with that in Table II	0.182	0.200	0.151	0.186	0.094	0.100	0.080	0.094
	Incidence of Labor Protests, 1997–2002				Incidence of Social Protests, 2005			
Log (number of VK users), June 2011	−0.070 [0.239]	−0.080 [0.217]	−0.164 [0.225]	−0.052 [0.241]	−0.056 [0.238]	−0.060 [0.226]	−0.022 [0.226]	−0.000 [0.232]
<i>p</i> -value for equality of coefficients with that in Table II	0.042	0.037	0.017	0.040	0.108	0.095	0.120	0.121
Panel B. Participation in Earlier Protests								
	Log (Number of Protesters), 1987–1992				Log (Pro-Democracy Protesters), 1987–1992			
Log (number of VK users), June 2011	0.533 [1.904]	0.494 [1.953]	0.295 [1.851]	0.495 [1.937]	0.144 [1.494]	0.119 [1.487]	0.022 [1.474]	0.220 [1.564]
<i>p</i> -value for equality of coefficients with that in Table II	0.482	0.497	0.412	0.453	0.298	0.301	0.267	0.302
	Log (Participants in Labor Protests), 1997–2002				Log (Participants in Social Protests) 2005			
Log (number of VK users), June 2011	−0.562 [1.850]	−0.604 [1.740]	−1.326 [1.772]	−0.537 [1.862]	−0.312 [1.625]	−0.335 [1.532]	−0.083 [1.540]	0.100 [1.584]
<i>p</i> -value for equality of coefficients with that in Table II	0.194	0.182	0.085	0.179	0.268	0.244	0.303	0.319
Population, Age cohorts, Education, and Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electoral controls, 1995		Yes				Yes		
Electoral controls, 1999			Yes				Yes	
Electoral controls, 2003				Yes				Yes
Observations	625	625	625	625	625	625	625	625

^aRobust standard errors in brackets are adjusted by clusters within regions. Unit of observation is a city. Logarithm of any variable is calculated with 1 added inside. “Yes” indicates inclusion of a corresponding group of controls. Flexible controls for population (5th polynomial) are included in all specifications. Age cohort controls include the number of people aged 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50 and older years, in each city according to 2010 Russian Census. Education controls include the share of population with higher education overall according to 2002 Russian Census and separately in each of the age cohorts according to 2010 Russian Census, to account for both the levels and the change in education. Electoral controls include vote for Yabloko party, Communist Party (KPRF), LDPR party, the ruling party (Our Home is Russia in 1995, Unity in 1999, United Russia in 2003), vote against all, and electoral turnout for a corresponding year. Other controls include dummy for regional and county centers, distances to Moscow and St Petersburg, log (average wage), share of people with higher education in 2002, internet penetration in 2011, log (Odnoklassniki users in 2014). *p*-values for equality of coefficients are calculated relative to a corresponding coefficient in columns (1)–(4) of Table II using a 3SLS framework.

TABLE SA.III
VK PENETRATION AND PRE-VK VOTING RESULTS^a

	Dependent Variable					
	Pro-Government Vote Share	Yabloko Vote Share	Communists Vote Share	LDPR Vote Share	Turnout	Against All Share
Voting results in 1995, IV with SPbSU cohorts	-0.018 [0.029]	-0.012 [0.022]	0.093 [0.072]	0.034 [0.057]	0.025 [0.039]	-0.010 [0.008]
Voting results in 1999, IV with SPbSU cohorts	0.031 [0.051]	0.006 [0.017]	0.053 [0.049]	-0.008 [0.011]	-0.088 [0.062]	-0.000 [0.007]
Voting results in 2003, IV with SPbSU cohorts	0.088 [0.056]	-0.017 [0.011]	-0.005 [0.024]	-0.002 [0.025]	-0.019 [0.050]	-0.016 [0.012]
Panel B. Presidential elections						
Year 1996, 1st Round	Yeltsin Vote Share	Yavlinsky Vote Share	Zyuganov Vote Share	Lebedev Vote Share	Turnout	Against All Share
Voting results, IV with SPbSU cohorts	-0.135 [0.086]	0.014 [0.018]	0.127 [0.091]	-0.007 [0.042]	0.008 [0.025]	-0.002 [0.003]
Year 1996, 2nd Round	Yeltsin Vote Share		Zyuganov Vote Share		Turnout	Against All Share
Voting results, IV with SPbSU cohorts	-0.122 [0.092]	-	0.136 [0.095]	-	0.004 [0.031]	-0.006 [0.009]
Year 2000	Putin Vote Share	Yavlinsky Vote	Zyuganov Vote	Tuleev Vote Share	Turnout	Against All Share
Voting results, IV with SPbSU cohorts	0.125 [0.081]	-0.028 [0.015]	-0.042 [0.055]	-0.006 [0.031]	0.005 [0.031]	-0.012 [0.005]
Year 2004	Putin Vote Share	Hakamada Vote	Haritonov Vote	Glaziev Vote Share	Turnout	
Voting results, IV with SPbSU cohorts	0.109 [0.063]	-0.025 [0.014]	0.000 [0.034]	-0.034 [0.019]	-0.027 [0.053]	

