Electoral Effects of Biased Media: Russian Television in Ukraine

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We use plausibly exogenous variation in the availability of Russian analog television signal in Ukraine to study how a media source with a conspicuous political agenda impacts political behavior and attitudes. Using highly granular election data and an original survey we estimate that Russian television substantially increased average electoral support for parties and candidates with a 'pro-Russian' agenda in the 2014 presidential and parliamentary elections. We show that this effect is attributable to persuasion rather than differential mobilization. The effectiveness of biased media varied in a politically consequential way: its impact was largest on voters with strong pro-Russian priors but was less effective, and to some degree even counter-effective, in persuading those with strong pro-Western priors. Our finding suggests that exposing an already polarized society to a biased media source can result in even deeper polarization.

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On a visit to the secessionist region of Donbass, president Petro Poroshenko of Ukraine remarked that the primary task before his government was to "recover control, not so much over [lost] territory, but rather over [Ukrainian citizens'] souls poisoned by Russian propaganda."[1] The hybrid war over Ukraine's territorial integrity that ignited with Russia's annexation of Crimea in March 2014 not only brought Russia and the West into a most intense confrontation since the Cold War but also prompted discussions about the cross-national impact of state-controlled media and state-directed informational warfare. Authorities in Ukraine and some other countries in the region banned broadcasts of Russian television in an attempt to lessen the impact of Russian media on their domestic affairs. The European Council set up a task force to counteract Russia's biased news reporting, and U.S. officials described the growing international presence of Russian media as a "weaponization of information," with the "potential to destabilize NATO members, impacting [U.S.] security commitments" (HRFAC, 2015).

Media broadcasts across borders to influence the adversary's population are a time-honored tactic used during the Cold War and even earlier (Roth-Ey, 2011). Over the past few decades, with decline of dominant news networks and rise of social media, 'weaponization of information' has become a truly global phenomenon. In the Middle East, cross-national Shi'a television channels pose a political concern for some Sunni governments.[2] In Africa, the rise of China Central Television is having a transformative impact on the continent's informational landscape (Gagliardone, 2013). Strategic use of (mis)information to influence popular sentiment and sway elections is likely to grow due to falling technological costs of information transmission.

Despite rising global importance of biased media our understanding of how it impacts politics remains poor. The existing literature has mostly focused on domestic effects of biased media and has produced a mixed set of findings: some studies

[1] "Poroshenko smenil rukovoditelia Donetskoi oblasti," lb.ua, 11 June 2015.
[2] "Al-Manar, Al Mayadeen violated charter of honor", *The Daily Star* (Lebanon), 9 December 2015.

document very convincing evidence for the effect of biased media on political behavior (Adena et al., 2015; DellaVigna and Kaplan, 2007; Enikolopov, Petrova and Zhuravskaya, 2011; Yanagizawa-Drott, 2014), while others show equally convincing evidence for the lack of such effects as people 'adjust' for perceived biases in the media (Chiang and Knight, 2011; Durante and Knight, 2012). The fledgling literature on cross-national effects of biased media has also yielded conflicting results ranging from claims that it is effective (DellaVigna et al., 2014), ineffective (Crabtree, Darmofal and Kern, 2015), or even counter-effective (Kern and Hainmueller, 2009). Thus, the current state of the literature indicates that the key question is not so much whether biased media can impact political behavior but instead *how* and *when* it can do so.

To advance the understanding of what types of consumers biased media affects most effectively and by what mechanisms we investigate how Russian television impacted elections in Ukraine in 2014. During this period, the two countries were at the height of a military conflict by proxy, which meant that Russia had a clear stake in Ukrainian politics. The coverage of Ukrainian affairs in Russian state-controlled media was intense and conspicuously one-sided. Our empirical strategy exploits plausibly quasi-random variation in the reception of spillover Russian analog television signal across the border into Ukraine. Using very granular election data, we estimate that Russian television reception has, despite its conspicuous bias, resulted in substantially and significantly higher electoral support for pro-Russian parties. These effects of Russian television are absent in several 'placebo' tests: in the 2010 and 2012 elections, when Russian media barely covered Ukraine's domestic politics, and among survey respondents who did not have access to terrestrial television and were therefore immune to variation in the strength of Russian analog signal. Leveraging original survey data we demonstrate that Russian television had a consistent impact not only behaviors but also on attitudes. Finally, we document how the effectiveness of the Russian media message varied substantially depending on the political priors of Ukrainian voters: the

message was most effective among voters who held pro-Russian priors, but much less effective, and to some extent event counter-effective, among those with pro-Western priors.

These findings contribute to existing scholarship in two principal ways. First, they advance our understanding of the mechanisms by which biased media impacts political behavior. The literature is largely silent about these mechanisms. One possibility is that biased media persuades consumers by altering their beliefs; the other is that it simply mobilizes consumers without affecting their political attitudes. We show that Russian television did not just mobilize voters who were pro-Russian but actually persuaded some of them into holding more pro-Russian attitudes. In fact, we isolate the mechanism even more precisely by demonstrating that the persuasive effect of Russian television was driven specifically by consumption of political *news*, and that only those political attitudes were altered that related to subjects covered on Russian television.

Second, we contribute to the study of the heterogenous effects of biased media. The fledgling literature on the heterogenous effects of biased media is conflicted. In the U.S. context, DellaVigna and Kaplan (2007) find that the pro-Republican Fox News channel was more effective in pro-Democratic than in pro-Republican areas, which could be interpreted as suggesting that biased media is more effective in convincing consumers whose political priors are opposite to those of the source. In contrast, Adena et al. (2015) find that state-run radio in Nazi Germany was most effective at increasing support for Nazi policies in areas historically predisposed toward the Nazi message, arguing, in effect, that biased message is most effective among those who already lean in the direction of the source. Likewise, DellaVigna et al. (2014), while they do not study heterogeneity directly, report that reception of Serbian radio in neighboring Croatia increased support for both extremist Croatian nationalists *and* a moderate socialist party thus providing indirect evidence that people with divergent priors react differently to the same message.

As these existing studies present evidence at the level of electoral districts or municipalities one cannot be certain that the heterogeneous effects that they report are present at the level of individual voters due to the ecological inference problem (King, 2013; Prior, 2013). Using both precinct-level data and evidence from an original survey we are able to demonstrate that electoral effects of biased media are similarly (though not identically) heterogeneous in both aggregate- and individual-level data. Another problem in the literature is that existing evidence is not sufficient to establish that the reported effects are driven by political priors and not some confounders, given that political priors can be correlated with factors like education and urbanization. We demonstrate that the heterogenous effect of biased media is a product of political priors and not other factors. The overall implication of our findings is that exposure to biased media tends to result in political polarization.

Finally, our findings have direct relevance for current policy debates. To our knowledge, this is the first paper to study how biased media affects electoral outcomes in a conflictual international environment. It is, of course, precisely in this type of setting that the political impact of biased media is most consequential. Russia has recently been implicated in efforts to influence elections in the U.S., France, and Germany through misinformation campaigns, which resemble the ones used earlier in Ukraine.[3] There are ongoing debates over whether a media source with a conspicuous political agenda can make a sizable political impact in a highly charged political environment.[4] Our research sheds light on this phenomenon by explaining the nature of the potential political impact of biased media.

[3]For example, 'fake news' and conspiracy theories, which became highly debated topics during the 2016 presidential elections in the U.S., were routinely used by Russian television in its coverage of Ukraine; see "Russian involvement in US vote raises fears for European elections," *The Guardian*, 10 December 2016).

[4]"RT's propaganda is far less influential than Westerners fear", *Economist*, Jan 19, 2017.

POLITICAL CONTEXT AND THEORETICAL EXPECTATIONS

Television is the primary source of political information for 91% of Ukrainians.[5] Given the importance of television news to information dissemination, the Ukrainian government banned Russian state-controlled television channels from Ukraine's cable networks following Russia's annexation of Crimea in February 2014. Nonetheless, as of October 2014, it was estimated that 21% of Ukrainians, most of whom are either bilingual or fluent in Russian, receive their news from Russian television.[6]

To get a sense for how Russian television covered Ukraine we collected transcripts of daily news reports broadcast in 2010-2015 on *Channel One*, Russia's most widely watched station. In Figure 1, we plot the frequency with which Ukraine was mentioned on *Channel One* news during this period. Prior to the Euromaidan protests late in 2013, Ukraine received relatively little attention, even during elections. In contrast, over the course of the presidential and parliamentary elections in 2014, Ukraine became the most talked about topic on Russian television. For instance, in the week prior to Ukraine's parliamentary election, Russia's most popular evening news program 'Vremia' dedicated 31-46% of broadcast time on weekdays and 78% of its Sunday news show to Ukraine.

The dominant narrative across all major Russian channels was consistently and conspicuously disparaging of Ukraine's government and those political parties that promoted closer integration with the West. Newscasters maintained that 'ultra-nationalists' and 'neo-Nazis' sponsored by Western powers were readying to run in the parliamentary election in order to construct a 'new order,' that pro-Russian opposition was violently silenced, and that the incumbent post-Maidan government was an illegitimate 'junta.'

[5]Survey by International Republican Institute, March 2014.
[6]Kiev International Institute of Sociology, October 2014, kiis.com.ua.

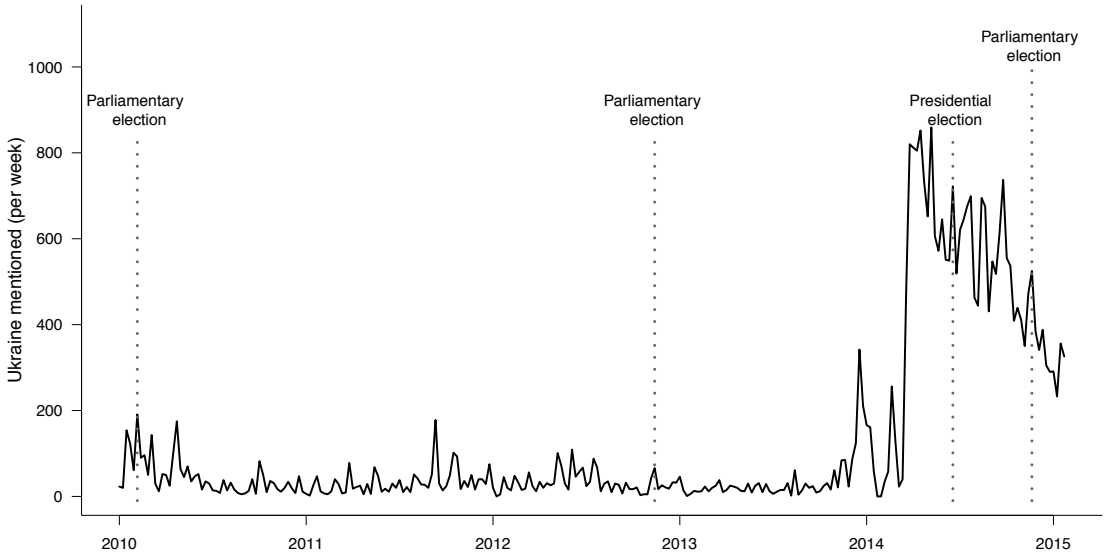

Figure 1: Weekly frequency of mentions of Ukraine on *Channel One* news (source: www.1tv.ru).

The literature suggests that when media bias is *conspicuous* consumers will discount its message if it contradicts their priors. In political psychology, the discounting of information that conflicts with one's priors is variously referred to as 'biased assimilation' (Lord, Ross and Lepper, 1979), 'motivated reasoning' (Ditto and Lopez, 1992), or 'motivated skepticism' (Taber and Lodge, 2006). Models of media persuasion in political economy also arrive at the conclusion that consumers of information will discount biased information that is inconsistent with their priors (Gentzkow and Kamenica, 2011; Gehlbach and Sonin, 2014). Psychological theories of information updating make an even stronger prediction that biased messages may backfire when targeted at consumers with opposing priors (Lord, Ross and Lepper, 1979; Ditto and Lopez, 1992). In Online Appendix 1, we present a formal model showing that such backfiring effect is possible even if receivers are fully rational Bayesian agents.

These theoretical propositions give rise to the following empirical expectations. First, given that the area of our study has historically been relatively pro-Russian, we expect that exposure to Russian television *on average* increased electoral support

for pro-Russian parties and candidates in the 2014 elections. Second, we expect that Russian television had a persuasive effect on voters with pro-Russian priors and was considerably less persuasive, or even dissuasive, with voters with pro-Western priors.

DATA

Our study covers electoral precincts in three provinces (*oblasts*) of northeastern Ukraine: Chernihiv, Sumy, and Kharkiv (see Figure 2). The two provinces east and south of our study area – Luhansk and Donetsk – also share an extended border with Russia, but we could not include them in our analyses as most polling stations there were closed due to ongoing conflict.

Election Data and Variables

We focus on two national elections held in 2014 when Ukrainian domestic affairs were high on Russia's news agenda. We also use the results from the two preceding elections – the 2010 presidential (second round) and the 2012 parliamentary races – for placebo tests.[7] In these earlier elections, Russia did not have a political axe to grind, and coverage of Ukraine on Russian news was limited. All precinct level data come from the Central Election Commission of Ukraine (CEC).

Ukraine has a multiparty system with numerous candidates and political parties. Analyzing the effects of Russian television reception on each candidate and party separately is unwieldy and not very informative, as multiple candidates and parties run on similar platforms. To circumvent this problem, we classify all candidates and parties into the 'pro-Russian' and 'pro-Western' blocs, representing, in a simplified fashion,

[7] We could not use the 2010 election results as control variables, because precinct boundaries changed between 2010 and 2012.

the key cleavage in contemporary Ukrainian politics (Frye, 2015). We code candidates and parties as pro-Western if they publicly advocated for Ukraine's membership in the European Union or NATO or promoted the strengthening of economic, social, or military ties with Europe. In contrast, those candidates and parties that called for closer relations with Russia are coded as pro-Russian. For presidential contenders, we label all those who served exclusively in the Viktor Yushchenko or Yulia Tymoshenko administrations or who were active on the side of the anti-Yanukovych protesters during the Euromaidan protests as pro-Western. Those who served exclusively in the Yanukovych government are labeled as pro-Russian. The list of all parties and candidates along with their classification is provided in Online Appendix 2.

Reception of Russian Television

We measure the quality of reception of Russian analog television in Ukraine with the help of the Irregular Terrain Model (ITM) following Olken (2009). Information on the locations and technical parameters of Russian television transmitters and relays was obtained from the International Telecommunication Union. All Russian transmitters broadcasting channels that carry news programming and located within 100 kilometers of the area under study are included in our analyses.[8] Terrain elevation measures are taken from the 30-arc-second gridded quality-controlled global Digital Elevation Model (GLOBE Task Team, 2010).

When calculating television or radio signal strength at a specific location the conventional practice is to take the most powerful transmitter signal of several that might be available in that location (Enikolopov, Petrova and Zhuravskaya, 2011; Adena et al., 2015). In contrast, we find that the quality of television reception can be measured more accurately by averaging across a small number of highest quality signals because

[8]Later, we also add transmitters carrying only entertainment channels as a placebo test.

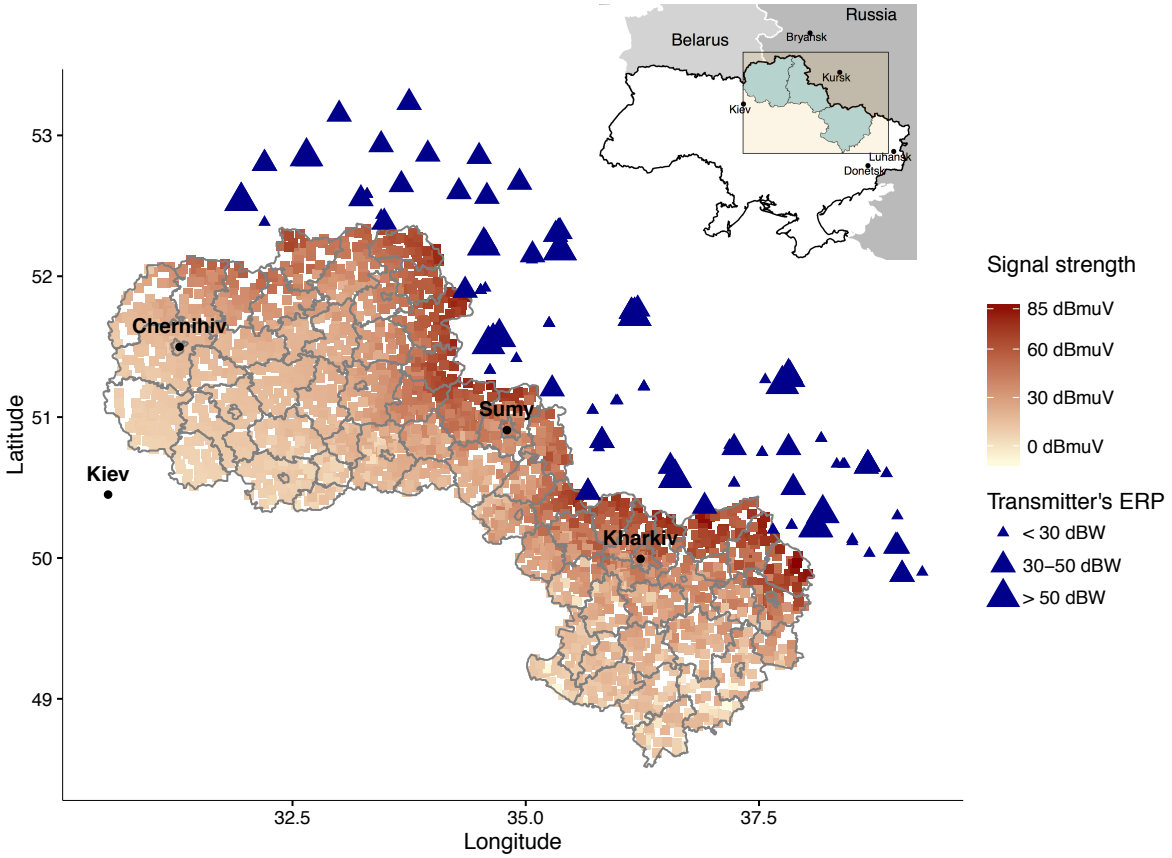

Figure 2: Location of Russian TV transmitters (triangles) and analog signal strength at polling stations; county (*raion*) borders are in grey.

small obstacles (e.g. antenna turned in the wrong direction) can impede reception from any one transmitter. Our survey, which is described below, provides self-reported information about the reception of Russian television across 160 locations. We find that whether a household is able to watch Russian TV is best predicted by averaging out across four highest quality transmitter signals (see Online Appendix 3 for details). Thus, our measure of raw signal strength (*Signal*) is the average of four strongest signals at a given location.

In Figure 2, we map out the location of Russian transmitters in the vicinity of the Ukrainian border and plot field strength of Russian analog television signal at each Ukrainian polling station under study. Signal quality varies substantially across the relatively small area of our study. In about 8% of the precincts, Russian TV signal is of very high quality at above 60 $dB\mu V$ (in these precincts, the probability of self-reported

reception of Russian television varies from 0.36 to 0.84). In about 60% of the precincts, the signal is in a range where viewers are still able to watch Russian television (20-60 $dB\mu V$) but at lower quality and reliability (the probability of reception there ranges from 0.02 to 0.36). In the remaining 22% of precincts, it is practically infeasible to receive Russian analog television.

Using estimated signal field strength, *Signal*, we construct the variable *Reception*, which represents the probability that a precinct receives Russian analog television. We estimate the probability of the availability of Russian television from the following probit model:

$$\Pr\{\text{Receives Russian TV}_i = 1\} = \Phi\left(\lambda(\text{Signal}_i)\right), \tag{1}$$

where i stands for individual survey respondent, Φ is the standard normal distribution function, and λ is an unknown continuous function.[9]This model form allows television reception to vary non-linearly as a product of signal strength. As we show in Online Appendix 3, the probability that a particular location receives Russian television increases only slowly when signal strength is low and then steeply when *Signal* takes on high values. All the results below hold irrespective of whether we use raw signal strength or probability of reception as our main independent variable. In all precinct-level analyses that follow, we use *Reception* as the main independent variable. In individual-level analyses where it is the viewing of Russian television and not its availability that is the independent variable of interest, we instrument for consumption of Russian television with the *Signal* variable.

[9]We use smoothing splines to approximate λ and estimate this regression in the generalized additive model framework (Wood, 2006).

Precinct-Level Covariates

In the analyses that follow, we control for a number of covariates. These include pre-existing political preferences (pro-Russian vote and turnout in the 2012 parliamentary election), the level of economic development (density of road networks within a one kilometer radius of the polling station), population size (number of registered voters), and whether the precinct is rural or urban. We also control for the percent of Ukrainian speakers as reported in the most recent (2001) census. Census statistics are available only at settlement level, which, in the urban context, results in multiple precincts being assigned the same value on this variable. This imprecision in measurement does not appear to create a problem, as our results turn out to be similar for rural and urban precincts irrespective of whether we control for language.

Survey

We fielded a survey of 1,676 respondents in 160 electoral precincts located within 50 kilometers (31 miles) of the Ukrainian-Russian border in January-April 2015. We focused on precincts located in such close proximity to the border in order to control for distance from Russia by design. The sampling scheme and the survey instrument are described in more detail in Online Appendix 4. The survey asked about television viewing habits, voting behavior, and demographic information including language, income, education, and frequency of travel to Russia (intended to capture the depth of cross-border family, friendship, and economic ties). All the key variables are summarized in Table 1.

Variable	Mean	Min	Max	Obs.
Precinct- or settlement-level (Sources: Ukrainian Electoral Commission, ITU, 2001 census)				
% Pro-Russian votes (2014 parl.)	26.72	0	78.9	3,589
% Pro-Russian votes (2014 pres.)	22.48	0	75.71	3,589
% Pro-Russian votes (2012 parl.)	51.52	11.69	95.17	3,589
Russian TV signal ($dB\mu V$)	32.68	-11.7	87.31	3,589
Probability of Russian TV reception	0.11	0	0.85	3,589
Voting population	1091.25	40	2516	3,589
Distance to Russia (km)	62.21	0.13	180.26	3,589
Rural precinct	0.56	0	1	3,589
Road density	35.74	0	164.83	3,589
% Ukrainian speakers	88.07	1.92	100	1,717
Individual-level (Source: survey)				
Russian TV available (self-reported)	0.39	0	1	1,676
Watches Russian TV (entire sample)	0.31	0	1	1,676
Watches Russian TV (if available)	0.79	0	1	648
Uses Ukrainian language	1.58	0 (Never)	4 (Always)	1,663
Income category	1.37	1 (Low)	3 (High)	1,662
Education	2.2	1 (Primary)	3 (Higher)	1,674
Travel to Russia	1.17	1 (Never)	5 (Weekly)	1,614

Table 1: Summary statistics of the main variables.

RESEARCH DESIGN

This study is an example of 'encouragement design' (Hirano et al., 2000; Duflo, Glennerster and Kremer, 2007), where it is not the treatment itself but the availability of a treatment that is randomly assigned. The encouragement design idea stipulates that in precincts with good Russian television reception individuals are *encouraged* to watch it. In this framework, we can estimate the causal effect of the *availability* of Russian television on electoral behavior in Ukraine, but not the effect of its actual *consumption*. These two effects can be quite different (Angrist, Imbens and Rubin, 1996). To estimate the effect of actual consumption of Russian television we later turn to survey data.

The key identifying assumption behind this research design is that, conditional on

geographic covariates, the availability of Russian analog television is exogenous to standard determinants of political attitudes and behavior. One possible challenge to this assumption is that the strength of Russian television signal tends to improve in the immediate vicinity of the Russian border. This geographic variation might in some way correlate with political behavior thus confounding the effect of Russian television that we set out to estimate. To deal with this problem we control flexibly for distance to the Russian border and include fixed effects for counties (*raions*) or electoral districts.[10] Thus, our identification comes from variation in the level of reception of Russian television *within* small geographic units (counties or electoral districts) located at similar distance from the Russian border.

We perform a series of balance tests to determine whether Russian television reception is orthogonal to pre-treatment covariates after controlling for geographic factors. We first estimate residualized television reception using the following semi-parametric OLS regression model:

$$\text{Reception}_i = f(\text{Distance to Russia}_i) + \text{County}_{j[i]} + \epsilon_i, \tag{2}$$

where f is an unknown smooth function approximated by natural cubic splines,[11] $County_{j[i]}$ is a county fixed effect, and ϵ_i is the error term clustered by county.[12] For robustness, we also consider an alternative specification with fixed effects for electoral districts.

Next, we regress the pretreatment variables–potential determinants of political behavior that might confound the effect of Russian television–on residualized signal

[10]There are 26 electoral districts and 66 counties in the area of our study. Counties are mostly nested inside districts, except in urban areas, where a county might include several districts.

[11]To choose the number of knots in a spline we use the Bayesian information criterion, as suggested by Molinari, Durand and Sabatier (2004). This way we estimate a function of distance to Russia, f, that can best explain the variation in television reception without overfitting.

[12]We compute clustered standard errors and p-values using wild cluster bootstrapping (Cameron, Gelbach and Miller, 2008). Alternative bootstrapping methods yield very similar results.

	County fixed effects			District fixed effects			
	Est.	S.E.	p-val.	Est.	S.E.	p-val.	Obs.
Precinct or settlement-level variables							
1. Pro-Russian vote, 2012	1.30	4.57	0.78	−1.15	8.24	0.89	3,589
2. Pro-Russian vote, 2010	−0.37	11.20	0.97	1.42	6.73	0.83	3,659
3. % Ukrainian speakers	−3.22	8.67	0.71	4.10	9.78	0.67	2,058
4. Turnout, 2012	−3.24	4.63	0.48	−0.36	2.31	0.88	3,589
5. Turnout, 2010	−5.43	3.62	0.13	−3.58	2.43	0.14	3,659
6. Voting population (log)	−0.01	0.51	0.99	−0.13	0.21	0.53	3,589
7. Rural precinct	0.13	0.29	0.66	−0.02	0.11	0.83	3,589
8. Road density	0.30	0.57	0.60	0.05	0.14	0.72	3,589
9. km to Kiev (log)	0.01	0.21	0.97	−0.00	0.16	0.99	3,589
10. km to Donetsk (log)	−0.01	0.16	0.96	0.03	0.15	0.86	3,589
11. km to regional capital (log)	0.55	0.77	0.47	0.39	0.29	0.18	3,589
Individual-level variables (averaged over precincts)							
12. Ukrainian usage	−0.47	0.46	0.31	−0.29	0.48	0.54	160
13. Education	−0.08	0.10	0.41	−0.06	0.11	0.58	160
14. Travel to Russia	−0.00	0.07	1.00	0.01	0.07	0.92	160
15. Income	−0.17	0.15	0.25	−0.08	0.20	0.70	160

Table 2: Balance tests. OLS coefficients for residualized Russian television reception. Standard errors clustered by county.

strength. The results are reported in Table 2. Variables in rows 1-11 are measured at precinct level (*Percent Ukrainian speakers* is at settlement level), and those in rows 12-15 are individual-level variables averaged across precincts. Covariate balance is generally quite good. Most importantly, reception of Russian television is not correlated with pro-Russian voting in the 2012 parliamentary election and the 2010 presidential election – those coefficients are small, unstable, and never statistically significant. Once geographic factors are adjusted for, Russian television reception is not related to either socio-economic features of precincts (number of registered voters, rural/urban location, road density) or other geographic features like distance to the capital Kiev, distance to Donetsk, a major city in the conflict zone, and distance to regional capitals. Individual-level covariates are also well-balanced.

Although the coefficients in the balance tests are never significant, in a few cases they are somewhat large. *Percent Ukrainian speakers* is one such case. However, that coefficient is extremely unstable, changing sign depending on whether county or district effects are controlled for. The coefficient for turnout in the 2010 election is also large but very brittle: when we drop the control for distance to Russia, the coefficient for 2010 turnout shrinks to -2.2 when county effects are controlled for and to 0.3 in analyses controlling for district fixed effects. In contrast, the coefficients for post-treatment outcomes of 2014 elections *increase* when distance to Russia is not controlled for. This suggests that the potential lack of balance with respect to turnout in 2010 is unlikely to indicate substantial problems with our identification strategy.

Two additional concerns regarding identification are worth noting. First, Russia might be building its television transmitters strategically in order to influence Ukrainian voters. According to the data by the International Telecommunication Union, Russia has issued 108 new analog television transmitter licenses from 2013 to 2015. None of these new transmitters were placed in the vicinity of the Russian-Ukrainian border. In fact, in June 2015, Russia reduced the power of television transmitters along its border with Ukraine.[13] This is the opposite of what one would expect had Russia been strategically placing its transmitters along the Ukrainian border.

Another potential source of concern is residential self-sorting: individuals might relocate to places with better (worse) Russian analog television reception if they already have pro-Russian (pro-Western) sympathies and values. This concern is exacerbated by the fact that millions of internally displaced persons (IDPs) moved from the conflict zone in the east to other parts of Ukraine. While this type of self-sorting is possible in theory, there is little empirical support for this notion. The IDPs typically move to

[13] Federal State Unitary Company 'Russia's Television and Radio Network' (RTRN). June 2015. "RTRN adjusted the frequency of transmission of 286 television transmitters in order to comply with the Geneva-6 international agreement" (in Russian). Accessed on 4 August 2015. Note that this change came *after* the period of our study, thus it could not impact our results.

settlements where there are jobs and government services geared toward them (primarily cities and large towns), and it is highly unlikely that the IDPs would prioritize the availability of Russian analog television when deciding where to move.[14] In addition, the movement of the IDPs began in earnest in the summer of 2014, whereas we identify electoral effects of Russian television already as of May 2014.

BIASED MEDIA AND MASS ELECTORAL BEHAVIOR

In this section, we examine the effect of the reception of Russian television on precinct-level electoral outcomes. To estimate these effects we use the following semi-parametric OLS regression:

$$\text{y}_i = \gamma \cdot \text{Reception}_i + f(\text{Distance to Russia}_i) + \text{County}_{j[i]} + \boldsymbol{\beta}'\boldsymbol{x}_i + \epsilon_i, \tag{3}$$

where y_i is the percentage of votes cast for pro-Russian parties in the 2014 presidential or parliamentary elections. The coefficient γ for *Reception* is the key parameter of interest. As in the balance tests, f is a continuous function modeled by natural cubic splines (spline selection follows the same steps as in balance tests), *County* and $\boldsymbol{x}$ are fixed effects and control variables respectively. In Online Appendix 5, we consider the effects of Russian television on turnout, but there appear to be none.

Results from the regressions are reported in Table 3. We separately estimate a baseline model, which only includes geographic controls and a full specification with all the covariates described earlier. The size of the estimates for the effect of Russian television decreases somewhat as we move to the 'full' model, but the difference between the baseline and 'full' model estimates is not statistically significant. When interpreting the results we rely on the more conservative estimates from 'full' models.

[14] "Refugee World Day: where re-settlers from Donbass are forced to migrate," Bigmir.net, accessed on 4 August 2015.

	Presidential		Parliamentary	
	Baseline	Full	Baseline	Full
Russian TV reception	9.57**	7.62**	10.92***	7.48***
	(3.33)	(2.56)	(2.94)	(2.16)
Percent Ukrainian speakers		−0.05**		−0.09***
		(0.02)		(0.01)
Pro-Russian vote in 2012		0.43***		0.48***
		(0.05)		(0.05)
Turnout in 2012		−0.03		−0.07**
		(0.02)		(0.03)
Log(Number of Voters)		−0.44		−1.96**
		(0.47)		(0.57)
Rural precinct		0.80*		1.84***
		(0.36)		(0.37)
Road density		−0.42		−0.02
		(0.27)		(0.19)
Persuasion rate	8.18	6.52	8.44	5.80
Adjusted R^2	0.87	0.92	0.87	0.92
Observations	3,589	3,567	3,589	3,567

Standard errors (in parentheses) clustered by county; *p<0.05; **p<0.01; ***p<0.001.

Table 3: Precinct-level regression results. Dependent variables are vote-percentages for pro-Russian parties. All specifications control for county-level fixed effects and smoothing splines for distance to Russia.