^aRobust standard errors in brackets are adjusted by clusters within regions. Each cell reports the coefficient for log (VK users) from IV regression with a standard set of controls (i.e. Table 3, column (1)) with various pre-2006 dependent variables, indicated in column titles. Since the outcomes are shares of population, population weights are applied.

TABLE SA.IV
FRACTIONALIZATION OF NETWORKS AND PROTEST PARTICIPATION^a

Panel A. Network Fractionalization and the Incidence of Protest								
Incidence of Protests, Dummy, Dec 2011								
	Whole Sample				Cities With More Than 100,000 Inhabitants			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fractionalization of social media networks (Facebook + Vkontakte)	-0.135 [0.143]	-0.153 [0.148]	-0.155 [0.141]	-0.133 [0.146]	-0.983 [0.435]	-0.883 [0.424]	-0.910 [0.430]	-1.046 [0.417]
Log (number of users in both networks)	0.265 [0.074]	0.262 [0.072]	0.252 [0.073]	0.265 [0.073]	0.072 [0.122]	0.099 [0.122]	0.108 [0.125]	0.140 [0.124]
Observations	625	625	625	625	158	158	158	158
Mean of the dependent variable	0.134	0.134	0.134	0.134	0.500	0.500	0.500	0.500
SD of the dependent variable	0.341	0.341	0.341	0.341	0.502	0.502	0.502	0.502
Population, Age cohorts, Education, and Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electoral controls, 1995		Yes				Yes		
Electoral controls, 1999			Yes				Yes	
Electoral controls, 2003				Yes				Yes
R-squared	0.783	0.787	0.786	0.786	0.768	0.789	0.786	0.799

Panel B. Network Fractionalization and Protest Participation								
Log (Number of Protesters), Dec 2011								
	Whole Sample				Cities With More Than 100,000 Inhabitants			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fractionalization of social media networks (Facebook + Vkontakte)	-0.894 [0.744]	-1.007 [0.771]	-1.010 [0.741]	-0.922 [0.754]	-4.797 [2.140]	-4.731 [2.238]	-4.453 [2.195]	-5.311 [2.044]
Log (number of users in both networks)	1.896 [0.373]	1.874 [0.367]	1.823 [0.373]	1.889 [0.370]	1.233 [0.618]	1.269 [0.665]	1.497 [0.639]	1.490 [0.649]
Observations	625	625	625	625	158	158	158	158
Mean of the dependent variable	0.773	0.773	0.773	0.773	2.926	2.926	2.926	2.926
SD of the dependent variable	2.024	2.024	2.024	2.024	3.065	3.065	3.065	3.065
Population, Age cohorts, Education, and Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Electoral controls, 1995		Yes				Yes		
Electoral controls, 1999			Yes				Yes	
Electoral controls, 2003				Yes				Yes
R-squared	0.838	0.841	0.842	0.841	0.821	0.836	0.838	0.840

^aRobust standard errors in brackets are adjusted by clusters within regions. Unit of observation is a city. Logarithm of any variable is calculated with 1 added inside. "Yes" is added to indicate inclusion of a group of controls. Flexible controls for population (5th polynomial) are included in all specifications. Age cohort controls include the number of people aged 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50 and older years, in each city according to 2010 Russian Census. Education controls include the share of population with higher education overall according to 2002 Russian Census and separately in each of the age cohorts according to 2010 Russian Census, to account for both the levels and the change in education. Electoral controls include vote for Yabloko party, Communist Party (KPRF), LDPR party, the ruling party (Our Home is Russia in 1995, Unity in 1999, United Russia in 2003), and electoral turnout for a corresponding year. Other controls include dummy for regional and county centers, distances to Moscow and St Petersburg, log (average wage), share of people with higher education in 2002, internet penetration in 2011, log (Odnoklassniki users in 2014).

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