As the probability that Russian television is available increases from 0 to 1, the average percentage of votes cast for pro-Russian candidates and parties in the 2014 presidential and parliamentary elections increases by about 7.5 percentage points. These effects are significant at the 99 percent confidence level. A shift from complete absence of Russian television to perfect reception is obviously quite extreme. More meaningfully, improvement in the quality of Russian TV reception by one standard deviation is associated with an increase in average support for pro-Russian parties of 1.2 and 1.1 percentage points in the presidential and parliamentary elections respectively. In the area under study, pro-Russian parties received 22% and 27% of the vote in the two elections. Therefore, one standard deviation change in Russian television reception ac-

	Presidential		Parliamentary		
	Coef.	S.E.	Coef.	S.E.	Obs.
1. Distance to Russia < 50 km	7.46^{**}	(2.68)	7.14^{**}	(2.33)	$1,816$
2. Distance to Russia > 25 km	4.60^{*}	(1.90)	7.99^{***}	(1.85)	$3,030$
3. TV Reception $\in (0.2, 0.8)$	9.75^{**}	(3.38)	9.33^{**}	(3.29)	676
4. Only villages	8.71^{**}	(3.17)	5.93	(3.25)	$1,977$
5. Only towns and cities	5.50^{*}	(2.37)	6.67^{***}	(1.41)	$1,590$
6. District effects	9.57^{***}	(2.71)	5.71^{**}	(2.05)	$3,567$
7. Distance to Kiev and Donetsk	7.63^{**}	(2.62)	6.97^{**}	(2.15)	$3,567$
8. Control for Ukrainian TV reception	7.59^{**}	(2.60)	7.35^{**}	(2.21)	$3,567$
9. Dep. var. = Poroshenko vote	-5.53^{*}	(2.11)			$3,567$
10. Dep. var. = 'Opposition Block' vote			5.47^{***}	(1.57)	$3,567$
11. Altonji-Elder-Taber-style test	-0.29^{***}	(0.07)	-0.17^{*}	(0.07)	$3,567$
12. Placebo signal, county effects	5.57	(5.07)	7.61	(3.97)	$3,567$
13. Placebo signal, district effects	-0.44	(3.83)	-1.55	(2.70)	$3,567$

Standard errors (in parentheses) clustered by county; *p<0.05; **p<0.01; ***p<0.001.

Table 4: Robustness checks: regression coefficients for Russian TV reception. All specifications include the full set of covariates.

counts for about $1.2/22 \times 100\% \approx 5\%$ and and $1.1/27 \times 100\% \approx 4\%$ of the votes amassed by pro-Russian parties in the two elections.

In Table 3, we also report the persuasion rates – the percentage of voters, among those with access to Russian television, who were persuaded to vote for pro-Russian parties as a result of exposure to Russian television (DellaVigna and Kaplan, 2007).[15] Roughly six percent of voters in each of the two elections were persuaded to vote for pro-Russian parties because of the *availability* of Russian television. For comparison, in a study of the effectiveness of pro-opposition media *inside* Russia, Enikolopov, Petrova and Zhuravskaya (2011) estimate persuasion rates at 7.7 percent. Our effect is somewhat smaller but comparable. Note that these effects mask important heterogeneities in voters' behavior and are a product of the mere *availability* of Russian TV, not of its consumption.

To evaluate the robustness of these results we perform a battery of additional tests.

[15]The method for calculating the persuasion rates is explained in Online Appendix 6.

These are summarized in Table 4. First, we check whether our results might be driven by differences between precincts that are especially distant (and therefore different) from one another by restricting the sample to precincts close to the border (row 1) and further away from it (row 2). Second, we exclude all the precincts with either very good or very bad reception of Russian television by restricting the sample to precincts within the intermediate reception range (row 3). Third, we examine separately the effects in rural (row 4) and urban precincts (row 5). Fourth, we check to see whether the results are robust to inclusion of district fixed effects (row 6), distance to the capital Kiev and Donetsk, the largest city in the conflict zone, (row 7) and the quality of reception of Ukrainian analog television (row 8). Fifth, to ensure that the results are not an artifact of how we coded pro-Russian and pro-Western political forces we consider separately the results for a specific candidate (Petro Poroshenko (advocates closer alliance with the EU and NATO) in row 9) and a specific party (the Opposition Block (successor to the pro-Russian Party of Regions) in row 10). Although the magnitudes of the coefficient estimates vary somewhat across specifications, the estimates are generally very similar to our main results.

In row 11, we report results from a test for bias due to unobservables in the spirit of (Altonji, Elder and Taber, 2005). Following the approach recommended by Enikolopov, Petrova and Zhuravskaya (2011), we first regress *Reception* on the full set of covariates and then estimate regressions with the full set of covariates and predicted values of *Reception*. We do not find significant correlation between the index of observables that best predict the variation in Russian television reception and pro-Russian voting. Finally, in rows 12-13 we report results from a placebo test, which examines whether the reception of Russian channels that do not carry news impacted behavior by Ukrainian voters.[16] Availability of Russian entertainment channels has no statistically significant

[16]These include Disney (animation), Kultura (culture), Peretz (youth entertainment), Rossyia 2 (sports), and TNT (films).

effect on voting behavior (the reported coefficients are from regressions that control for all covariates as well as reception of political channels). This suggests that Russian media is influencing Ukrainian voters only through political programming and not entertainment (cf. Kern and Hainmueller, 2009).

INDIVIDUAL-LEVEL MECHANISMS

The evidence reported up to this point does not necessarily imply that biased media has a persuasive effect on voters. First, the preceding estimates only capture the effect of media availability, not of its consumption. Second, because of the ecological inference problem (King, 2013) we do not know whether the same voters who had access to Russian television were also the ones voting for pro-Russian candidates. Third, and most importantly, on the basis of the evidence presented thus far we do not know whether Russian television simply mobilized pro-Russian voters, or if it actually changed their attitudes by making them more favorable toward pro-Russian parties. In this section, we draw on individual-level data to better understand micro-level mechanisms driving our results.

We first estimate the effect of consumption of Russian television on Ukrainian voters. We do that within the instrumental variable (IV) framework. The quality of Russian analog signal is our instrument for consumption of Russian news. The measure of Russian news consumption is a binary variable *Watch* that is equal to one if the respondent reports watching *news* on any of the four leading Russian television channels[17] and equal to zero otherwise. Given that the quality of reception of Russian television varies non-linearly as a product of signal strength, we allow the propensity to *watch* Russian television to vary non-linearly with signal strength. Thus, for the first stage

[17] Channel One, Rossiya 1, NTV, and Channel 5.

we specify a semi-parametric regression:

$$\text{Watch}_i = g\big(\text{Signal}_{j[i]}\big) + \text{County}_{k[i]} + \boldsymbol{\gamma}'\boldsymbol{x}_i + \epsilon_i, \tag{4}$$

where $Signal_{j[i]}$ is the strength of Russian television signal in the precinct where respondent i resides and g is an unknown smooth function approximated by smoothing regression splines.[18] $County_{k[i]}$ is the county fixed-effect, and $\boldsymbol{x}_{ij}$ is a set of individual-level covariates – the use of Ukrainian versus Russian language, income, education, and frequency of travel to Russia (covariates are entered as factors for additional flexibility).[19] The second-stage specification is as follows:

$$\text{y}_i = \beta \cdot \widehat{\text{Watch}}_i + \text{County}_{k[i]} + \boldsymbol{w}'\boldsymbol{x}_{ij} + u_{ij}, \tag{5}$$

where y_{ij} is an individual's vote choice or a measure of political attitudes, and $\widehat{\text{Watch}}_{ij}$ is the fitted value from the first stage. The parameters are estimated using a two-stage least squares (TSLS) linear probability model, and standard errors are clustered by precincts since the instrument varies by precinct and not at the level of individuals.

We consider behavioral and attitudinal outcomes. The behavioral measures are vote choice in the 2014 presidential and parliamentary elections, and these take on the value of one if the respondent voted for pro-Russian candidates and parties. The attitudinal measures are the respondent's agreement with the view that the post-Maidan Ukrainian government is illegitimate (the position strongly advocated on Russian tele-

[18] We use natural cubic splines and select the number of knots based on the Bayesian information criterion.

[19] We do not control for distance to the Russian border because we deliberately sampled precincts that are situated very close to the border (50km/31mi) in order to control for proximity effects by design. Also, we control for how often a respondent travels to Russia, which meaningfully captures personal and business ties to Russia. In Online Appendix 9, we estimate IV regressions controlling for respondents' self-reported vote choice in the 2010 election; coefficient estimates and their significance remain very similar. We do not include historical controls for voting in the main specification because that substantially reduces the sample size.

Main outcomes	Estimate	S.E.	p-value	First stage F	Obs.
Vote pro-Russian (pres.)	0.26	0.16	0.10	13.14	346
Vote pro-Russian (parl.)	0.46	0.22	0.04	12.05	341
Post-Maidan government illegitimate	0.43	0.13	0.00	23.97	499
Trust Vladimir Putin	0.30	0.11	0.01	27.26	566
'Placebo' outcomes					
Favors state-owned property	0.13	0.08	0.10	32.66	598
Positive towards Lenin	0.07	0.10	0.52	24.15	575
Positive towards Stalin	-0.02	0.11	0.87	24.69	567

Table 5: Second stage IV coefficients for watching Russian news. All specifications include standard covariates and county fixed effects. Standard errors are clustered by precinct.

vision) and whether the respondent says that she trusts Russia's president Vladimir Putin. We also consider variation on three 'placebo' attitudes: favorable view of state ownership and positive assessment of Lenin and Stalin. These are attitudes that strongly correlate with a pro-Russian position but are not frequently discussed on Russian news and therefore should not be affected as a result of exposure to Russian television. All of the attitudinal outcomes were measured on a five-point Likert scale. We rescale these outcomes so that one is a maximum value and represents the most pro-Russian attitude on a given question.

Second-stage IV coefficients for watching Russian news and first-stage statistics are reported in Table 5. Watching Russian news increased the probability of voting for pro-Russian candidates by 0.26 and 0.46 points in presidential and parliamentary elections respectively. The estimate for the presidential election is considerably lower and not statistically significant. This might be due to the fact that by the time that the survey was fielded, nine to eleven months after the presidential election, respondents made more recall errors which biased the coefficient downward (Hyslop and Imbens, 2001).[20]

[20]Our case is quite unusual in that both the treatment (self-reports about watching Russian news) and the outcome (voting for pro-Russian candidates and holding pro-Russian attitudes) variables are subject to social desirability bias. In Online Appendix 8, we provide an extensive formal treatment of this problem and show that such double social desirability bias can quite substantially attenuate the

Watching Russian news also had a substantively meaningful and statistically significant impact on respondents' political attitudes with regards to issues covered by Russian media. Respondents who watched Russian news were 0.43 points more likely to consider the post-Maidan Ukrainian government illegitimate. Remarkably, watching Russian news also increased the level of trust in Russia's president Putin by 0.30 points despite the ongoing proxy conflict with Russia. Consistent with expectations, consumption of Russian news does not seem to affect the 'placebo' outcomes (those not directly addressed in news programming). All of the 'placebo' coefficients are small and not significant statistically.

The results suggest that biased media is capable of changing consumers' attitudes through persuasion. Thus, mass-level behavioral effects of biased media documented in the preceding section are likely due to persuasion and not merely to Russian media selectively mobilizing its consumers. Just as one would expect, the effects associated with *viewing* Russian news are much stronger than those associated merely with its *availability*. Specifically, consumption of Russian TV news is about twice as effective as its mere availability. The calculation runs as follows. According to survey data, analog signal varies meaningfully in about 40% of all the sampled settlements. Those who watch Russian television are 0.46 points more likely to vote for pro-Russian candidates in parliamentary elections. Therefore, the potential aggregate-level effect of consuming Russian news is $40\% \times 0.46 \approx 18\%$. In precinct-level analyses, the effect of Russian television availability was about 7.5%, or a little less than half of the consumption effect.

The results from instrumental variable regressions are only valid as long as one is willing to accept the exclusion restriction, i.e. the idea that reception of Russian television impacts behavior and attitudes only through consumption of Russian news and not in some other way. We use evidence from the survey to investigate this assumption.

estimated effects.

Fifty four percent of survey respondents do not have access to analog television; they can be thought of as 'placebo consumers.' If the exclusion restriction holds, political behavior and attitudes of these placebo consumers should not be in any way affected by the fact that some of them reside in settlements where Russian analog television is accessible. That is precisely want we find: variation in Russian analog television reception has no effect on placebo consumers (these results are reported in Online Appendix 7).

PRIORS AND THE EFFECTIVENESS OF BIASED MEDIA

In this section, we consider whether Russian television had a variable effect on voters with opposite political priors. As before, we first present precinct-level analyses (uninformative about micro-level mechanisms but less subject to measurement errors) and then individual-level analyses (informative about mechanisms but more subject to measurement errors).

Aggregate-Level Heterogeneity

At precinct level, we measure pre-2014 political priors by considering how the precinct voted in the 2012 parliamentary election. The assumption is that a precinct that voted heavily for pro-Russian parties in 2012 is one where there are a lot of voters with pro-Russian priors. The reader will recall that the quality of reception of Russian television is not correlated with voting outcomes in 2012. In estimating the heterogenous impact of Russian television we use the following regression model:

$$\mathrm{Y}_i = \sum_{\ell=1}^{L} \gamma_\ell \cdot \mathrm{Reception}_i \cdot x_{i,\ell} + \sum_{\ell=1}^{L} \beta_\ell \cdot x_{i,\ell} + f(\mathrm{Distance}_i) + \mathrm{County}_{j[i]} + \epsilon_i, \qquad (6)$$

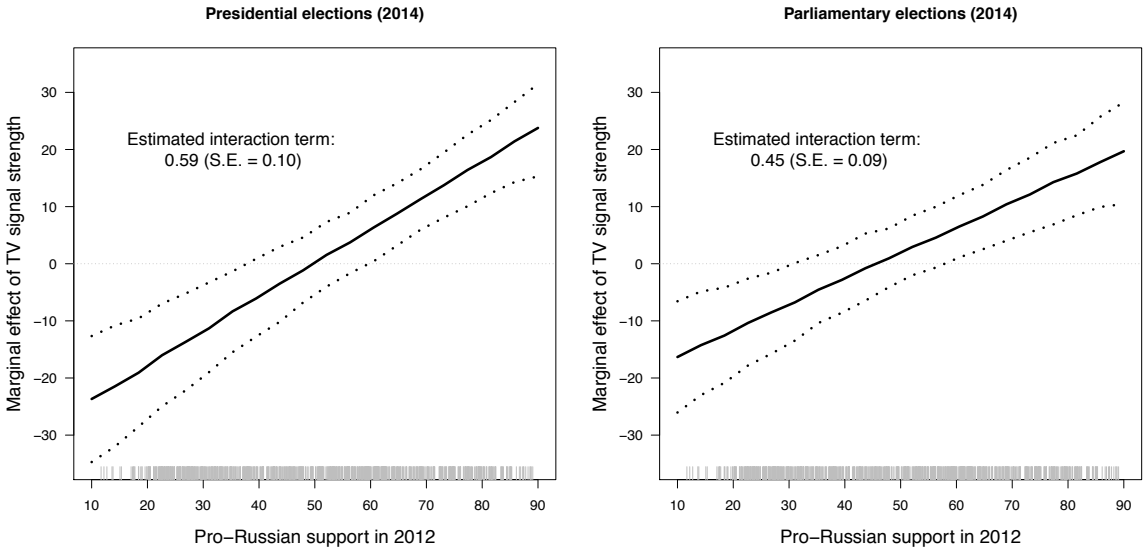

Figure 3: Estimated sample-averaged marginal effects of Russian television reception (95% point-wise confidence bounds) for different values of prior pro-Russian support.

where vector $(x_{i,1}, ..., x_{i,L})$ contains the constant term and all of the covariates, including voting outcomes in 2012. We interact *Reception* with every covariate in order to exclude the possibility that resultant heterogeneity is a product of a factor other than variation in voting outcomes in 2012.[21]

In Figure 3, we plot sample-averaged marginal effects of Russian television reception conditional on pro-Russian vote share in the 2012 election. There is strong evidence for heterogeneity of the effect of Russian television. The persuasive effect of Russian television reception was largest in precincts that historically voted overwhelmingly for pro-Russian parties. This effect weakens as we move to less pro-Russian precincts. The attenuation rate was 0.59 percent in the presidential and 0.45 percent in the parliamentary elections (reported in the top quadrant of the figure). This means that the effectiveness of the Russian news message increased by about five percent for

[21] In Online Appendix 9, we estimate a simpler interaction model where *Reception* is interacted only with pro-Russian vote in 2012. Such a model risks conflating heterogeneity due to prior voting with heterogeneity due to other factors that might be correlated with electoral preferences (e.g. urbanization). We also estimate a fully non-parametric model using the kernel regularized least squares approach (Hainmueller and Hazlett, 2014). Results are consistent across all of the estimations.

every ten percent increase in the precinct-level pro-Russian vote in the 2012 election.

The effect of Russian television on Ukrainian voters does not just decrease as we move from historically pro-Russian to historically pro-Western precincts but becomes altogether negative below a certain threshold. Specifically, Russian television reception *reduced* the support for pro-Russian candidates in 2014 in precincts where in 2012 pro-Russian parties received less than 30% of the vote (about 18% of all precincts in our sample). While the availability of Russian television had a persuasive effect on average, its message was highly effective in communities where many voters were *a priori* already sympathetic to it, less effective in communities where pro-Russian preferences were weaker, and had a dissuasive effect in communities with strong pro-Western priors.[22]

Individual-Level Heterogeneity

Having established in aggregate-level analyses that Russian media has a heterogenous impact on Ukrainian voters we now turn to individual-level data to investigate whether different types of voters are being *persuaded* differently as a result of exposure to Russian news. One concern that must be resolved first is that political priors are difficult to measure at the individual level because recall biases and errors render self-reports of past voting behavior unreliable (Weir, 1975; Wright, 1993). Even if we use such self-reports our sample would be limited only to those who voted in both of the 2014 elections *and* also in the 2012 election, resulting in prohibitively small samples. Instead, we opt for an alternative measure of political priors that is commonly, albeit not universally, accepted in the literature on Ukrainian politics to stand in for political pri-

[22]Why would pro-Western Ukrainians consume Russian media? Studies suggest that media consumers often do not discriminate between news sources if the covered events are of personal interest (Gentzkow and Shapiro, 2010; Stroud, 2011). Our survey shows that 76 percent of Ukrainian speakers watch Russian television where it is available.

	Votes pro-Russian (pres.)	Votes pro-Russian (parl.)	Post-Maidan govt. illegitimate	Trust Putin
Watch Russian TV	0.73**	0.69*	0.47**	0.62***
	(0.25)	(0.29)	(0.17)	(0.16)
Watch Russian TV × Ukrainian usage	−0.23*	−0.12	−0.02	−0.18**
	(0.11)	(0.15)	(0.08)	(0.06)
Cragg-Donald F-statistic (10% bias cutoff = 13.43)	15.00	15.80	25.00	30.10
Observations	346	341	499	566

Note: Standard errors clustered by county; *p<0.05; **p<0.01; ***p<0.001.

Table 6: Second stage IV estimates of the heterogenous effects of watching Russian television after controlling for covariates and county effects.

ors: language usage. Studies of the Ukrainian electorate generally concur that Russian speakers are more likely to favor closer relations with Russia than Ukrainian speakers (Hesli, Reisinger and Miller, 1998; Colton, 2011; Kulyk, 2011). Thus, our proxy measure of prior preferences is a five category variable indicating language use in everyday interactions – from speaking only in Russian (0) to speaking only in Ukrainian (4).

When estimating individual-level heterogenous effects we follow the approach suggested by Wooldridge (2006). We augment the preceding individual-level two-stage least squared regressions by including an interaction between *Watch Russian television* and *Usage of Ukrainian* in the second stage and an interaction between *Signal* and *Usage of Ukrainian* in the second stage.[23] As before, we control for a set of individual-level covariates and county fixed effects and cluster standard errors by precinct.

In Table 6, we present second-stage coefficients for Russian news consumption and first-stage statistics (full results are available in Online Appendix 9). The coefficient for *Watch Russian TV* is the effect of watching Russian television only on those respondents who speak exclusively in Russian: in all four cases, the coefficient is positive

[23]In Online Appendix 9, we present two more flexible IV specifications: one where each covariate is interacted with the treatment and another where treatment is interacted with language use as a factor.

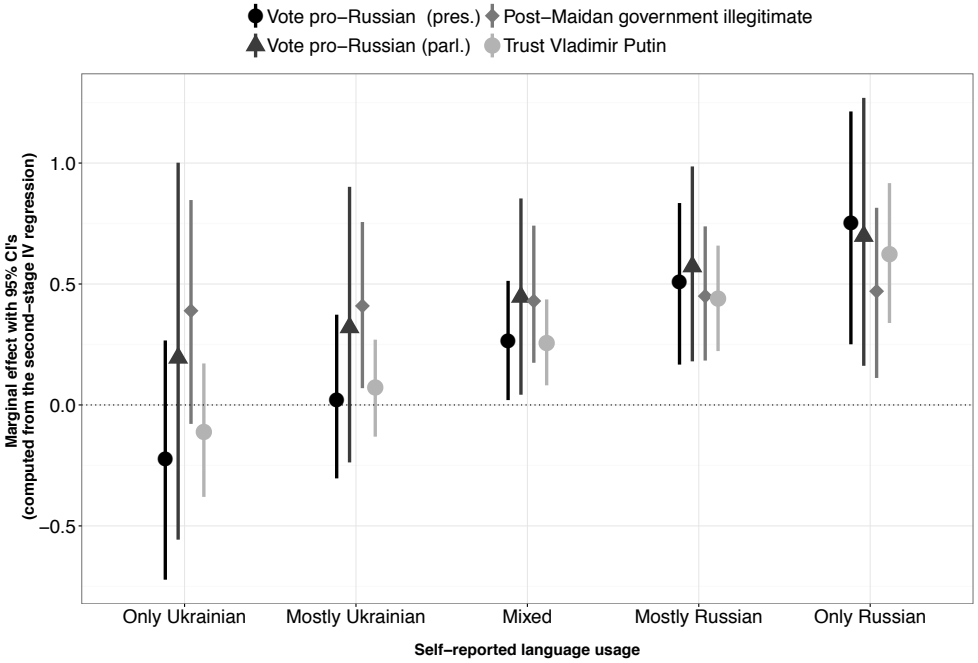

Figure 4: Marginal effects of Russian television consumption by linguistic group with 95% bootsstrapped confidence intervals.

and statistically significant. This means that respondents with strongly pro-Russian preferences are significantly more likely to vote for pro-Russian parties and to hold pro-Russian attitudes. The coefficients for the interaction between *Watch Russian TV* and *Ukrainian usage* are negative in all four specifications and statistically significant for one behavioral (vote in the presidential election) and one attitudinal measure (trust in Putin). Also, consistent with earlier precinct-level findings, the effect-heterogeneity is weaker in parliamentary than presidential elections. This might be due to the fact that the tone of political discourse was considerably more charged in the run up to the presidential race given that the election followed closely on mass protests and the annexation of Crimea.

In Figure 4, we plot the marginal effects of *Watching Russian TV* for each of the five linguistic categories in order to explore in greater depth how exposure to Russian news affects different types of viewers. Among the respondents who speak exclusively in

Russian, exposure to Russian news increases the probability of voting for pro-Russian parties and candidates by about 0.7 points, strengthens the belief that the Ukrainian government is illegitimate by about 0.5 points, and increases trust in Putin by about 0.6 points. All of these effects decrease in magnitude among respondents who use Ukrainian more frequently than Russian in their daily interactions. Among those who communicate exclusively in Ukrainian, exposure to Russian news decreases the probability of voting for pro-Russian candidates in the presidential race by 0.2 points and decreases trust in Putin by about 0.1 points, although both of these effects fall short of statistical significance. In this reference group, the estimate for the effect on voting for pro-Russian parties in parliamentary elections is too noisy to say anything meaningful, whereas the estimate for believing that post-Maidan government is illegitimate is positive at about 0.4 points.

Overall, we find strong evidence across mass- and individual-level analyses that the effectiveness of biased media varies with receivers' priors. At the individual level, there is also evidence that political attitudes are impacted alongside voting behavior, which indicates that biased media persuades its consumers instead of merely mobilizing them. At the same time, we must be cautious when commenting on the precise nature of the heterogenous impact of biased media. At the aggregate level, we found strong evidence that receivers with strongly opposing priors might update in the opposite direction to the content of the message. However, the evidence of such backfiring at the individual level is at best weak. One possibility is that this indeed indicates that the backfiring effect we have found in the aggregate-level data, and similar effect reported in Adena et al. (2015), is due to ecological inference error. But it is also possible that the individual-level results are biased due to measurement errors, especially if social desirability biases depend on the respondents' political priors.

CONCLUSIONS

The goal of this paper was to evaluate how conspicuously biased media impacts mass electoral behavior in a highly polarized political environment. We find consistent evidence that Russian television had a major impact on electoral outcomes in Ukraine by increasing electoral support for pro-Russian political candidates and parties. However, Russian television swayed electoral returns in the pro-Russian direction *on average* by strengthening attitudes of those voters who already had pro-Russian priors rather than by altering the beliefs of pro-Western voters who in fact remained unpersuaded (and probably even dissuaded). Using original survey data we have also shown that Russian media did not just mobilize voters with pro-Russian priors but strengthened their pro-Russian beliefs even further through persuasion by causing political attitudes to shift. The implication of this set of findings is that the aggregate effect of biased media is a product of the distribution of political priors in the population. In the case of Ukraine, where voters were already polarized, exposure to Russian television brought about greater polarization, as expressed through differences in political attitudes and voting.

Some uncertainty remains over the true nature of heterogeneity of biased media effects. In this paper, we found strong support both at aggregate and individual levels that a biased media message becomes considerably less effective among consumers whose political priors are contrary to the message's content. However, evidence for the backfiring effect – the notion that biased media dissuades, as opposed to just failing to persuade, consumers with incompatible priors – was found only at the level of aggregate behavioral outcomes and not at the level of individual attitudes and behaviors. Additional research is needed to establish whether the backfiring effect is an artifact of ecological inference or a real phenomenon at the level of individual consumers.

The study of the effectiveness of biased media, especially in a conflictual environ-

ment, would also benefit from further attention. For one, the depth of historical relations and linguistic commonalities between Russia and Ukraine might challenge the generalizability of our results. Outside of this context, it might be especially interesting to consider the effectiveness of Russian state-sponsored media, like the RT television channel or the Sputnik news service, designed to influence public opinion in developed Western democracies.

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Electoral Effects of Biased Media: Russian Television in Ukraine
Online Appendix

Contents

1. A MODEL OF HETEROGENOUS INFORMATION UPDATING

Let $\theta \in R$ represent the unknown state variable (e.g., how incompetent the Ukrainian government is). The receiver does not know the value of this state variable but has a prior probability distribution over the θ given by $\theta \sim \mathcal{N}(\mu, \sigma^2)$. A media source provides the receiver with the information about the state variable θ. The media source can be either truthful or biased, but the receiver does not know before observing the message whether the source is biased or not. Let s be an indicator variable denoting whether the source is truthful or biased, but he assigns probability π that the source is biased and probability $1 - \pi$ that the source is truthful.

The receiver observes a message $y \in \mathbb{R}$ that is generated by the following stochastic process:

$$y = s\theta + (1 - s)(-\theta) + \epsilon,$$

where ϵ is a standard normal random variable representing the noise in the news. We see that when media is truthful ($s = 1$) its message y is positively correlated with the true state θ since then $y = \theta + \epsilon$, but when media is biased its message represents a 'lie' since it is negatively correlated with the true state θ as we have $y = -\theta + \epsilon$.

We are interested in how the agent's updated posterior belief $E(\theta|y)$ depends on the observed signal y conditional on his prior expectation $\mu = \mathbb{E}(\theta)$. The proposition below makes two claims: first, the updating is weaker when the receiver has a strong prior (μ very large negative or very large positive), and second, when two receivers observe a sufficiently strong signal (a large value of y in absolute terms) they update in different directions if their priors are sufficiently different from each other.

Proposition 1 (Heterogenous Updating)**.** *For any $\pi > 0$, there exists a cut-off $\hat{y}$ such that if $y > \hat{y}$ then the posterior is increasing in y for μ sufficiently large and decreasing in y for μ sufficiently small.*

Proof. After having observed the message y the receiver updates his prior beliefs about the expected value of the state variable y given by:

$$\mathbb{E}(\theta|y) = \mathbb{E}(\theta|y, s = 0)\Pr(s = 0|y) + \mathbb{E}(\theta|y, s = 1)\Pr(s = 1|y).$$

The standard Bayesian updating procedure (Gelman et al., 2003) yields

$$\mathbb{E}(\theta|y, s=0) = \frac{\mu - \sigma^2 y}{\sigma^2 + 1},$$
$$\mathbb{E}(\theta|y, s=1) = \frac{\mu + \sigma^2 y}{\sigma^2 + 1}.$$

The posterior probability that the message is arriving from a truthful media source given that the value of signal is given by

$$\begin{aligned}\Pr(s=1|y) &= \frac{f(y|s=1)(1-\pi)}{f(y|s=1)(1-\pi) + f(y|s=0)(1-\pi)} \\ &= \frac{1}{1 + \frac{\int_\theta \phi(y+\theta)\phi(\frac{\theta-\mu}{\sigma})\,d\theta}{\int_\theta \phi(y-\theta)\phi(\frac{\theta-\mu}{\sigma})\,d\theta}\frac{\pi}{1-\pi}}.\end{aligned}$$

Since the convolution of the normal random variables is the normal random variable, the marginal density $f(y|s=1) = \int_\theta \phi(y-\theta)\phi(\frac{\theta-\mu}{\sigma})\,d\theta$ must also be normal. By the law of iterated expectation we have $\mathbb{E}(y|s=1) = \mathbb{E}(E(y|\theta)) = \mu$. By the law of iterated variance we have

$$Var(y|s=1) = \mathbb{E}(Var(y|\theta)) + Var(\mathbb{E}(y|\theta)) = 1 + Var(\theta) = 1 + \sigma^2.$$

Similarly, we have $\mathbb{E}(y|s=0) = -\mu$ and $Var(y|s=0) = 1 + \sigma^2$. Putting this all together, we can write:

$$\begin{aligned}\Pr(s=1|y) &= \left(1 + \frac{\phi\left(\frac{y+\mu}{\sqrt{1+\sigma^2}}\right)}{\phi\left(\frac{y-\mu}{\sqrt{1+\sigma^2}}\right)}\frac{\pi}{1-\pi}\right)^{-1}, \\ &= \left(1 + \exp\left\{\frac{-2\mu y}{1+\sigma^2}\right\}\frac{\pi}{1-\pi}\right)^{-1}.\end{aligned}$$

By inspection, if $\mu > 0$, then $\Pr(s=1|y)$ is increasing in y for all y, and it is decreasing otherwise. Differentiating the posterior expectation of θ with respect to signal y we get

$$\frac{\partial}{\partial y}\mathbb{E}(\theta|y) \propto \Pr(s=1|y) + y\frac{\partial}{\partial y}\Pr(s=1|y).$$

When $\mu > 0$ the above expression is positive for all $y > 0$. For $\mu < 0$, since the first term is decreasing in y with the zero limit, and the second term is negative and increasing in y, there is a value of y such that the expression is negative. □

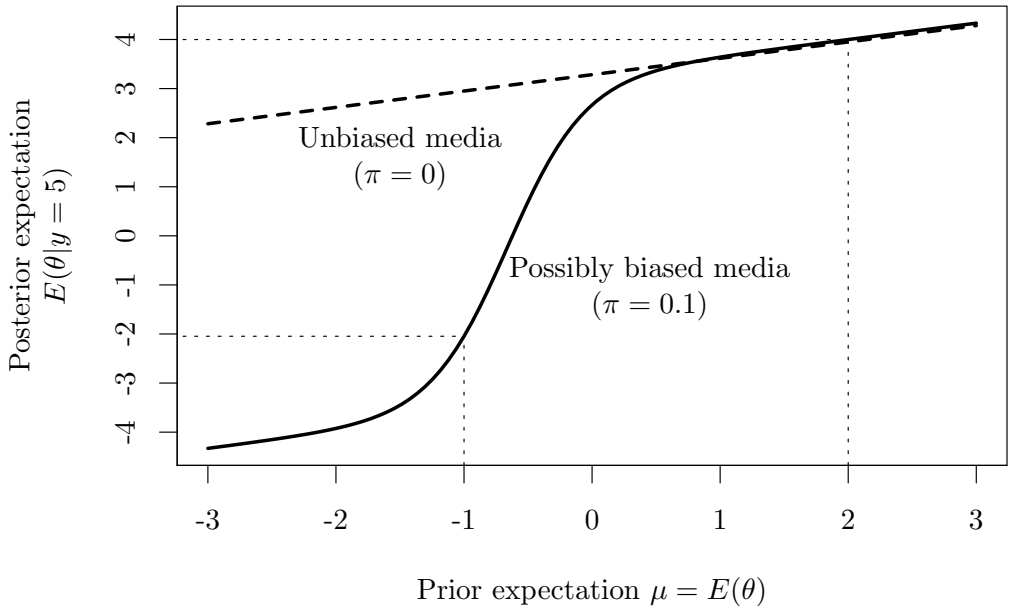

Figure A1: Belief-updating as a function of prior expectation of the state variable given a high positive signal y of the state variable θ.

Figure A1 provides some additional intuition on the mechanics of updating. The horizontal axis represents the receiver's priors, whereas the vertical axis represents the updated belief about the value of θ after observing a large positive signal ($y = 5$). When receivers know that a media source is unbiased ($\pi = 0$) they update strongly in the direction of the signal (in this case, in the positive direction), and their posteriors do not show a lot of heterogeneity. In fact, any heterogeneity fades away as signal strength increases when $\pi = 0$.

However, when $\pi > 0$ so that receivers expect a small chance that the media source is biased against their interests posterior beliefs exhibit very strong heterogeneity. If a receiver expected that the value of $\theta = 2$, then his updated expectation is $E(\theta|y = 5) \approx 4$, thus he updates in the direction of the signal. However, if the receiver has a prior that strongly contradicts the content of the message – he beliefs a priori that $\mathbb{E}(\theta) = -1$ – then his updated belief is $E(\theta|y = 5) \approx -2$; thus, he is updating in the direction opposite to the content of the message.

The main intuition behind these results is that whenever a receiver observes a message that strongly contradicts his prior beliefs, he not only revises his prior belief about the state variable θ but also his belief as to whether he is facing a media source that is telling the truth or lying. In a population with highly diverse priors (variable values of μ in this case), observing the same message y can lead to highly polarized posterior, especially if the message is so strong (the value of y is high) that it raises that the concern that it can

be biased.

The analysis indicates that the following conditions are necessary to generate heterogeneous updating in the population exposed to the same message: (1) the population has sufficiently divergent priors μ about the true state of the world, (2) the messages generated by the media source should not be subtle but rather tending toward judgmental and extreme (y should take large, in absolute terms, values). Interestingly, there are no strong conditions for how biased the media source is expected to be – as long as that probability is not zero ($\pi > 0$), it is possible to generate a divergent effect of media influence, as long as priors are sufficiently divergent and the message is sufficiently extreme. Given our discussion of ex ante polarization in Ukrainian politics driven by ethnolinguistic cleavages and highly loaded nature of Russian reporting on Ukraine, we believe that the two necessary conditions hold in the context of our study when it comes to issues that are a priori polarizing (on which people have strongly divergent and strong priors).

2. CLASSIFICATION OF POLITICAL PARTIES

Table A1: Classification of political parties in the 2012 parliamentary election

Party name	*Classification*	*No. registered candidates*	*% national vote*
Party of Regions/ Партія регіонів	Pro-Russian	221	30.00
All-Ukrainian Union “Fatherland”/ Всеукраїнське об’єднання "Батьківщина"	Pro-Western	203	25.55
UDAR of Vitaliy Klychko/ "УДАР Віталія Кличка"	Pro-Western	208	13.96
Communist Party of Ukraine/ Комуністична партія України	Pro-Russian	214	13.18
All-Ukrainian Union Svoboda/ Всеукраїнське об’єднання "Свобода"	Pro-Western	217	10.44
Below 5% party-list threshold for entry into parliament:			
Ukraine Forward! Of Natalia Korolevska/ Партія Наталії Королевської "Україна – Вперед!"	Pro-Western	149	1.58
“Our Ukraine”/"Наша Україна"	Pro-Western	185	1.11
Radical Party of Oleh Liashko/ Радикальна Партія Олега Ляшка	Pro-Western	139	1.08
Pensioners’ Party of Ukraine/ Партія Пенсіонерів України	Pro-Russian	29	0.56
Socialist Party of Ukraine/ Соціалістична партія України	Pro-Russian	155	0.45
Party of Greens of Ukraine/ Партія Зелених України	Pro-Western	78	0.34
Ukrainian Party “Green Planet”/ Українська партія "Зелена планета"	Pro-Western	225	0.34
“Russian Bloc”/"Руський блок"	Pro-Russian	34	0.31
Greens/Політична партія "Зелені"	Pro-Russian	56	0.25
Ukraine of the Future/ Політична партія "Україна Майбутнього"	Pro-Western	30	0.18
Political association “Native Fatherland”/ Політичне об’єднання "Рідна Вітчизна"	?	106	0.16
People’s Labor Union of Ukraine/ "Народно-трудовий союз України"	Pro-Russian	17	0.11
“New Politics”/"Нова Політика"	?	69	0.10
All-Ukrainian Association “Community”/ Всеукраїнське об’єднання "Громада"	Pro-Western	41	0.08
Ukrainian National Assembly/ Українська Національна Асамблея	Pro-Western	114	0.08
Liberal Party of Ukraine/ Ліберальна партія України	Pro-Western	55	0.07

Table A2: Classification of political parties in the 2014 parliamentary election

Party name	*Classification*	*No. registered candidates*	*% nat vote*
People's Front/"Народний Фронт"	Pro-Western	219	22.14
Petro Poroshenko Bloc/ "Блок Петра Порошенка"	Pro-Western	193	21.82
Self-Reliance Union/ "Об'єднання "Самопоміч"	Pro-Western	60	10.97
Opposition Bloc/ "Опозиційний блок"	Pro-Russian	194	9.43
Radical Party of Oleh Liashko/ Радикальна Партія Олега Ляшка	Pro-Western	215	7.44
All-Ukrainian Union "Fatherland"/ Всеукраїнське об'єднання "Батьківщина"	Pro-Western	212	5.68
Below 5% party-list threshold for entry into parliament:			
All-Ukrainian Union Svoboda/ Всеукраїнське об'єднання "Свобода"	Pro-Western	206	4.71
Communist Party of Ukraine/ Комуністична партія України	Pro-Russian	204	3.88
Serhiy Tihipko's "Strong Ukraine"/ Партія Сергія Тігіпка "Сильна Україна"	Pro-Russian	201	3.11
Anatoliy Hrytsenko's "Civic Position"/ Партія "Громадянська позиція (Анатолій Гриценко)"	Pro-Western	146	3.10
All-Ukrainian Agrarian Union "Spade"/ "Всеукраїнське Аграрне Об'єднання "Заступ"	Pro-Western	183	2.65
"Right Sector"/"Правий Сектор"	Pro-Western	32	1.80
Solidarity of the Women of Ukraine/ Партія "Солідарність жінок України"	Pro-Russian	61	0.66
Party "5.10"/Політична Партія "5.10"	?	173	0.42
Internet Party of Ukraine/ "Інтернет партія України"	?	17	0.36
Party of Greens of Ukraine/ Партія Зелених України	Pro-Western	52	0.25
Ukrainian Party "Green Planet"/ Українська партія "Зелена планета"	Pro-Western	98	0.23
Revival Party/Партія "Відродження"	?	89	0.19
"One Country"/ "Єдина Країна"	Pro-Western	27	0.17
All-Ukrainian Union "Ukraine-One Country"/Всеукраїнське Політичне Об'єднання "Україна – Єдина Країна"	Pro-Western	92	0.12
"New Politics"/"Нова Політика"	?	36	0.12
Політична партія "Сила Людей"	Pro-Western	37	0.11
Ukraine of the Future/ Політична партія "Україна Майбутнього"	Pro-Western	51	0.08
"Strength and Honor"/"Сила і Честь"	Pro-Western	72	0.08
Ukrainian Civil Movement/ Громадянський рух України	Pro-Western	34	0.08
Bloc of Left Forces of Ukraine/ "Блок Лівих Сил України"	Pro-Western	109	0.07

TABLE A3: Classification of political candidates in the 2014 presidential election

Candidate name:	*Classification*	*% national vote*
Petro Poroshenko/Порошенко Петро Олексійович	Pro-Western	54.70
Yulia Tymoshenko/Тимошенко Юлія Володимирівна	Pro-Western	12.81
Oleh Lyashko/Ляшко Олег Валерійович	Pro-Western	8.32
Anatoliy Hrytsenko/Гриценко Анатолій Степанович	Pro-Western	5.48
Serhiy Tihipko/Тігіпко Сергій Леонідович	Pro-Russian	5.23
Mykhailo Dobkin/Добкін Михайло Маркович	Pro-Russian	3.03
Vadim Rabinovich/Рабінович Вадим Зіновійович	?	2.25
Olha Bohomolets/Богомолець Ольга Вадимівна	Pro-Western	1.91
Petro Symonenko/Симоненко Петро Миколайович	Pro-Russian	1.51
Oleh Tyahnybok/Тягнибок Олег Ярославович	Pro-Western	1.16
Dmytro Yarosh/Ярош Дмитро Анатолійович	Pro-Western	0.70
Andriy Hrynenko/Гриненко Андрій Валерійович	?	0.40
Valeriy Konovalyuk/Коновалюк Валерій Ілліч	Pro-Russian	0.38
Yuriy Boyko/Бойко Юрій Анатолійович	Pro-Russian	0.19
Mykola Malomuzh/Маломуж Микола Григорович	Pro-Russian	0.13
Renat Kuzmin/Кузьмін Ренат Равелійович	Pro-Russian	0.10
Vasyl Kuybida/Куйбіда Василь Степанович	Pro-Western	0.06
Oleksandr Klymenko/Клименко Олександр Іванович	Pro-Western	0.05
Vasyl Tsushko/Цушко Василь Петрович	Pro-Russian	0.05
Volodymyr Saranov/Саранов Володимир Георгійович	?	0.03
Zorian Shkiryak/Шкіряк Зорян Несторович	Pro-Western	0.02

3. MEASURING SIGNAL QUALITY AND TV RECEPTION

Let π_i denote the probability that a respondent i reports receiving Russian television.[1] Let $\boldsymbol{s}_i = \{s_{i,1}, ..., s_{i,T}\}$ denote the strength of signals at location i as predicted by the Irregular Terrain Model from $t = 1, ..., T$ Russian transmitters and relay stations. Let $s_i^{(k)}$ denote field strength of the kth strongest signal at location i, and let K denote the number of highest-quality signals to be averaged over. We then fit the following probit regression model:

$$\Phi^{-1}(\pi_i) = \lambda\left(S_i\right), \text{where } S_i = \frac{1}{K}\sum_{k=1}^{K} s_i^{(k)}, \tag{1}$$

where Φ is the standard normal distribution function and λ is an unknown continuous function, which allows television reception to very non-linearly with signal strength. This probit regression is estimated by approximating the function λ with penalized thin plate regression splines (Wood, 2003) in the generalized additive modeling framework (Wood, 2006). For comparison, Enikolopov, Petrova and Zhuravskaya (2011) use specification $\pi = \Phi(\alpha_0 + \alpha_1 s_i^{(1)})$, which is a special case of our measurement approach that assumes $K = 1$ and λ is a linear function.

The optimal number of signals is then identified by identifying the number K that yields the most optimal classification of actual Russian television availability, as reported in the survey. Since the variation in Russian television signal quality can only impact those viewers who watch television via analog antennae, to construct these measurements we exclude respondents who watch television through cable and satellite. The optimal K is found through the following steps

1. Fix K and estimate the model in equation 1;
2. Calculate the area under Receiver Operating Characteristic (ROC) curve as a measure of how accurately the model can identify self-reported Russian television reception;
3. Repeat steps 1-2 for $K = 1, ..., T$, and select K^* that yields the largest area under the ROC curve.

Figure A2 shows the predictive accuracy of the model for various values of $K = 1, ..., 10$. We see that the optimal value of $K = 4$ in our data because this is the point

[1] In the survey, we did not ask 'Do you receive Russian television?' To reduce strong language, we listed the list of channels (some of them Russian), and asked whether respondents receive those channels and whether they watch them.

at which the predictive accuracy of the model is maximized. This means that we can predict signal reception better by averaging over four strongest signals at a given location rather than by using maximum signal value there. Intuitively, even if a single signal is strong it might not be reliable, and thus viewers at a given location might not form a habit of watching the channel. This approach yields a more accurate measure of television reception at no extra data-collection cost.

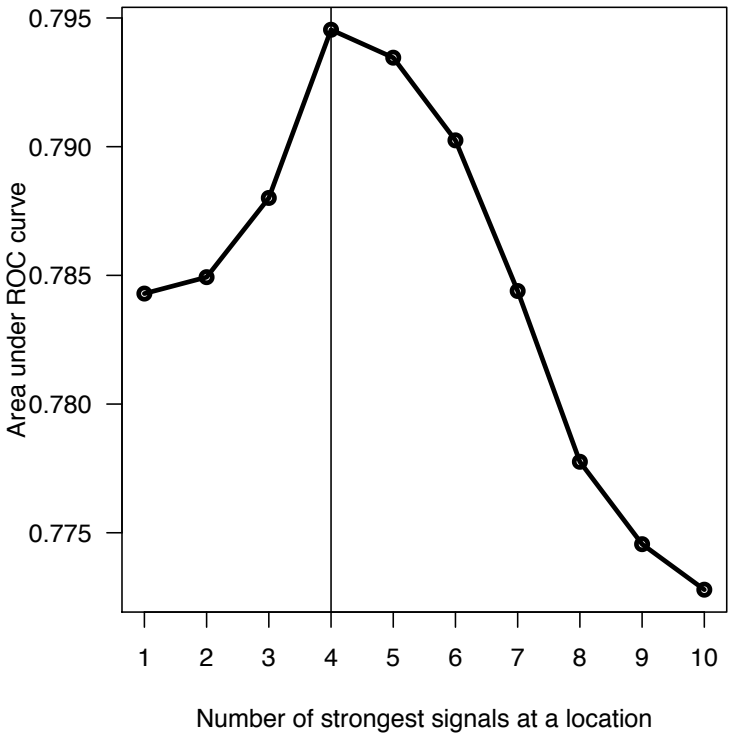

Figure A2: This figure shows how accurately we can predict self-reported reception of Russian television as a function of the number of strongest signals that we average over.

Having identified the optimal value of K (K^*), we then calculate (raw) signal strength at location i ($Signal_i$). To get a sense of how well signal strength predicts actual television reception and viewership, Figure A3 shows the *cumulative proportion* of precincts with respondents reporting to receive or watch Russian television as a function of signal strength. We see that starting at about 30 dBmuV's, respondents increasingly report receiving and watching Russian television. This threshold around which respondents begin to report receiving Russian television is roughly the threshold for analogue TV availability suggested by the United States Federal Communications Commission, which ranges from 11 to 45 dBmuV's, (FCC, 2002). Note that the overall cumulative proportion of precincts that receive Russian television is about 0.4 (note that this proportion includes all precincts below and at the maximum signal strength). Since about 40 percent of respondents in the

sample have analogue antennae, the measure picks up actual reception quite accurately.

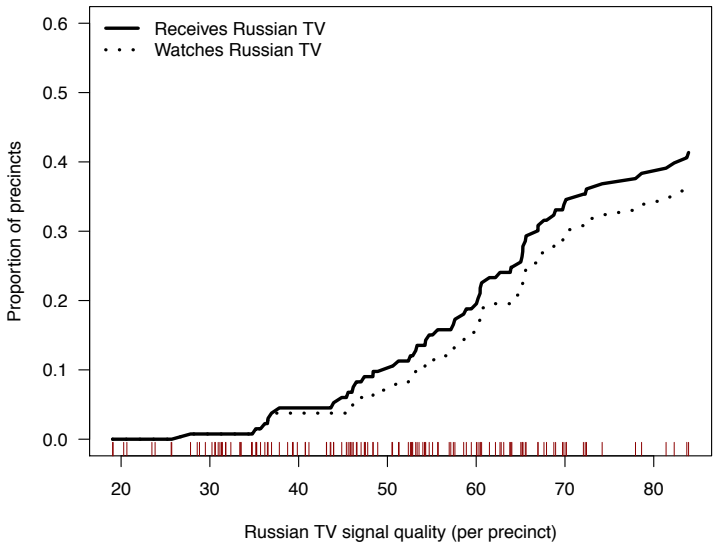

Figure A3: This figure shows the *cumulative proportion* of precincts with respondents reporting to receive or watch Russian television as a function of signal strength.

Using the measure of raw signal strength ($Signal_i$), we calculate the probability of receiving Russian television at location i ($Reception_i$). This probability is simply a fitted value from the probit regression, $\Phi(\hat{\lambda}(Signal_i))$, where $\hat{\lambda}$ is the estimate of λ. Figure A4 shows how raw values of signal strength ($Signal_i$) map onto the probability of receiving Russian television ($Reception_i$). The non-linear nature of this relationship makes sense – signal strength has small impact on reception at low values of the signal and a larger impact at high values of the signal.

Figure A5 shows how well our *Reception* measure predicts reception of each of the four major Russian channels which we asked about in the survey. For the two most popular channels the predicted probability is increasing steeply in step with signal quality. Furthermore, the area under the receiver operator curve (ROC), reported in each figure, also shows the reception estimated by the ITM, and the model predicts the availability of Russian TV channels quite well. The lower panel of Figure A5 shows that reception also predicts well the probability that a respondent *watches* Russian television. We should note that the reception measure predicts best the availability and the propensity to watch Channel 1 and Rossiya 1 – Russia's leading news channels and ones most important for the purposes of this study. The area under the ROC curve for these two channels is 0.81-0.82, indicating that though imperfect, the reception measure is a good predictor of self-

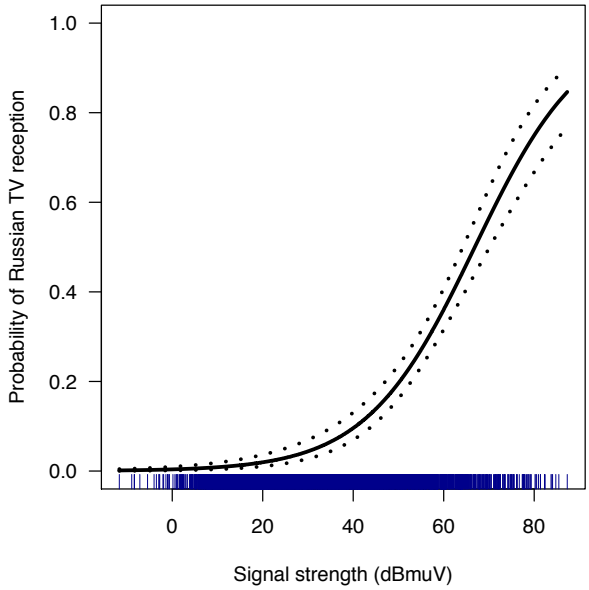

Figure A4: Russian television reception (predicted probability of receiving Russian television with 95 percent confidence bounds) as a function of signal strength.

reported TV reception and consumption.

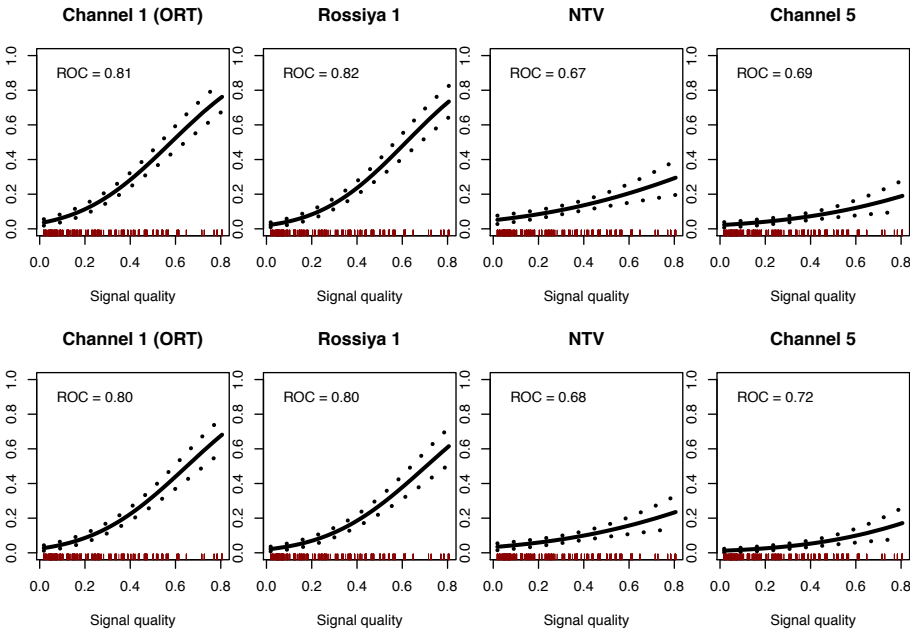

Figure A5: Predicted probabilities of receiving (upper panel) and watching (lower panel) Russian TV channels with 95 percent confidence intervals.

4. SURVEY DESIGN

The survey was fielded in 160 randomly selected precincts located within 50km (30mi) of the Ukrainian-Russian border. We sampled a set of precincts from the overall precinct population and then randomly selected respondents from within each precinct. Since our goal was not to estimate unbiased univariate population parameters but rather to explore the causal relationship between television signal quality and electoral behavior, the sampling scheme was designed to insure high within-sample variation in the quality of Russian television signal. We first sorted all precincts into five equal bands/quintiles corresponding to the distribution of Russian television signal quality and then randomly sampled precincts from within each band. The number of respondents within each band was made proportionate to the number of precincts in it. To make sure that we have enough respondents who actually receive Russian analog television, we oversampled precincts in the band where Russian television reception was very good (above 0.7 on our reception scale). Precincts with fewer than 200 registered voters were excluded because they correspond to very small settlements and are therefore difficult to reach due to poor road conditions. Precincts that made it into the sample are marked in Figure A6.

We randomly selected streets within the precinct from which households were sampled wherever Ukraine's Central Election Commission (CEC) provided specific street addresses in its description of the precincts (precincts in cities, towns, and large villages). Otherwise, in cases where a precinct encompassed an entire settlement (i.e. small and medium-sized villages), interviewers were instructed to pick a street at random on their own initiative. Interviewers were instructed to interview five respondents per street (six in villages). The CEC distinguishes between small, medium, and large precincts by number of registered voters. Six respondents were selected at random from small precincts (exclusively villages), 10 from medium-sized precincts, and 15 from large precincts (mostly cities). Interviewers were instructed to select an initial building at random on a given street. In villages where people live mostly in single-family stand-alone homes, interviewers would knock on every fifth door counting from the building that was approached initially. In cities where apartment buildings predominate, interviewers were asked to knock on every fifteenth apartment door. Once contact was made with a specific household, interviewers selected a respondent at random from among all the adults resident at that address following the nearest birthday method (the individual whose birthday is closest to the date of the interview was interviewed). Response rates were very high; over 80% across all settlement types.

The survey was in the field in January-March 2015, and it was implemented by Sot-

sioinform, a Lviv-based public opinion firm with a national interviewer network. The project was reviewed and approved by the Institutional Review Board at [OMITTED FOR ANONYMITY].

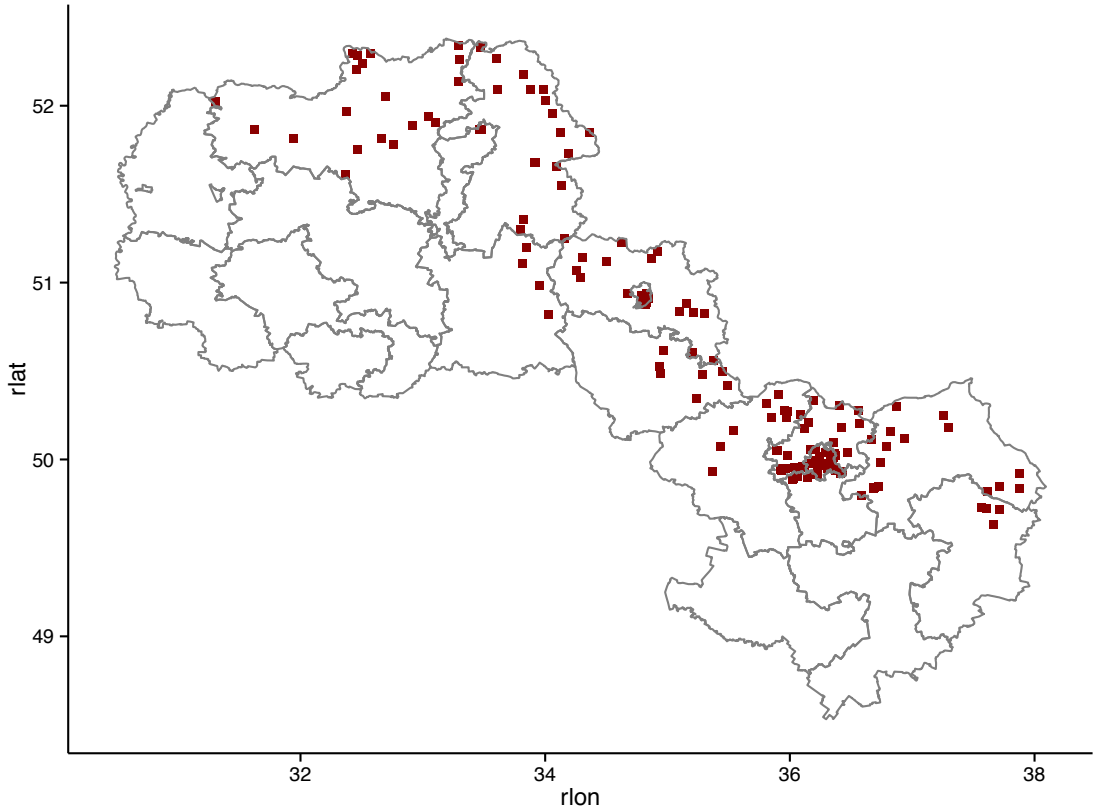

Figure A6: Locations of surveyed precincts.

The survey instrument was offered to respondents in Russian and Ukrainian. It contained 136 questions with blocks on television viewing patterns, political attitudes and behavior, attitudes toward the secessionist conflict in eastern Ukraine, and demographics. Below are English-language translations of survey questions (along with answer options) that we used in this paper. The survey instrument in its entirety is available on request.

1. Television viewing:

   (a) Some people have room and house antennae, others have cable TV, satellite, and others yet watch television on the internet. How do you watch television? (a) Room antenna, (b) House antenna, (c) Cable, (d) Satellite, (e) Via the internet. Which one of these methods of television reception do you use most commonly? (a) Room antenna, (b) House antenna, (c) Cable, (d) Satellite, (e) Via the internet.

(b) I will now read out the names of several television channels. Please tell me whether you receive this channel and describe the quality of television reception. Russian channels: (a) First Channel (ORT), (b) Russia 1, (c) NTV, (d) 5th Channel (Russia).

2. Political behavior:

(a) Did you vote in the last parliamentary election of 26 October 2014? (1) Yes, (0) No.

(b) Which political party did you vote for? (a) People's Front, (b) Poroshenko Block, (c) Opposition Block, (d) Radical Party of Oleh Liashko, (e) Fatherland, (f) Svoboda, (g) Strong Ukraine, (h) Communist Party of Ukraine, (i) Against all/spoilt ballot.

(c) Did you vote in the last presidential election in May 2014? (1) Yes, (0) No.

(d) Which candidate did you vote for? (a) Petro Poroshenko, (b) Yulia Tymoshenko, (c) Oleh Liashko, (d) Anatoliy Hrytsenko, (e) Serhiy Tihipko, (f) Mikhailo Dobkin, (g) Against all/spoilt ballot.

3. Demographic information:

(a) What language do you speak in daily life/at home? (1) Only Russian, (2) Mostly Russian with a few Ukrainian words interspersed, (3) Equal measure Russian and Ukrainian, (4) Mostly Ukrainian with a few Russian words interspersed, (5) Exclusively Ukrainian.

(b) How often do you generally travel to Russia? (5) One a week or more frequently, (4) Once a month or more frequently, (3) Once or several times every six months, (2) One or several times every twelve months, (3) Never.

(c) What is your education level? (1) Incomplete primary, (2) Primary or incomplete secondary, (3) Secondary, (4) Specialized secondary, (5) Professional or technical diploma (polytechnic), (6) Incomplete higher, (7) Higher.

(d) How would you describe your family's income level: is it low, average, or high? (1) Low, (2) Average, (3) High.

5. RUSSIAN TELEVISION AND TURNOUT

The table below reports estimated effects on the level of electoral turnout at precinct level in the two 2014 elections. The estimates are very small across all specifications and statistically not significant. We also do not find any heterogeneous effects of Russian television on turnout. Finally, we also do not find any effects on consuming Russian television on pro-Russian electoral behavior or political attitudes in our individual-level data.

	Presidential		Parliamentary	
	Baseline	Full	Baseline	Full
Russian TV reception	-0.89	2.03	-0.22	1.37
	(2.37)	(2.05)	(3.32)	(2.79)
Percent Ukrainian speakers		0.00		-0.03^{*}
		(0.01)		(0.02)
Pro-Russian vote in 2012		-0.17^{***}		-0.10^{***}
		(0.01)		(0.02)
Turnout in 2012		0.69^{***}		0.73^{***}
		(0.03)		(0.03)
Log(Number of Voters)		0.24		-0.05
		(0.38)		(0.39)
Rural precinct		-1.49^{***}		-2.43^{***}
		(0.29)		(0.31)
Road density		0.41^{*}		0.39
		(0.16)		(0.20)
Adjusted R^2	0.59	0.84	0.45	0.78
Observations	$3,589$	$3,567$	$3,589$	$3,567$

Standard errors (in parentheses) clustered by county; *p<0.05; **p<0.01; ***p<0.001.

Table A1: Precinct-level regression results. The dependent variables are turnout-percentages in each election. All specifications control for county fixed effects and smoothing splines for distance to Russia.

6. CALCULATING PERSUASION RATES

DellaVigna and Kaplan (2007), who proposed the idea of persuasion rates, use the formula

$$f = 100\frac{y_1 - y_0}{e_1 - e_0}\frac{1}{1 - y_0},$$

where y_0 and y_1 stand for the share of those who do not and do receive message, respectively, and $e_1 - e_0$ is the share of those who are exposed to the message. However, this formula only works for binary treatment and exposure. Enikolopov, Petrova and Zhuravskaya (2011) propose a continuous version of the formula, which is

$$f = 100\frac{1}{1 - v_0 t_0}\left(t\frac{dv}{de} + v\frac{dt}{de}\right),$$

where v_0 and t_0 is the predicted vote-share for pro-Russian parties and turnout, respectively, when reception probability is set to zero, t is turnout rate, dv/de is the rate of change in vote-shares as a function of the change in exposure, and dt/de the rate of change in turnout as a function of the change in exposure. In our estimations, we do not find statistically significant impact of Russian TV reception on turnout and thus we set $dt/de = 0$. Enikolopov, Petrova and Zhuravskaya (2011) suggest to calculate dv/de as a product of the regression coefficient and the inverse of the probability that a given voter watches Russian television when it is available. From our survey data, we estimate this probability to be 0.79. Finally, since turnout is not affected by TV reception in our data, we set $t_0 = t = \hat{t}$ - the average turnout rate in a given election. Thus, the final formula for persuasion rate is

$$f = 100\frac{1}{1 - v_0\hat{t}}\frac{\hat{t}\hat{\gamma}}{0.79},$$

where $\hat{\gamma}$ is the estimated regression coefficient for Russian TV availability. Following the usual practice (DellaVigna and Kaplan, 2007; DellaVigna and Gentzkow, 2010; Enikolopov, Petrova and Zhuravskaya, 2011) we calculate v_0 as the average predicted pro-Russian vote-share at zero probability that Russian TV is available.

7. IV ANALYSES: SUPPLEMENTARY RESULTS

7.1. *Full IV output*

The table below presents the full second-stage IV regressions, the abridged results of which are reported in Table 5 of the paper.

	Vote pres.	Vote parl.	Maidan illegitimate	Trust Putin
	(1)	(2)	(3)	(4)
Mostly Ukrainian speaker	−0.07	−0.03	−0.10	−0.11**
	(0.07)	(0.09)	(0.06)	(0.04)
Mixed speaker	−0.15*	−0.17*	−0.04	−0.08*
	(0.07)	(0.08)	(0.05)	(0.04)
Mostly Russian speaker	−0.21**	−0.20*	−0.11	−0.07
	(0.07)	(0.08)	(0.06)	(0.05)
Exclusively Russian speaker	−0.15	−0.09	−0.05	−0.08
	(0.10)	(0.10)	(0.08)	(0.05)
Middle income	−0.07	−0.06	0.01	0.01
	(0.05)	(0.06)	(0.03)	(0.03)
High school education	−0.01	−0.09	0.06	0.09*
	(0.06)	(0.08)	(0.06)	(0.05)
Higher education	−0.04	−0.02	−0.03	0.09
	(0.08)	(0.11)	(0.07)	(0.06)
Travels to Russia once a year	0.05	−0.004	−0.01	0.04
	(0.08)	(0.09)	(0.05)	(0.04)
... twice a year	−0.07	−0.01	0.05	0.04
	(0.11)	(0.15)	(0.09)	(0.10)
... every month	−0.35*	−0.54*	−0.17	−0.26***
	(0.16)	(0.21)	(0.14)	(0.08)
... every week	−0.04	−0.09	−0.32***	−0.04
	(0.04)	(0.05)	(0.03)	(0.04)
Russian TV reception	0.26	0.46*	0.43**	0.30**
	(0.16)	(0.22)	(0.13)	(0.11)
N	346	341	499	566
R^2	0.22	0.24	0.16	0.16
Adjusted R^2	0.12	0.15	0.09	0.10
Residual Std. Error	0.34 (df = 307)	0.40 (df = 302)	0.32 (df = 460)	0.25 (df = 527)

*p < .05; **p < .01; ***p < .001

Table A2: Full output of IV regressionsfully interactive regressions (specifications include county fixed effects). Standard errors are clustered by precinct.

7.2. *Controlling for Prior Individual Voting*

The table below presents the second-stage IV regression coefficients after controlling for how individuals voting in the 2010 presidential election (first round). The vote is coded as 'pro-Russian' if the respondent voted either for Viktor Yanukovich or Serget Tigipko. As we see, including this variable reduces the sample by quite a bit, which results in more noisy estimate. However, the coefficients are within the margin of error from the coefficients reported in the paper. Moreover, the effects on placebo attitudes are statistically indistinguishable from zero, as in the main results.

Main outcomes	Estimate	S.E.	p-value	First stage F	Obs.
Vote pro-Russian (pres.)	0.23	0.12	0.06	13.07	276
Vote pro-Russian (parl.)	0.32	0.18	0.07	11.22	269
Post-Maidan government illegitimate	0.52	0.15	0.00	16.35	307
Trust Vladimir Putin	0.39	0.14	0.01	20.69	340
'Placebo' outcomes					
Favors state-owned property	0.06	0.09	0.51	21.32	352
Positive towards Lenin	0.07	0.11	0.52	16.72	350
Positive towards Stalin	0.08	0.12	0.52	16.95	343

Table A3: Second stage IV coefficients for watching Russian TV news, after controlling for individual's pro-Russian vote in 2010 presidential election. All specifications include the covariates (levels for language, income, education, frequency of traveling to Russia) and county fixed effects. Standard errors clustered by precinct.

7.3. *Effects on the Intensive Margin*

We now consider the effects of Russian news consumption on the intensive margin. The treatment variable in this case is the frequency with which the respondent reports to watch news on the four main national Russian television channels. This measure is an additive index across four Likert scales. That is, for each channel, we asked how often on the scale from one (never) to five (every day) the viewer watches news on Russian channels. We then added these numbers across the four channels. To have results on an interpretable scale, we rescaled the treatment variable to range from zero to one, where zero represents the lowest category and 1 represents that maximum frequency in the sample.

Results are reported below in Table A4. They are very similar to and in some ways even stronger than the ones reported in the paper. Watching more Russian news makes

Main outcomes	Estimate	S.E.	p-value	First stage F	Obs.
Vote pro-Russian (pres.)	0.77	0.39	0.05	10.76	346
Vote pro-Russian (parl.)	1.10	0.45	0.02	8.14	341
Post-Maidan government illegitimate	1.17	0.33	0.00	17.43	499
Trust Vladimir Putin	0.86	0.28	0.00	16.42	566
'Placebo' outcomes					
Favors state-owned property	0.26	0.21	0.21	22.34	598
Positive towards Lenin	0.18	0.32	0.57	16.64	575
Positive towards Stalin	-0.05	0.31	0.88	14.95	567

Table A4: Second stage IV coefficients for watching Russian TV news – intensive margin. The treatment variable is the frequency of watching Russian television news (across all channels) scale to a unit interval. All specifications include the covariates (levels for language, income, education, frequency of traveling to Russia) and county fixed effects. Standard errors clustered by precincts.

respondents more likely to vote for pro-Russian parties and hold pro-Russian attitudes (note that here even for presidential elections the coefficient is close to being significant at the 95 percent confidence level), but not for placebo attitudes, where all coefficients are at least three times smaller than for the main outcomes. Thus, the more intensive is consumption of Russian news, the more likely are people to hold pro-Russian attitudes and show pro-Russian behaviors.

7.4. *Individual-Level Placebo Tests*

While the two assumptions cannot be tested, our data allow us to indirectly asses their validity through the following placebo test. Among survey respondents, 40% watch television *exclusively* via analog, whereas 54% watch television *exclusively* via cable, satellite, or the internet (the six remaining percent have access to analog and non-analog television). The individuals who do not have analog effectively constitute the placebo group because their likelihood of watching Russian news should not be affected by the quality of Russian analog signal. Furthermore, if our identifying assumptions are valid, we should also expect to see no reduced form relationship between the variation in the quality of the Russian television signal and attitudes and behavior for this placebo group.

Table A5 shows the results of these placebo tests for five dependent variables: the propensity to watch news on Russian television and the four outcome variables (voting preferences in the two elections and the two attitudinal variables). Each of the five dependent variables were regressed using logistic model on signal strength, the covari-

	With analog (N = 673)			Without analog ("placebo" group, N = 903)		
Dependent variable	Coef.	S.E.	p-value	Coef.	S.E.	p-value
Watches Russian TV	0.85	0.17	0.00	−0.18	0.32	0.56
Vote pro-Russian (pres.)	0.21	0.13	0.11	−0.07	0.15	0.66
Vote pro-Russian (parl.)	0.40	0.16	0.01	−0.03	0.16	0.84
Post-Maidan government illegitimate	0.37	0.13	0.00	0.01	0.18	0.96
Trust Vladimir Putin	0.26	0.08	0.00	0.08	0.15	0.61

Table A5: The table shows coefficients for Russian TV reception on respondents with and without analog antennae from reduced-form linear probability regressions with the covariates (as factors) and county fixed effects.

ates, and district-level fixed-effects. For those respondents who have analog antennae, better quality of Russian television signal increases their likelihood of watching Russian news *and* also increases their likelihood of voting for pro-Russian parties and holding pro-Russian attitudes. However, for the placebo group that does not have analog antennae, the propensity of having access to strong Russian analog signal is not associated either with the propensity to watch Russian news or with voting for pro-Russian parties or having pro-Russian attitudes. These placebo tests provide strong support for our identifying assumptions.

8. DOUBLE SOCIAL DESIRABILITY BIAS

There exists a possibility that the respondents, because of social desirability bias, may misrepresent both their attitudes/voting preferences *as well as* their propensity to watch Russian television. The double misreporting bias is likely to be highly asymmetric: those who watch Russian television and those who have pro-Russian attitudes are likely to say otherwise, but not vice versa. Here we investigate the consequences of such double social desirability bias in survey answers for our results.

Let $y_i^* \in \{0, 1\}$ denote the respondent's *true* i attitude/behavior with $y_i^* = 1$ representing pro-Russian attitude/behavior, which is more likely to be stigmatized. Let $x_i^* \in \{0, 1\}$ denote the variable measuring whether the respondent i actually watches Russian television ($x_i^* = 1$) or not ($x_i^* = 0$). Neither y_i^* nor x_i^* are observable directly: the respondent provides survey answers y_i and x_i which may or may not represent the truth. The survey answers are generated by the following measurement model:

$$\begin{aligned} \Pr(y_i = 1|y_i^*) &= (1 - \epsilon_y)y^* \\ \Pr(x_i = 1|x_i^*) &= (1 - \epsilon_x)x^* \end{aligned}$$

Hence, whenever the respondent has non-stigmatized attitudes/behavior, he reports the truth. Otherwise, he lies about not watching Russian television with the probability ϵ_x and not having pro-Russian attitudes with the probability ϵ_y. Let the a priori probability $\Pr(x_i^* = 1) = a$, so that a is an unknown fraction of respondents who watch Russian television (but may lie about it in the survey).

The desired estimand is the effect of *actually* watching Russian television on *actually* having pro-Russian attitudes:

$$\delta^* = \mathbb{E}(y^*|x^* = 1) - \mathbb{E}(y^*|x^* = 0),$$

to be estimated from the observed data (x_i, y_i), $i = 1, ..., n$. If we were using the observed data as if it was not subject to measurement error, we would estimate instead

$$\delta = \mathbb{E}(y|x = 1) - \mathbb{E}(y|x = 0).$$

We now show that measurement errors of the above kind attenuate the estimated causal

effect, that is, $|\delta| < |\delta^*|$. Using the law of iterated expectations, we have

$$\begin{aligned}\mathbb{E}(y|x=1) =& \mathbb{E}(y|x=1, y^*=1)\Pr(y^*=1|x=1)\\ =& (1-\epsilon_y)\Pr(y^*=1|x=1, x^*=1)\Pr(x^*=1|x=1)\\ =& (1-\epsilon_y)\mathbb{E}(y^*|x^*=1)\end{aligned}$$

Using the law of iterated expectations and the Bayes rule we also have

$$\begin{aligned}\mathbb{E}(y|x=0) =& (1-\epsilon_y)\Pr(y^*=1|x=0)\\ =& (1-\epsilon_y)\left[\mathbb{E}(y^*|x^*=0)\Pr(x^*=0|x=0) + \mathbb{E}(y^*|x^*=1)\Pr(x^*=1|x=0)\right]\\ =& (1-\epsilon_y)\left[\mathbb{E}(y^*|x^*=0)\frac{1-a}{1-a+\epsilon_x a} + \mathbb{E}(y^*|x^*=1)\frac{\epsilon_x a}{1-a+\epsilon_x a}\right]\end{aligned}$$

Subtracting $E(y|x=0)$ from $E(y|x=1)$, yields, after some algebra,

$$\delta = \delta^* \frac{(1-a)(1-\epsilon_y)}{1-a+\epsilon_x a} \tag{2}$$

The fraction in the of the above expression following δ^* is strictly smaller than 1 for any a and any $\epsilon_x > 0$ and/or $\epsilon_y > 0$. Thus, the average effect estimated from the data contaminated by measurement error, δ, is strictly smaller (in absolute value) than the true average effect δ^*. This attenuation bias *increases* with the measurement errors ϵ_x and ϵ_y. Thus, if we believe that respondents in our survey underreported watching Russian television when it is available ($\epsilon_x > 0$) and/or voting for pro-Russian parties / having pro-Russian attitudes ($\epsilon_y > 0$) then the individual-level estimates reported in the paper constitute the lower bound on the true effects.

9. EFFECT-HETEROGENEITY: ADDITIONAL RESULTS

9.1. *Full Output of the Interactive Models*

The table below presents full output (except estimates of county effects and regression splines for distance to Russia) pertaining to Figure 3 in the paper. Note that only the interaction with pro-Russian vote in 2012 is consistently significant across the two models at conventional confidence levels.

	Presidential	Parliamentary
	(1)	(2)
Reception	-45.14^{*} (18.04)	-53.35^{*} (26.54)
Ukrainian speakers	-0.06^{***} (0.02)	-0.10^{***} (0.01)
Pro-Russian vote in 2012	0.37^{***} (0.05)	0.43^{***} (0.05)
Turnout in 2012	-0.02 (0.02)	-0.07^{**} (0.02)
Rural precinct	-0.62 (0.48)	-2.01^{**} (0.71)
Voting population	0.38 (0.35)	1.06^{*} (0.47)
Road density	-0.19 (0.25)	0.31 (0.26)
Ukrainian speakers x Reception	0.08 (0.05)	0.08 (0.05)
Pro-Russian vote in 2012 x Reception	0.59^{***} (0.10)	0.45^{***} (0.09)
Turnout in 2012 x Reception	-0.03 (0.14)	-0.04 (0.18)
Rural precinct x Reception	0.83 (3.03)	-0.98 (3.92)
Voting population x Reception	2.70 (1.65)	6.45^{*} (2.97)
Road density x Reception	-2.21 (1.77)	-3.92 (2.46)
N	3,567	3,567
R^2	0.92	0.92
Adjusted R^2	0.92	0.92
Residual Std. Error (df = 3485)	5.03	5.47

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table A6: Full output of the fully interactive regressions. Both specifications include splines for distance to Russia and county fixed effects. Standard errors are clustered by county.

9.2. *Simplified Interactive Model*

The table below presents results of a simpler regression specification where *Reception* is interacted only with pro-Russian vote in 2012. Coefficient estimates remain very similar for the presidential election and somewhat smaller but qualitatively similar for the parliamentary election.

	Presidential	Parliamentary
	(1)	(2)
Reception	-27.94^{***} (7.16)	-14.31^{***} (4.03)
Ukrainian speakers	0.38^{***} (0.05)	0.45^{***} (0.05)
Pro-Russian vote in 2012	-0.04^{***} (0.01)	-0.08^{***} (0.01)
Turnout in 2012	-0.03 (0.02)	-0.08^{**} (0.03)
Rural precinct	-0.55 (0.46)	-2.03^{***} (0.59)
Voting population	0.67^{*} (0.34)	1.75^{***} (0.39)
Road density	-0.37 (0.23)	0.01 (0.19)
Pro-Russian vote in 2012 x Reception	0.54^{***} (0.11)	0.33^{***} (0.07)
N	3,567	3,567
R^2	0.92	0.92
Adjusted R^2	0.92	0.92
Residual Std. Error (df = 3490)	5.04	5.51

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table A7: Full output of the fully interactive regressions. Both specifications include splines for distance to Russia and county fixed effects. Standard errors are clustered by county.

9.3. *Heterogeneity Estimates Using Kernel Regularized Least Squares*

To estimate the heterogeneous effect of Russian television reception at precinct-level in the main text of the paper we used an interactive model where signal strength is interacted with all of the covariates in the model. Here, we implement a more flexible analysis using the kernel regularized least squares (KRLS) approach (Hainmueller and Hazlett, 2014). The KRLS method fits a highly flexible regression model in which each independent variable is allowed to have a non-linear and interactive effect on the outcome; thus, we are not required to make assumptions about which variables should enter the model in a linear fashion or which ones should be interacted.

The results of KRLS analyses are summarized in Figure A7. The distribution of marginal effects of Russian television reception on vote percentages for pro-Russian parties in the two 2014 elections are reported in the figure's upper panel. These marginal effects are estimated individually for each precinct. The histograms indicate that there was a significant degree of variation in how Russian television reception impacted election outcomes. In the majority of precincts (represented in blue), marginal effects are positive and, in some cases, as large as 20% or higher. However, in a significant proportion of precincts (represented in red), marginal effects are negative and, in some cases, as large as -10%. More precisely, in 27% and 16% of precincts in presidential and parliamentary elections respectively, good Russian television reception is associated with *negative* support for pro-Russian parties.

We explore the source of that heterogeneity in the lower panel of Figure A7. There we plot the relationship between the percentage of votes cast for pro-Russian parties in 2012 in a given precinct (our measure of pro-Russian priors) and the estimated marginal effect of the availability of Russian television on pro-Russian vote in 2014. These estimates are shown as a smoothed scatterplot, where darker pixels represent higher density points. While the presence of heterogeneity is quite clear from the scatterplots alone, for ease of visualization we also add a non-parametric local regression curve to the plots(Loader, 1999), which indicates how the effect of Russian television signal changes as a function of pro-Russian support in 2012.

In both elections Russian television reception had the largest impact in those precincts that voted overwhelmingly for pro-Russian parties in 2012. In most extreme cases – precincts where pro-Russian parties received more than 80% of the vote in 2012 – the presence of Russian television signal increased the vote share for pro-Russian parties in 2014 on average by 11% in the presidential contest and by 12% in the parliamentary election. The size of these effects decreases quite steeply as we move to historically less pro-

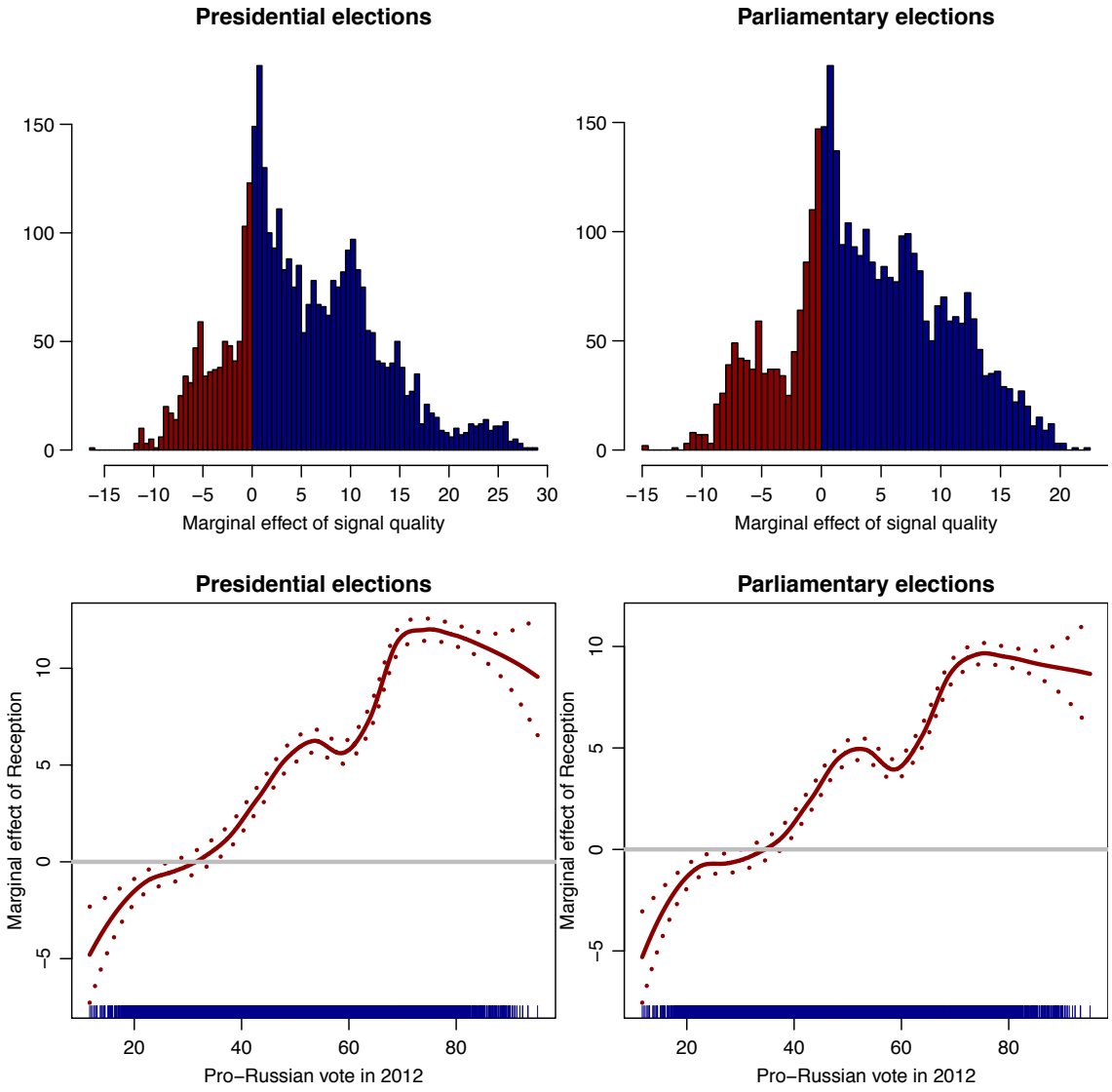

Figure A7: Heterogeneous impact of the availability of Russian analog signal on precinct-level electoral results in 2014 (marginal effects from KRLS regressions). Upper panel: distribution of estimated marginal effects (histogram). Lower panel: relationship between pro-Russian vote in 2012 and marginal effects of signal quality (smoothed scatterplot with a non-parametric regression curve and 95% point-wise confidence bounds.)

Russian precincts. In precincts where pro-Russian parties received about 40% of the vote in 2012, the effect of Russian television availability in 2014 is statistically indistinguishable from zero. Finally, in historically pro-Western precincts – those where pro-Russian parties received less than 25-30% of the vote in 2012 – the availability of Russian television signal had a negative effect on electoral support for pro-Russian parties in 2014. All in all, the availability of Russian television has substantially different effects on different communities depending on their priors. Russian television is most persuasive in

those communities where there are already many voters who are inclined to accept its message. On the other hand, in communities where there are many voters with strongly pro-Western preferences, we observe small but meaningful dissuasive effects of Russian television availability.

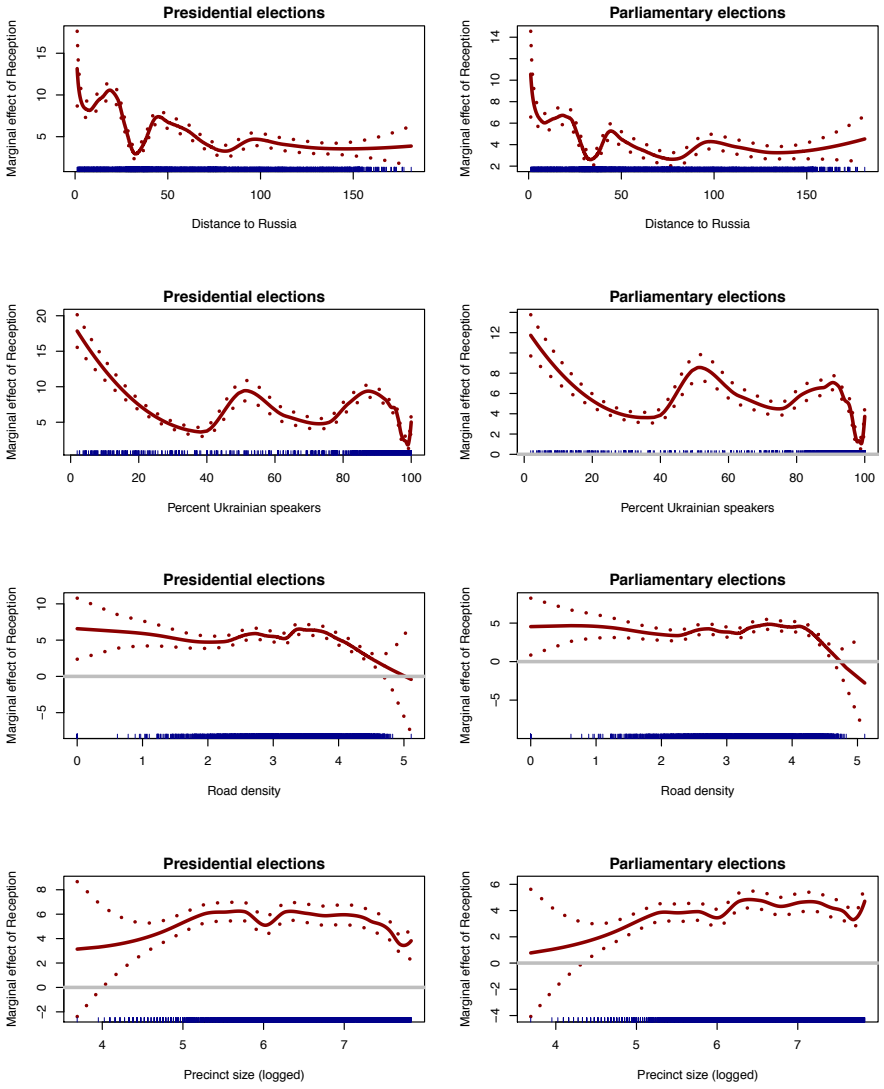

Figure A8: Heterogeneity of the Russian television reception effect conditional on the covariates.

In Figure A8, we explore how the effect-heterogeneity varies with respect to other covariates. We see some evidence of heterogeneity with respect to the use of the Ukrainian language in the sense that the effect is larger in places where fewer respondents self-identified as Ukrainian speakers in the 2001 population census. However, we do not see the marginal effect changing the sign. The evidence of heterogeneity is much weaker, or

even nonexistent, when it comes to economic modernization as measured by road density and population size. The heterogeneity with respect to distance to Russia is highly non-monotonic and quite difficult to interpret. All in all, it seems like the starkest heterogeneity is with respect to voting in the 2012 election.

9.4. *Individual-level Heterogeneity: Full Output*

The table below shows complete second-stage IV regression results (county fixed effects are not reported) relating to Table 6 in the paper.

	Vote pres.	Vote parl.	Maidan illegitimate	Trust Putin
	(1)	(2)	(3)	(4)
Mostly Russian	0.03	0.02	−0.09	−0.03
	(0.08)	(0.12)	(0.06)	(0.05)
Mixed	0.01	−0.10	−0.03	0.04
	(0.10)	(0.13)	(0.07)	(0.05)
Mostly Ukrainian	−0.001	−0.10	−0.09	0.09
	(0.11)	(0.16)	(0.09)	(0.06)
Only Ukrainian	0.03	−0.01	−0.04	0.06
	(0.13)	(0.14)	(0.09)	(0.06)
Middle income	−0.07	−0.06	0.01	0.01
	(0.05)	(0.06)	(0.03)	(0.03)
Incomplete highschool	0.01	−0.08	0.06	0.10*
	(0.07)	(0.08)	(0.06)	(0.04)
Highschool	0.01	0.003	−0.03	0.10
	(0.08)	(0.10)	(0.07)	(0.06)
Goes to Russia once a year	0.08	0.004	−0.01	0.04
	(0.08)	(0.09)	(0.05)	(0.05)
...twice a year	−0.18	−0.08	0.04	−0.03
	(0.15)	(0.15)	(0.10)	(0.09)
... every month	−0.51***	−0.62**	−0.18	−0.26**
	(0.15)	(0.19)	(0.14)	(0.08)
... every week	−0.01	−0.08	−0.32***	−0.02
	(0.04)	(0.05)	(0.03)	(0.04)
Ukrainian x Watches Russian TV	0.73**	0.69*	0.47**	0.62***
	(0.25)	(0.29)	(0.17)	(0.16)
Watches Russian TV	−0.23*	−0.12	−0.02	−0.18**
	(0.11)	(0.15)	(0.08)	(0.06)
N	346	341	499	566
R^2	0.12	0.21	0.17	0.10
Adjusted R^2	0.01	0.11	0.10	0.03
Residual Std. Error	0.36 (df = 306)	0.41 (df = 301)	0.32 (df = 459)	0.26 (df = 526)

*p < .05; **p < .01; ***p < .001

Table A8: IV regressions for heterogenous effects, including county fixed effects. Standard errors clustered by precinct.

9.5. *Individual-level Heterogeneity: Flexible Specification*

The table below shows a more flexible specification where we interact the indicator for *Watching Russian TV* with language group treated as a factor. While this model is more flexible, we face a problem of sparsity because some cells might become very small and the resulting estimates become very noisy. Nonetheless, we see sufficient evidence consistent with our linear specification in the paper: the coefficient for *Watching* is large and positive for respondents who are do not speak Ukrainian frequently. Moreover, in three specifications, the coefficient for *Only Ukrainian* group is negative, though it is estimated very imprecisely.

	Vote pres.	Vote parl.	Maidan illegitimate	Trust Putin
	(1)	(2)	(3)	(4)
Mostly Russian	0.02 (0.14)	0.06 (0.16)	−0.04 (0.08)	−0.02 (0.06)
Mixed	−0.08 (0.12)	−0.17 (0.13)	0.002 (0.07)	0.06 (0.06)
Mostly Ukrainian	−0.11 (0.13)	−0.11 (0.15)	−0.09 (0.08)	0.13 (0.07)
Only Ukrainian	0.11 (0.16)	0.01 (0.15)	0.02 (0.10)	0.003 (0.08)
Middle income	−0.09 (0.06)	−0.05 (0.07)	0.01 (0.04)	0.01 (0.03)
Incomplete highschool	0.03 (0.08)	−0.06 (0.08)	0.06 (0.06)	0.09* (0.04)
Highschool	0.01 (0.10)	0.01 (0.11)	−0.03 (0.07)	0.10 (0.05)
Visits Russia once a year	0.07 (0.08)	−0.01 (0.08)	−0.01 (0.05)	0.04 (0.04)
...twice a year	−0.18 (0.20)	−0.03 (0.20)	0.02 (0.10)	−0.04 (0.08)
... every month	−0.32 (0.49)	−0.43 (0.50)	−0.10 (0.22)	−0.28 (0.16)
... every week	−0.03 (0.42)	−0.05 (0.45)	−0.33 (0.34)	−0.02 (0.29)
Only Russian x Watching	0.55* (0.28)	0.60 (0.33)	0.52*** (0.14)	0.67*** (0.13)
Mostly Russian x Watching	0.21 (0.35)	0.33 (0.30)	0.30 (0.21)	0.51** (0.17)
Mixed x Watching	0.34 (0.29)	0.71* (0.32)	0.36* (0.17)	0.22 (0.14)
Mostly Ukrainian x Watching	0.17 (0.22)	0.17 (0.26)	0.50** (0.19)	−0.01 (0.15)
Only Ukrainian x Watching	−2.39 (1.45)	−1.94 (2.52)	−0.13 (0.79)	0.89 (0.70)
Constant	−0.01 (0.18)	0.17 (0.20)	0.04 (0.12)	−0.16 (0.10)
N	346	341	499	566
R^2	0.01	0.17	0.20	−0.002
Adjusted R^2	−0.13	0.05	0.13	−0.08
Residual Std. Error	0.39 (df = 303)	0.42 (df = 298)	0.31 (df = 456)	0.27 (df = 523)

*p < .05; **p < .01; ***p < .001

Table A9: IV regressions with coefficients estimated separately for each language group.

9.6. *Individual-level Heterogeneity: Fully Interactive Specification*

We now fit an IV model where the indicator for *Watches Russian TV* is interacted with each "background" covariate – education, income, frequency of travel to Russia, and usage of Ukrainian. To avoid sparsity we use each covariate as a linear term, not as a factor. Since our main results do not depend on whether we use each covariate as a linear term or a factor we do not expect this to cause major biases here as well. The results are largely consistent with our estimates reported in the paper: the estimate for the interactive term is large and (in two specifications, as in the paper) significant, and this holds *only* for the *Ukrainian usage* variable. Note that the linear term *Watches Russian TV* does not have a clear interpretation in this fully interactive model, and it should not be compared to our estimates in the paper (its magnitude and significance also cannot be interpreted directly from this output).

	Vote pres.	Vote parl.	Maidan illegitimate	Trust Putin
	(1)	(2)	(3)	(4)
Watches Russian TV	1.21	−0.01	0.12	0.52
	(1.34)	(1.26)	(0.51)	(0.36)
Ukrainian usage	−0.01	−0.01	−0.01	0.02
	(0.03)	(0.03)	(0.02)	(0.02)
Income	−0.07	−0.03	0.01	0.01
	(0.18)	(0.17)	(0.08)	(0.06)
Education	0.05	−0.05	−0.05	0.02
	(0.09)	(0.11)	(0.05)	(0.04)
Travel to Russia	0.02	−0.04	−0.07	−0.005
	(0.08)	(0.09)	(0.06)	(0.04)
Ukrainian usage x Watches Russian TV	−0.20*	−0.14	−0.04	−0.17**
	(0.10)	(0.14)	(0.07)	(0.06)
Income x Watches Russian TV	0.01	−0.10	−0.01	−0.02
	(0.54)	(0.52)	(0.25)	(0.19)
Education x Watches Russian TV	−0.30	0.48	0.14	0.09
	(0.51)	(0.66)	(0.21)	(0.14)
Travel to Russia x Watches Russian TV	−0.05	−0.03	0.09	−0.03
	(0.13)	(0.15)	(0.10)	(0.08)
Constant	−0.02	0.18	0.26	−0.14
	(0.31)	(0.30)	(0.16)	(0.13)
N	346	341	499	566
R^2	0.16	0.13	0.15	0.05
Adjusted R^2	0.06	0.03	0.09	−0.01
Residual Std. Error	0.35 (df = 310)	0.43 (df = 305)	0.32 (df = 463)	0.26 (df = 530)

*p < .05; **p < .01; ***p < .001

Table A10: IV regressions with coefficients estimated separately for each language group.

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